curriculum standard

apprenticeship

NOVA SCOTIA
APPRENTICESHIP
AGENCY

IRONWORKER (STRUCTURAL/ORNAMENTAL) 2017

Based on the CCDA Harmonization Recommendations and
the Interprovincial Program Guide
(pg. 10 for Program Structure)

NOVA SCOTIA

2017
Version #1.0

Preface

This Apprenticeship Curriculum Standard is intended to assist instructional staff in the design and delivery of technical, in-class training in support of the Ironworker (Structural/Ornamental) Apprenticeship Program.

This document contains all of the technical training elements required to complete the apprenticeship program and has been developed based on the 2015 National Occupational Analysis (NOA) and the Interprovincial Program Guide (IPG). The NOA and IPG can be found on the Red Seal website (www.red-seal.ca),

Implementation of this Apprenticeship Curriculum Standard for apprenticeship training is outlined in the following table.

Level	Implementation Effective
Level 1	2016-2017
Level 2	2017-2018
Level 3	2018-2019

*** The above implementation schedule was current at time of printing. Please **confirm** with Apprenticeship Staff prior to commencing training.*

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PROGRAM CONTENT

Introduction

Jurisdictions have long recognized the benefit of pooling resources in the development and maintenance of apprenticeship training standards. A successful example of this is the Interprovincial Standards Red Seal Program, which is administered by the Canadian Council of Directors of Apprenticeship (CCDA). Essential to the establishment of standards is the development of suitable training systems and programs which enable tradespeople to acquire certification based on these standards. While certification is the responsibility of Apprenticeship administrators throughout Canada, the development and delivery of technical training is the responsibility of jurisdictions.

With the support of Employment Services and Development Canada (ESDC), the provinces and territories have been working collaboratively to harmonize apprenticeship training programs across Canada. Four main areas of harmonization include:

- Use of the Red Seal trade name
- Consistent total training hours
- Same number of training levels
- Consistent sequencing of training content (at each level) using the most recent Red Seal Occupational Standard/National Occupational Analysis for the trade

This Apprenticeship Curriculum Standard is in alignment with the national CCDA harmonization recommendations.

Provincial-Territorial Apprentice Mobility Agreement and Protocol

The provincial-territorial apprenticeship mobility agreement and protocol obligates Apprenticeship Authorities across Canada to recognize hours worked and technical training successfully completed by apprentices, regardless of the jurisdiction in which they were completed. The protocol applies to apprentices moving permanently or temporarily, and to recent graduates of college trades program.

User Guide

Apprenticeship Curriculum Standards are developed based on the National Occupational Analysis (NOA) or Red Seal Occupational Standard (RSOS) for the trade, the Interprovincial Program Guide (IPG), if available, and extensive industry consultation. This document represents the minimum content to be delivered for the Apprenticeship Training Program.

The document includes a Level Structure that aligns with trade harmonization recommendations to facilitate mobility for apprentices moving from one jurisdiction to another.

Structure

The content of the Apprenticeship Curriculum Standard is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. It is at the discretion of the training provider to deliver the content in the required logical sequence of delivery within the level. Jurisdictions are free to deliver units one at a time or concurrently within a level, provided all outcomes are met.

The Learning Outcomes describe what the apprentice should know or be able to do at the end of training. Wording of the Learning Outcomes, "Demonstrate knowledge of…" acknowledges the broad spectrum of ways in which knowledge can be assessed (i.e. practical projects, multiple choice testing, presentations, etc.) by instructional staff within the training.

The National Occupational Analysis (NOA)/Red Seal Occupational Standard (RSOS) to Apprenticeship Curriculum Standard Comparison chart outlines the relationship between each NOA/RSOS sub-task and ACS units. NOA/RSOS References have also been detailed in each unit to highlight the direct link between the unit and relevant sub-tasks.

The theoretical objectives represent the material that is to be covered during the technical training in order to convey the required knowledge to the apprentice. Training providers are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided.

Glossary of Terms

These definitions are intended as a guide to how language is used in the document.

ADJUST	To put in good working order; regulate; bring to a proper state or position.
APPLICATION	The use to which something is put and/or the circumstance in which you would use it.
CHARACTERISTIC	A feature that helps to identify, tell apart, or describe recognizably; a distinguishing mark or trait.
COMPONENT	A part that can be separated from or attached to a system; a segment or unit.
DEFINE	To state the meaning of (a word, phrase, etc.).
DESCRIBE	To give a verbal account of; tell about in detail.
DIAGNOSE	To analyze or identify a problem or malfunction.
EXPLAIN	To make plain or clear; illustrate; rationalize.
IDENTIFY	To point out or name objectives or types.
INTERPRET	To translate information from observation, charts, tables, graphs, and written material.
MAINTAIN	To keep in a condition of good repair or efficiency.
METHOD	A means or manner of doing something that has procedures attached to it.
OPERATE	How an object works; to control or direct the functioning of.
PROCEDURE	A prescribed series of steps taken to accomplish an end.
PURPOSE	The reason for which something exists or is done, made or used.

Glossary of Terms *(continued)*

SERVICE	Routine inspection and replacement of worn or deteriorating parts. An act or business function provided to a customer in the course of one's profession. (e.g., haircut).
TECHNIQUE	Within a procedure, the manner in which technical skills are applied.
TEST	v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality. n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.
TROUBLESHOOT	To follow a systematic procedure to identify and locate a problem or malfunction and its cause.

Essential Skills Profiles

Through extensive research, the Government of Canada and other national and international agencies have identified and validated key essential skills for the workplace. These skills are used in nearly every job and at different levels of complexity. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Essential Skills Profiles describe how workers in various occupations use each of the key essential skills. They include:

- A brief description of the occupation;
- Examples of tasks that illustrate how each essential skill is applied; and,
- Complexity ratings that indicate the level of difficulty of the example tasks.

Essential Skills profiles can be found on the Employment and Social Development Canada (ESDA) website at www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

The development and improvement of these Essential Skills in inherent throughout the apprenticeship training program as apprentices work towards achieving journeyperson status.

Profile Chart

OCCUPATIONAL SKILLS			
IRS-100 Safety Awareness	IRS-105 Tools and Equipment	IRS-110 Trade Documentation	IRS-115 Oxy-fuel Cutting
IRS-120 Plasma Arc Cutting	IRS-125 Welding 1	IRS-140 Introduction to Drawings	IRS-145 Temporary Access Equipment
IRS-200 Structural Drawings	IRS-205 Work Planning	IRS-300 Welding 2	
RIGGING AND HOISTING			
IRS-130 Hoisting, Lifting and Rigging 1	IRS-215 Hoisting, Lifting and Rigging 2	IRS-305 Hoisting, Lifting and Rigging 3	
CRANES			
IRS-135 Introduction to Cranes	IRS-220 Hydraulic and Conventional Cranes	IRS-310 Tower Cranes	IRS-315 Electric Overhead Travelling Cranes
ERECTION, ASSEMBLY AND INSTALLATION			
IRS-150 Structural Components	IRS-155 Structural Steel 1	IRS-210 Structural Steel 2	IRS-225 Pre-Engineered Structures 1
IRS-230 Pre-Cast Concrete 1	IRS-235 Machinery and Equipment 1	IRS-240 Ornamental Ironwork 1	IRS-335 Machinery and Equipment 2
IRS-340 Ornamental Ironwork 2	IRS-345 Ornamental Ironwork 3		
MAINTENANCE AND UPGRADING			
IRS-325 Pre-Engineered Structures 2	IRS-320 Structural Steel 3	IRS-330 Pre-Cast Concrete 2	

Program Structure – Nova Scotia Apprenticeship Program

The courses listed below are required technical training in the Nova Scotia Ironworker (Structural/Ornamental) Apprenticeship Program. Apprentices are required to complete all courses in Levels 1, 2 and 3.

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Units to be Covered			
			Unit #	Unit Title	Sugg. Hrs	Pg.
Level 1 (8 weeks)						
MENT-700	Mentoring I	None	MENT-700	Mentoring I	6	17
IRWA-1801	Safety / Tools & Equipment	None	IRS-100	Safety Awareness	12	19
			IRS-105	Tools and Equipment	12	21
			IRS-110	Trade Documentation	3	23
IRWA-1831	Cutting and Welding	IRWA-1801	IRS-115	Oxy-fuel Cutting	6	25
			IRS-120	Plasma Arc Cutting	2	27
			IRS-125	Welding 1	20	29
IRWA-1856	Rigging and Cranes 1 *3 week course	IRWA-1801	IRS-130	Hoisting, Lifting and Rigging I	60	31
			IRS-135	Introduction to Cranes	30	34
IRWA-1851	Introduction to Drawings	IRWA-1801	IRS-140	Introduction to Drawings	30	36
IRWA-1852	Temporary Access Equipment and Structural Components	IRWA-1856	IRS-145	Temporary Access Equipment	24	38
			IRS-150	Structural Components	15	40
IRWA-1857	Structural Steel 1	IRR-1801, 1852	IRS-155	Structural Steel 1	20	43

Nova Scotia Course No.	Nova Scotia Course Name	Nova Scotia Prerequisites	Units to be Covered			
			Unit #	Unit Title	Sugg. Hrs	Pg.
Level 2 (6 Weeks)						
IRWA-1858	Structural Drawings and Work Planning	IRWA -1851	IRS-200	Structural Drawings	20	47
			IRS-205	Work Planning	10	48
IRWA-1859	Structural Steel 2	IRWA- 1857	IRS-210	Structural Steel 2	30	49
IRWA-1860	Rigging and Cranes 2 *2 week course	IRWA-1850	IRS-215	Hoisting, Lifting and Rigging 2	30	52
			IRS-220	Hydraulic and Conventional Cranes	30	54
IRWA-1861	Introduction to Pre-engineered and Pre-Cast Structures	IRWA-1801, 1851	IRS-225	Pre-engineered Structures 1	15	56
			IRS-230	Pre-cast Concrete 1	15	58
IRWA-1862	Introduction to Machinery and Ornamental Ironwork	IRWA-1801, 1851	IRS-235	Machinery and Equipment 1	15	60
			IRS-240	Ornamental Ironwork 1	15	61
Level 3 (7 Weeks)						
MENT-701	Mentoring II	MENT-700	MENT-701	Mentoring II	6	64
IRWA-1863	Advanced Welding	IRWA-1831	IRS-300	Welding 2	30	65
IRWA-1864	Rigging and Cranes 3	IRWA-1860	IRS-305	Hoisting, Lifting & Rigging 3	14	68
			IRS-310	Tower Cranes	5	70
			IRS-315	Electric Overhead Travelling Cranes	5	72
IRWA-1865	Structural Steel 3	IRWA-1859	IRS-320	Structural Steel 3	30	74
IRWA-1866	Pre-engineered and Pre-Cast Structures	IRWA-1861	IRS-325	Pre-engineered Structures 2	15	77
			IRS-330	Pre-cast Concrete 2	15	79
IRWA-1867	Machinery and Equipment	IRWA-1862	IRS-335	Machinery and Equipment 2	20	82
IRWA-1868	Ornamental Ironwork	IRWA-1862	IRS-340	Ornamental Ironwork 2	20	84
			IRS-345	Ornamental Ironwork 3	20	86
IRWA-1830	Program Review	Entire Program	IRS-350	Program Review	30	88
Nova Scotia Ironworker (Structural/Ornamental) Apprenticeship Program: All Courses are Required.						

2015 Ironworker (Structural/Ornamental) - NOA Sub-task to Unit Comparison

NOA Sub-task		Unit	
Task 1 - Interprets occupational documentation.			
1.01	Interprets drawings and specifications.	IRS-140	Introduction to Drawings
		IRS-200	Structural Drawings
1.02	Interprets standards, regulations and procedures.	IRS-110	Trade Documentation
Task 2 - Communicates in the workplace.			
2.01	Communicates with co-workers.	MENT-700 MENT-701	Mentoring I Mentoring II
2.02	Communicates with others.	MENT-700 MENT-701	Mentoring I Mentoring II
2.03	Communicates with apprentices.	MENT-700 MENT-701	Mentoring I Mentoring II
2.04	Uses hand signals.	IRS-130	Hoisting, Lifting and Rigging 1
		IRS-200	Hoisting, Lifting and Rigging 2
2.05	Communicates electronically.	MENT-700 MENT-701	Mentoring I Mentoring II
		IRS-130	Hoisting, Lifting and Rigging 1
		IRS-215	Hoisting, Lifting and Rigging 2
		IRS-305	Hoisting, Lifting and Rigging 3
Task 3 - Uses and maintains tools and equipment.			
3.01	Uses hand tools and measuring equipment.	IRS-105	Tools and Equipment
3.02	Uses power tools.	IRS-105	Tools and Equipment
3.03	Uses powder-actuated tools.	IRS-105	Tools and Equipment
3.04	Uses aerial work platforms	IRS-145	Temporary Access Equipment
3.05	Uses ladders.	IRS-145	Temporary Access Equipment
3.06	Uses scaffolding.	IRS-145	Temporary Access Equipment
3.07	Uses personal protective equipment (PPE).	IRS-100	Safety Awareness
3.08	Uses surveying equipment.	IRS-105	Tools and Equipment
		IRS-155	Structural Steel 1
		IRS-210	Structural Steel 2
		IRS-225	Pre-Engineered Structures 1
		IRS-230	Pre-Cast Concrete 1
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2

NOA Sub-task		Unit	
		IRS-330	Pre-Cast Concrete 2
3.09	Uses Welding equipment	IRS-125	Welding 1
		IRS-300	Welding 2
3.10	Uses thermal and oxy-fuel cutting equipment.	IRS-115	Oxy-fuel Cutting
		IRS-120	Plasma Arc Cutting
Task 4 - Organizes work.			
4.01	Organizes materials and supplies.	IRS-110	Trade Documentation
		IRS-205	Work Planning
4.02	Marks layouts.	IRS-150	Structural Components
		IRS-155	Structural Steel 1
		IRS-210	Structural Steel 2
		IRS-225	Pre-Engineered Structures 1
		IRS-230	Pre-Cast Concrete 1
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
4.03	Maintains safe work environment.	IRS-100	Safety Awareness
4.04	Assesses site hazards.	IRS-100	Safety Awareness
4.05	Plans work tasks.	IRS-205	Work Planning
Task 5 - Selects rigging equipment.			
5.01	Matches load to lift capability.	IRS-130	Hoisting, Lifting and Rigging 1
		IRS-215	Hoisting, Lifting and Rigging 2
		IRS-305	Hoisting, Lifting and Rigging 3
5.02	Inspects rigging equipment.	IRS-130	Hoisting, Lifting and Rigging 1
		IRS-215	Hoisting, Lifting and Rigging 2
		IRS-305	Hoisting, Lifting and Rigging 3
5.03	Maintains rigging equipment.	IRS-130	Hoisting, Lifting and Rigging 1
		IRS-215	Hoisting, Lifting and Rigging 2
		IRS-305	Hoisting, Lifting and Rigging 3
Task 6 - Uses hoisting and lifting equipment.			
6.01	Uses hoisting equipment.	IRS-130	Hoisting, Lifting and Rigging 1
		IRS-215	Hoisting, Lifting and Rigging 2
		IRS-305	Hoisting, Lifting and Rigging 3
6.02	Uses lifting equipment.	IRS-130	Hoisting, Lifting and Rigging 1
		IRS-215	Hoisting, Lifting and Rigging 2
		IRS-305	Hoisting, Lifting and Rigging 3
6.03	Attaches rigging to load.	IRS-130	Hoisting, Lifting and Rigging 1
		IRS-215	Hoisting, Lifting and Rigging 2
		IRS-305	Hoisting, Lifting and Rigging 3

NOA Sub-task		Unit	
Task 7 - Assembles and erects cranes.			
7.01	Assesses crane site limitations.	IRS-135	Introduction to Cranes
		IRS-220	Hydraulic and Conventional Cranes
		IRS-310	Tower Cranes
7.02	Determines crane position.	IRS-135	Introduction to Cranes
		IRS-220	Hydraulic and Conventional Cranes
		IRS-310	Tower Cranes
		IRS-315	Electric Overhead Travelling Cranes
7.03	Prepares bases.	IRS-135	Introduction to Cranes
		IRS-220	Hydraulic and Conventional Cranes
7.04	Erects cranes and components.	IRS-135	Introduction to Cranes
		IRS-220	Hydraulic and Conventional Cranes
		IRS-310	Tower Cranes
		IRS-315	Electric Overhead Travelling Cranes
Task 8 - Disassembles cranes.			
8.01	Disassembles crane components.	IRS-135	Introduction to Cranes
		IRS-220	Hydraulic and Conventional Cranes
		IRS-310	Tower Cranes
		IRS-315	Electric Overhead Travelling Cranes
8.02	Prepares crane for transport.	IRS-135	Introduction to Cranes
		IRS-220	Hydraulic and Conventional Cranes
		IRS-310	Tower Cranes
Task 9 – Installs primary and secondary structural members.			
9.01	Erects falsework.	IRS-150	Structural Components
9.02	Attaches structural members.	IRS-150	Structural Components
		IRS-155	Structural Steel 1
		IRS-210	Structural Steel 2
		IRS-225	Pre-Engineered Structures 1
		IRS-230	Pre-Cast Concrete 1
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2

NOA Sub-task		Unit	
9.03	Levels, plumbs and aligns structural members	IRS-155	Structural Steel 1
		IRS-210	Structural Steel 2
		IRS-225	Pre-Engineered Structures 1
		IRS-230	Pre-Cast Concrete 1
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
9.04	Completes installation of structural members.	IRS-155	Structural Steel 1
		IRS-210	Structural Steel 2
		IRS-225	Pre-Engineered Structures 1
		IRS-230	Pre-Cast Concrete 1
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
Task 10 – Installs ornamental components and systems.			
10.01	Installs curtain walls and window walls.	IRS-240	Ornamental Ironwork 1
		IRS-345	Ornamental Ironwork 3
10.02	Installs miscellaneous components.	IRS-240	Ornamental Ironwork 1
		IRS-340	Ornamental Ironwork 2
Task 11 – Installs conveyors, machinery and equipment.			
11.01	Installs material handling systems.	IRS-235	Machinery and Equipment 1
		IRS-335	Machinery and Equipment 2
11.02	Aligns material handling systems.	IRS-235	Machinery and Equipment 1
		IRS-335	Machinery and Equipment 2
11.03	Places machinery and equipment.	IRS-235	Machinery and Equipment 1
		IRS-335	Machinery and Equipment 2
Task 12 – Repairs components.			
12.01	Accesses current condition of components.	IRS-210	Structural Steel 2
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
12.02	Field fabricates components.	IRS-210	Structural Steel 2
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
12.03	Replaces components.	IRS-210	Structural Steel 2
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
12.04	Performs preventative maintenance.	IRS-210	Structural Steel 2

NOA Sub-task		Unit	
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
Task 13 – Decommissions, disassembles and removes structural, mechanical and miscellaneous components.			
13.01	Ensures decommissioning of structure or components.	IRS-210	Structural Steel 2
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
13.02	Plans sequence of disassembly.	IRS-210	Structural Steel 2
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2
13.03	Removes components.	IRS-210	Structural Steel 2
		IRS-320	Structural Steel 3
		IRS-325	Pre-Engineered Structures 2
		IRS-330	Pre-Cast Concrete 2

LEVEL 1

MENT-700 Mentoring I

Learning Outcomes:

- Demonstrate knowledge of effective communication practices as a learner.
- Demonstrate knowledge of strategies for learning skills in the workplace.

Red Seal Occupational Standard Reference:

2.03 Communicates with apprentices

Suggested Hours:

6 hours

Theoretical Objectives:

1. Describe the importance of one's own individual experiences.
2. Identify behaviours that demonstrate positive learning experiences.
3. Identify the benefits of workplace mentoring for the apprentice, mentor, and employer.
4. Identify the partners involved in apprenticeship training.
5. Describe the shared responsibilities for workplace learning in apprenticeship.
6. Identify different learning needs and strategies to address challenges or barriers in the workplace.
   i) learning disabilities
   ii) language
   iii) underrepresentation
7. Identify the components that create a positive and inclusive workplace culture.
   i) workplace characteristics

ii) individual behaviours

8. Identify various learning styles and determine one's own learning preferences.

9. Explain how learning preferences impact learning new skills.

10. Identify different learning strategies to meet individual learning needs.

11. Describe the importance of adapting to a variety of teaching and learning methods in the workplace.

12. Identify techniques for effective communication as a learner.
    i) verbal and non-verbal
    ii) active listening

13. Identify and describe personal responsibilities and attitudes that contribute to on-the-job success.
    i) self advocating
    ii) asking questions
    iii) accepting constructive feedback
    iv) working safely
    v) employing time management techniques and being punctual

Practical Objectives:
N/A

IRS-100 Safety Awareness

Learning Outcomes:

- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

National Occupational Analysis Reference:

3.07 Uses personal protective equipment (PPE).
4.03 Maintains safe work environment.
4.04 Assesses site hazards.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Identify types of personal protective equipment (PPE) and clothing and describe their applications and limitations.

2. Describe the procedures used to care for and maintain PPE.

3. Identify hazards and describe safe work practices.
   i) personal
   ii) workplace
      - lockout / tag out
      - confined space awareness
      - trenches and excavations
      - fire
      - heights (fall arrest and protection)
      - marine
   iii) environmental

4. Identify and describe workplace safety and health regulations.
    i) federal
        - Workplace Hazardous Material Information System (WHMIS)
    ii) provincial/territorial
        - occupational health and safety
        - training and certification requirements
    iii) worksite specific requirements

IRS-105 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for use.

National Occupational Analysis Reference:

3.01 Uses hand tools and measuring equipment.
3.02 Uses power tools.
3.03 Uses powder-actuated tools.
3.08 Uses surveying equipment.

Suggested Hours:

12 Hours

Objectives and Content:

Theoretical Objectives

1. Identify types of hand tools and describe their applications and procedures for use.

2. Describe the procedures used to inspect, maintain and store hand tools.

3. Identify types of power tools and describe their applications and procedures for use.
   i) electric
   ii) hydraulic
   iii) pneumatic
   iv) gas

4. Describe the procedures used to inspect, maintain and store power tools.

5. Identify types of measuring and layout tools and equipment and describe their applications and procedures for use.

6. Describe the procedures used to inspect, maintain and store measuring and layout tools and equipment.

7. Identify types of leveling and alignment instruments and describe their applications and procedures for use.

8. Describe the procedures used to inspect, maintain and store leveling and alignment instruments.

9. Identify types of powder actuated equipment and describe their applications.
   i) certification requirements

IRS-110 Trade Documentation

Learning Outcomes:

- Demonstrate knowledge of trade related documentation and its use.
- Demonstrate knowledge of the procedures used to prepare and complete trade documentation.

National Occupational Analysis Reference:

1.02 Interprets standards, regulations and procedures.
4.01 Organizes materials and supplies. (Introduction)
4.05 Plans work tasks. (Introduction)

Suggested Hours:

3 Hours

Objectives and Content:

Theoretical Objectives

1. Describe effective verbal and non-verbal communication.
   i) other tradespersons
   ii) co-workers/colleagues
   iii) supervisors
   iv) apprentices

2. Identify types of communication devices and describe their applications and operation.
   i) cellular
   ii) two-way radio
   iii) computer

3. Describe the importance of communicating with others to organize materials and supplies on site and effectively plan work tasks.

4. Identify types of trade related documentation and describe their applications and procedures for use.
   i) manufacturers' specifications

ii) codes and standards
iii) manuals
iv) drawings
v) shipping documentation
vi) safety documentation

5. Describe the procedures used to prepare and complete trade related documentation.

IRS-115 Oxy-fuel Cutting

Learning Outcomes:

- Demonstrate knowledge of oxy-fuel equipment and accessories.
- Demonstrate knowledge of the procedures used to cut with oxy-fuel equipment.

National Occupational Analysis Reference:

3.10 Uses thermal and oxy-fuel cutting equipment.

Suggested Hours:

6 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with oxy-fuel cutting.

2. Identify hazards and describe safe work practices pertaining to oxy-fuel cutting.
   i) personal
   ii) shop/facility
   iii) equipment
   iv) ventilation
   v) storage/handling

3. Identify and interpret codes and regulations pertaining to oxy-fuel equipment.

4. Identify oxy-fuel equipment and accessories and describe their applications.

5. Identify types of fuels and gases used in oxy-fuel cutting operations and describe their characteristics and applications.

6. Identify types of cutting flames and describe their application and the procedures for flame adjustment.
   i) oxidizing
   ii) carburizing
   iii) neutral

7. Describe the procedures used to set-up, adjust and shut-down oxy-fuel equipment.

8. Describe the procedures used to inspect, maintain and store oxy-fuel equipment.

9. Describe the procedures used to cut materials using oxy-fuel equipment.

10. Identify common cutting faults and describe the procedures to prevent and correct them.

11. Set-up, operate and shut-down oxy-fuel equipment.

IRS-120 Plasma Arc Cutting

Learning Outcomes:

- Demonstrate knowledge of plasma arc cutting equipment and accessories.
- Demonstrate knowledge of procedures used to cut with plasma arc cutting equipment.

National Occupational Analysis Reference:

3.10 Uses thermal and oxy-fuel cutting equipment.

Suggested Hours:

2 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with plasma arc cutting.

2. Identify hazards and describe safe work practices pertaining to plasma arc cutting.
   i) personal
   ii) shop/facility
   iii) equipment
   iv) ventilation
   v) storage/handling

3. Describe the plasma arc cutting process and its applications.

4. Identify plasma arc cutting equipment and accessories and describe their applications.

5. Describe the procedures used to set-up, adjust and shut-down plasma arc cutting equipment.

6. Describe the procedures used to inspect, maintain and store plasma arc cutting equipment.

7. Describe the procedures used to cut using plasma arc cutting equipment.
   i) free hand
   ii) straight edge

8. Identify common cutting faults and describe the procedures used to prevent and correct them.

9. Set-up, operate and shut-down plasma arc cutting equipment.

IRS-125 Welding 1

Learning Outcomes:

- Demonstrate knowledge of Shielded Metal Arc Welding (SMAW) equipment, consumables and accessories.
- Demonstrate knowledge of SMAW welding processes.

National Occupational Analysis Reference:

3.09 Uses welding equipment.

Suggested Hours:

20 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with SMAW welding.

2. Interpret information pertaining to SMAW welding found on drawings.
   i) symbols
   ii) abbreviations

3. Identify hazards and describe safe work practices pertaining to SMAW welding.
   i) personal
   ii) shop/facility
   iii) equipment
   iv) ventilation
   v) storage/handling

4. Identify codes and standards pertaining to welding.
   i) Canadian Welding Bureau (CWB)

5. Identify the SMAW welding processes and describe their characteristics and basic applications.

6. Identify SMAW welding equipment, consumables and accessories and describe their application.

7. Describe the procedures used to set-up and adjust SMAW welding equipment.

8. Describe the procedures used to inspect and maintain SMAW welding equipment.

9. Identify types of welds performed using SMAW welding equipment.

10. Identify welding positions and describe their applications.

11. Describe the procedures used to weld using SMAW welding equipment.

12. Identify common weld faults and describe the procedures to prevent and correct them.

13. Set-up, operate and shut-down SMAW welding equipment

IRS-130 Hoisting, Lifting and Rigging 1

Learning Outcomes:

- Demonstrate knowledge of hoisting, lifting and rigging equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of the procedures used to rig material and equipment for hoisting and lifting.
- Demonstrate knowledge of the procedures used to perform basic hoisting and lifting operations.
- Demonstrate knowledge of the procedures used to communicate during hoisting and lifting operations.

National Occupational Analysis Reference:

2.04	Uses hand signals.
2.05	Communicates electronically.
5.01	Matches load to lift capability.
5.02	Inspects rigging equipment.
5.03	Maintains rigging equipment.
6.01	Uses hoisting equipment.
6.02	Uses lifting equipment.
6.03	Attaches rigging to load.

Suggested Hours:

60 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hoisting, lifting and rigging.

2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.

3. Identify codes and regulations pertaining to hoisting, lifting and rigging.

4. Identify types of rigging equipment and accessories and describe their limitations, applications and procedures for use.
5. Perform calculations pertaining to rigging equipment.
   i) safe working loads
   ii) breaking strength

6. Identify types of hoisting and lifting equipment and accessories and describe their applications and procedures for use.

7. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.

8. Identify types of knots, hitches and bends and describe their applications and the procedures used to tie them.

9. Describe the procedures used to rig material/equipment for hoisting and lifting.

10. Describe the procedures used to ensure the work area is safe for hoisting and lifting.
    i) supervision of lift
    ii) securing work area
    iii) communication

11. Identify and describe procedures used to communicate during hoisting, lifting and rigging operations.
    i) hand signals
    ii) electronic communications
    iii) audible/visual
    iv) relay of signals

12. Perform hand signals used in hoisting, lifting and rigging operations.

13. Identify the factors to consider when selecting rigging equipment.
    i) load characteristics
    ii) environment

14. Describe the procedures used to perform a basic lift.
    i) secure work area
    ii) load determination
    iii) selection of rigging hardware
    iv) communication methods
    v) pre-lift checks
    vi) placement of load
    vii) post-lift inspection

IRS-135 Introduction to Cranes

Learning Outcomes:

- Demonstrate knowledge of cranes, their applications and limitations.
- Demonstrate knowledge of crane lifting operations.

National Occupational Analysis Reference:

7.01 Assesses crane site limitations.
7.02 Determines crane position.
7.03 Prepares bases.
7.04 Erects cranes and components.
8.01 Disassembles crane components.
8.02 Prepares crane for transport**.**

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with cranes and crane lifting operations.

2. Identify hazards and describe safe work practices pertaining to cranes and crane lifting operations.

3. Explain the principles of leverage and their application to cranes.

4. Interpret codes and regulations pertaining to cranes and crane lifting operations.

5. Interpret information pertaining to crane lifting operations found on drawings and specifications.

6. Interpret tables and charts to lift and move loads.
   i) crane limitations
      - tipping/stability failure
      - structural failure

7. Identify types of cranes and describe their components, characteristics and applications.
   i) hydraulic
   ii) conventional
   iii) tower
   iv) electric overhead travelling (EOT)
   v) crawler
   vi) carrier mounted
   vii) rough terrain
   viii) all terrain
   ix) high capacity
   x) knuckle boom
   xi) boom truck

8. Identify the considerations for crane assembly and disassembly.
   i) site hazard assessment
      - overhead powerlines
      - underground services
      - obstructions
      - soil/ground conditions
   ii) crane position
      - crane radius/swing area
      - headroom
   iii) crane and components
      - assembly
      - disassembly
      - transport

IRS-140 Introduction to Drawings

Learning Outcomes:

- Demonstrate knowledge of drawings and their applications.
- Demonstrate knowledge of the procedures to interpret and extract information from drawings.

National Occupational Analysis Reference:

1.01 Interprets drawings and specifications.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with drawings.

2. Identify types of drawings and describe their applications.
   i) civil/site/plot
   ii) architectural
   iii) mechanical
   iv) structural
   v) shop/detail drawings
   vi) sketches

3. Identify drawing projections and views and describe their applications.
   i) orthographic
   ii) oblique
   iii) isometric
   iv) section
   v) auxiliary

4. Interpret and extract information from drawings.
    i) lines
    ii) legend
    iii) welding symbols
    iv) abbreviations
    v) title block
    vi) notes and specifications
    vii) tolerances/allowances
    viii) bill of materials
    ix) schedules
    x) metric and imperial dimensioning
    xi) revisions
    xii) scales

IRS-145 Temporary Access Equipment

Learning Outcomes:

- Demonstrate knowledge of temporary access equipment, their applications, limitations and procedures for use.

National Occupational Analysis Reference:

3.04 Uses aerial work platforms.
3.05 Uses ladders.
3.06 Uses scaffolding.

Suggested Hours:

24 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with temporary access equipment.

2. Identify hazards and describe safe work practices pertaining temporary access equipment.

3. Identify codes and regulations pertaining to temporary access equipment.

4. Identify types of temporary access equipment and describe their characteristics and applications.
   i) aerial work platforms
   ii) ladders
   iii) scaffolding

5. Identify types of work positioning, fall arrest and protection equipment and describe their applications and procedures for use.

6. Describe the procedures used to position aerial work platforms.

7. Describe the procedures used to erect, secure and dismantle ladders and scaffolding.

8. Describe the procedures used to inspect and maintain ladders, scaffolding and aerial work platforms.

IRS-150 Structural Components

Learning Outcomes:

- Demonstrate knowledge of structural components, their characteristics and applications.
- Demonstrate knowledge of fastening methods relating to structural steel erection.
- Demonstrate knowledge of falsework, their characteristics and applications.
- Demonstrate knowledge of the procedures used to erect and dismantle falsework.

National Occupational Analysis Reference:

4.02 Marks layouts.
9.01 Erects falsework.
9.02 Attaches structural members.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with structural components.

2. Identify hazards and describe safe work practices pertaining to structural components.

3. Interpret codes, regulations and standards pertaining to structural components.
   i) industry standards
   ii) codes of practice
   iii) government regulations

4. Interpret information pertaining to structural components found on drawings and specifications.

5. Identify types of structures and describe their characteristics.

6. Identify structural steel shapes and describe their designations, characteristics and applications.
   i) I-beam
   ii) H-beam
   iii) wide flange
   iv) welded wide flange
   v) angle
   vi) channel
   vii) tee
   viii) hollow structural steel (HSS)
   ix) miscellaneous shapes

7. Identify types of structural components and their purpose.
   i) columns
   ii) girders
   iii) beams
   iv) trusses
   v) joists
   vi) secondary steel
   vii) decking
   viii) girts
   ix) purlins
   x) sag rods
   xi) bracing
   xii) bridging
   xiii) lintels
   xiv) pre-cast
   xv) glued laminated timber products
   xvi) composite

8. Identify fastening methods associated with structural steel and describe their characteristics, applications and limitations.
   i) install fasteners/bolts
   ii) welding

9. Describe the procedures used to install fasteners for securing structural steel members.

10. Identify types of falsework and describe their characteristics and applications.

11. Describe the procedures used to erect and dismantle falsework.

IRS-155 Structural Steel 1

Learning Outcomes:

- Demonstrate knowledge of structural steel members and components, their characteristics and applications.
- Demonstrate knowledge of the procedures to plan and prepare for structural steel erection.

National Occupational Analysis Reference:

3.08 Uses surveying equipment.
4.02 Marks layouts.
9.02 Attaches structural members.
9.03 Levels, plumbs and aligns structural members.
9.04 Completes installation of structural members.

Suggested Hours:

20 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with structural steel erection.

2. Identify hazards and describe safe work practices pertaining to structural steel erection.
   i) hot work permits
   ii) JHA (job hazard analysis)
   iii) PPE
   iv) lock-out, tag-out

3. Interpret information pertaining to structural steel erection of members and components found on drawings and specifications.

4. Identify tools and equipment relating to structural steel erection of members and components and describe their applications and procedures for use.
   i) erection
   ii) aligning
   iii) fastening
   iv) revision/fabrication

5. Identify structural steel shapes and describe their designations, characteristics and applications.
   i) I-beam
   ii) H-beam
   iii) wide flange
   iv) welded wide flange
   v) angle
   vi) channel
   vii) tee
   viii) hollow structural steel (HSS)
   ix) miscellaneous shapes

6. Identify materials used for structural components and describe their characteristics and applications.
   i) steel
      - stainless
      - galvanized
      - alloys
   ii) aluminum
   iii) wood

7. Identify structural steel members and components and describe their characteristics and applications.
   - i) columns/piers
   - ii) girders
   - iii) beams
   - iv) trusses
   - vi) joists
   - vi) secondary steel
   - vii) decking and grating
   - viii) girts
   - ix) purlins
   - x) sag rods
   - xi) bracing
   - xii) bridging
   - xv) lintels
   - xvi) pre-cast
   - xv) glued laminated timber products
   - xvi) composite
   - xvii) foundations
   - xviii) walls
   - xix) grillage
   - xx) falsework

8. Describe the procedures used to unload, handle and store structural steel materials and components.

9. Identify types of plates associated with structural steel members and components and describe their characteristics and applications.

10. Identify types of connections for structural components and components and describe their characteristics and applications.

11. Describe the procedures used to plan and prepare for structural steel erection.

LEVEL 2

IRS-200 Structural Drawings

Learning Outcomes:

- Demonstrate knowledge of structural drawings and their applications.
- Demonstrate knowledge of the procedures to interpret and extract information from structural drawings.

National Occupational Analysis Reference:

1.01 Interprets drawings and specifications.

Suggested Hours:

20 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with structural drawings.

2. Identify types of structural drawings and describe their applications.

3. Identify structural drawing projections and views and describe their applications.

4. Interpret and extract information from structural drawings.
   - i) lines
   - ii) legend
   - iii) symbols and abbreviations
   - iv) title block
   - v) notes and specifications
   - vi) tolerances/allowances
   - vii) bill of materials
   - viii) schedules
   - ix) metric and imperial dimensioning
   - x) revisions
   - xi) scales

IRW-205 Work Planning

Learning Outcomes:

- Demonstrate knowledge of the procedures used to plan and organize work tasks and handle work materials.

National Occupational Analysis Reference:

4.01 Organizes materials and supplies.
4.05 Plans work tasks.

Suggested Hours:

10 Hours

Objectives and Content:

Theoretical Objectives

1. Identify sources of information relevant to work task planning.
   i) documentation
   ii) drawings
   iii) related professionals
   iv) clients

2. Describe the procedures used to plan work tasks.
   i) scheduling
   ii) material/equipment selection
   iii) weight calculation
   iv) bar place order/sequence

3. Describe the procedures used to organize and store tools, equipment, materials and supplies on-site.
   i) select location for material lay down
   ii) offload/unload and sort materials and supplies
   iii) set up equipment

IRS-210 Structural Steel 2

Learning Outcomes:

- Demonstrate knowledge of the procedures used to erect and install structural steel members and components.
- Demonstrate knowledge of the procedures used to repair and replace structural steel members.
- Demonstrate knowledge of the procedures used to dismantle and remove structural steel members and components.

National Occupational Analysis Reference:

3.08	Uses surveying equipment.
4.02	Marks layouts.
9.02	Attaches structural members.
9.03	Levels, plumbs and aligns structural members.
9.04	Completes installation of structural members.
12.01	Assess current condition of components.
12.02	Field-fabricates components.
12.03	Replaces components.
12.04	Preforms preventative maintenance.
13.01	Ensures decommissioning of structure or components.
13.02	Plans sequence of disassembly.
13.03	Removes components.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with structural steel erection and dismantling of members and components.

2. Identify hazards and describe safe work practices pertaining to structural steel erection and dismantling of members and components.
   i) temporary bracing
   ii) environmental conditions
   iii) sequence

3. Interpret codes, regulations and standards pertaining to structural steel erection and dismantling of members and components.
   i) industry standards
   ii) codes of practice
   iii) government regulations

4. Interpret information pertaining to structural steel erection and dismantling found on drawings and specifications.

5. Identify tools and equipment relating to structural steel erection and dismantling of members and components and describe their applications and procedures for use.
   i) erection
   ii) aligning
   iii) fastening
   iv) inspecting
   v) revision/fabrication

6. Identify structural steel members and components and describe their characteristics and applications.
   i) columns/piers
   ii) girders
   iii) beams
   iv) trusses
   v) joists
   vi) decking and grating
   vii) girts
   viii) purlins
   ix) sag rods
   x) bracing
   xi) bridging
   xii) lintels

7. Identify types of plates associated with structural steel members and describe their characteristics and applications.

8. Identify types of connections for structural components and describe their characteristics and applications.

9. Describe the procedures used to erect and install structural steel members and components.

10. Describe the procedures used to level, plumb and align structural steel members and components.

11. Describe the procedures used to inspect erected structural steel to ensure conformity to standards.
    i) visual
    ii) mechanical

12. Describe the procedures used to repair and replace structural steel members and components.

13. Describe the procedures used to dismantle and remove structural steel members and components.

IRS-215 Hoisting, Lifting and Rigging 2

Learning Outcomes:

- Demonstrate knowledge of the procedures used to rig material and equipment for hoisting and lifting.
- Demonstrate knowledge of the procedures used to perform hoisting and lifting operations.
- Demonstrate knowledge of calculations required when performing hoisting and lifting operations.

National Occupational Analysis Reference:

2.04	Uses hand signals.
2.05	Communicates electronically.
5.01	Matches load to lift capability.
5.02	Inspects rigging equipment.
5.03	Maintains rigging equipment.
6.01	Uses hoisting equipment.
6.02	Uses lifting equipment.
6.03	Attaches rigging to load.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Perform calculations pertaining to rigging equipment.
   i) safe working loads
   ii) breaking strength

2. Calculate sling tension and sling angle when preparing for hoisting and listing operations.

3. Describe the procedures used to determine the weight and weight distribution of loads.
    i) reference load charts
    ii) determine types of loads
    iii) engineered lifts

4. Identify the factors to consider when selecting rigging equipment.
    i) load characteristics
        - weight
        - size
        - shape
        - center of gravity
    ii) environment

5. Describe the procedures used to perform a lift.
    i) secure work area
    ii) load determination
    iii) selection of rigging hardware
    iv) communication methods
    v) pre-lift checks
    vi) placement of load
    vii) post-lift inspection

IRS-220 Hydraulic and Conventional Cranes

Learning Outcomes:

- Demonstrate knowledge of hydraulic and conventional cranes, their components and accessories.
- Demonstrate knowledge of the procedures used to erect, set-up and disassemble hydraulic and conventional cranes.

National Occupational Analysis Reference:

7.01 Assesses crane site limitations.
7.02 Determines crane position.
7.03 Prepares bases.
7.04 Erects cranes and components.
8.01 Disassembles crane components.
8.02 Prepares crane for transport.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with hydraulic and conventional cranes.

2. Identify and describe the procedures used to communicate during hydraulic and conventional crane operations.
   i) hand signals
   ii) electronic communications
   iii) audible/visual

3. Identify hydraulic crane components, accessories and attachments and describe their characteristics and applications.

4. Identify conventional crane components, accessories and attachments and describe their characteristics and applications.

5. Identify the considerations for hydraulic and conventional crane assembly/installation on-site.
   i) site hazard assessment
      - overhead powerlines
      - underground services
      - obstructions
      - soil/ground conditions
      - environmental conditions
   ii) crane position
      - crane radius/swing area
      - quadrants of operation
      - headroom

6. Describe the procedures used to assemble and set-up hydraulic cranes.

7. Describe the procedures used to assemble and set-up conventional cranes.

8. Describe the procedures used to disassemble hydraulic cranes, their components, accessories and attachments.

9. Describe the procedures used to disassemble conventional cranes, their components, accessories and attachments.

10. Describe the procedures used to prepare hydraulic cranes for transport.

11. Describe the procedures used to prepare conventional cranes for transport.

IRS-225 Pre-Engineered Structures 1

Learning Outcomes:

- Demonstrate knowledge of pre-engineered structures and their components.
- Demonstrate knowledge of the procedures used to erect pre-engineered structures.

National Occupational Analysis Reference:

3.08	Uses surveying equipment.
4.02	Marks layouts.
9.02	Attaches structural members.
9.03	Levels, plumbs and aligns structural members.
9.04	Completes installation of structural members.

Suggested Hours:

15 hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with pre-engineered structures erection.

2. Identify hazards and describe safe work practices pertaining to pre-engineered structures erection.

3. Interpret codes and regulations pertaining to pre-engineered structures erection.

4. Interpret information pertaining to pre-engineered structures erection found on drawings and specifications.

5. Identify tools and equipment relating to pre-engineered structures erection and describe their applications and procedures for use.

6. Identify types of pre-engineered structures and describe their characteristics and applications.
   i) tapered beam
   ii) single-span rigid frame
   iii) multi-span rigid frame
   iv) single span and continuous trusses
   v) lean-to

7. Identify pre-engineered structure components and describe their characteristics and applications.

8. Describe the procedures used to plan and prepare for the erection of pre-engineered structures.

9. Describe the procedures used to erect pre-engineered structures and their components.

IRS-230 Pre-Cast Concrete 1

Learning Outcomes:

- Demonstrate knowledge of pre-cast concrete members and components.
- Demonstrate knowledge of the procedures to plan and prepare for the erection of pre-cast concrete members and components.

National Occupational Analysis Reference:

3.08 Uses surveying equipment
4.02 Marks layouts.
9.02 Attaches structural members
9.03 Levels, plumbs and aligns structural members.
9.04 Completes installation of structural members.

Suggested Hours:

15 hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with pre-cast concrete erection.

2. Identify hazards and describe safe practices pertaining to pre-cast concrete erection.

3. Interpret codes and regulations pertaining to pre-cast concrete erection and dismantling.

4. Interpret information pertaining to pre-cast concrete erection found on drawings and specifications.

5. Identify tools and equipment relating to fabricating and handling pre-cast concrete members and components and describe their applications and procedures for use.

6. Identify types of pre-cast concrete members and components and describe their characteristics and applications.
   i) panels
      - horizontal
      - vertical
   ii) beams
   iii) joists
   iv) columns
   v) single tees
   vi) twin tees

7. Describe the procedures used to plan and prepare for the erection of pre-cast concrete members and components.
   i) site preparation
   ii) equipment set-up
   iii) determine weight
   iv) rigging procedures
   v) material handling
   vi) layout

IRS-235 Machinery and Equipment 1

Learning Outcomes:

- Demonstrate knowledge of machinery and equipment, their components and operation.

National Occupational Analysis Reference:

11.01 Installs material handling systems.
11.02 Aligns material handling systems.
11.03 Places machinery and equipment.

Suggested Hours

15 hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with machinery and equipment.

2. Identify hazards and describe safe work practices pertaining to machinery and equipment.

3. Interpret codes and regulations pertaining to machinery and equipment.

4. Interpret information pertaining to machinery and equipment found on drawings and specifications.

5. Identify tools and equipment relating to machinery and equipment and describe their applications and procedures for use.

6. Identify types of machinery and equipment installed and removed by ironworkers and describe their components and operation.
   i) conveyors
   ii) storage tanks
   iii) bins
   iv) hoppers

IRS-240 Ornamental Ironwork 1

Learning Outcomes:

- Demonstrate knowledge of ornamental components and systems.
- Demonstrate knowledge of the procedures to plan and prepare for the installation of ornamental components and systems.

National Occupational Analysis Reference:

10.01 Installs curtain walls and window walls
10.02 Installs miscellaneous components.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with ornamental ironwork.

2. Identify hazards and describe safe work practices pertaining to ornamental ironwork.

3. Interpret codes and regulations pertaining to ornamental ironwork.

4. Interpret information pertaining to ornamental ironwork found on drawings and specifications.

5. Identify tools and equipment relating to ornamental ironwork and describe their applications and procedures for use.

6. Identify types of ornamental ironwork and describe their components, characteristics and applications.
   i) curtain walls
   ii) window walls
   iii) sloped wall systems
   iv) skylights
   v) entranceways
   vi) doors

7. Describe the procedures used to assemble and handle ornamental ironwork.

8. Describe the procedures to plan and prepare for the installation of ornamental components and systems.

LEVEL 3

MENT-701 Mentoring II

Learning Outcomes:

- Demonstrate knowledge of effective communication practices as a mentor.
- Demonstrate knowledge of strategies for teaching workplace skills.

Red Seal Occupational Standard Reference:

2.03 Communicates with apprentices

Suggested Hours:

6 hours

Theoretical Objectives:

1. Identify the different roles played by a workplace mentor.

2. Identify strategies to create a supportive learning environment.

3. Identify techniques for effective communication as a mentor.
   i) constructive feedback
   ii) active listening
   iii) leading meetings and one-on-one sessions

4. Describe the steps in teaching a skill.
   i) identifying the point of lesson
   ii) linking the lesson
   iii) demonstrating the skill
   iv) providing practice
   v) giving feedback
   vi) assessing skill and progress

5. Identify strategies to assist in teaching a skill while meeting individual learning needs.
   i) principles of instruction
   ii) coaching skills

6. Explain how to adjust a lesson for various situations.

IRS-300 Welding 2

Learning Outcomes:

- Demonstrate knowledge of welding and gouging equipment, consumables and accessories.
- Demonstrate knowledge of the procedures to weld using Flux core arc welding (FCAW) equipment.
- Demonstrate knowledge of the procedures to weld using stud welding equipment.
- Demonstrate knowledge of the procedures to gouge using arc-air gouging equipment.

National Occupational Analysis Reference:

3.09 Uses welding equipment

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with welding and gouging.

2. Interpret information pertaining to welding found on drawings and welding procedures.
   i) symbols
   ii) abbreviations

3. Identify hazards and describe safe work practices pertaining to welding and gouging.
   i) personal
   ii) shop/facility
   iii) equipment
   iv) ventilation
   v) storage/handling

4. Identify and interpret codes and standards pertaining to welding and gouging.
   i) Canadian Welding Bureau (CWB)

5. Identify welding processes and describe their characteristics and applications.
   i) shielded metal arc welding (SMAW)
   ii) gas metal arc welding (GMAW)
   iii) gas tungsten arc welding (GTAW)
   iv) flux core arc welding (FCAW)
   v) stud welding
   vi) arc-spot welding (ASW)
   vii) submerged arc welding (SAW)

6. Identify welding equipment, consumables and accessories and describe their applications.
   i) FCAW
   ii) stud welding

7. Describe the procedures used to set-up and adjust welding equipment.
   i) FCAW
   ii) stud welding

8. Describe the procedures used to inspect, maintain and store welding equipment.
   i) FCAW
   ii) stud welding

9. Identify types of welds and joints performed using welding equipment.

10. Identify welding positions and describe their applications.

11. Describe the procedures used to weld using welding equipment.
   i) FCAW
   ii) stud welding

12. Identify arc-air gouging equipment, consumables and accessories and describe their applications.

14. Demonstrate the procedures used to gouge using arc-air gouging equipment.

15. Identify common weld faults and describe the procedures to prevent and correct them.

Performance Outcomes:

Upon completion of this course, the apprentice will be able to:

1. Set-up and adjust welding equipment.
2. Weld using welding equipment.

IRS-305 Hoisting, Lifting and Rigging 3

Learning Outcomes:

- Demonstrate knowledge of the procedures used to perform complex/critical hoisting and lifting operations.
- Demonstrate knowledge of calculations required when performing complex/critical hoisting and lifting operations.

National Occupational Analysis Reference:

2.04 Uses hand signals.
2.05 Communicates electronically.
5.01 Matches load to lift capability.
5.02 Inspects rigging equipment.
5.03 Maintains rigging equipment.
6.01 Uses hoisting equipment.
6.02 Uses lifting equipment.
6.03 Attaches rigging to load.

Suggested Hours:

14 hours

Objectives and Content:

Theoretical Objectives

i) Identify hazards and describe safe work practices pertaining to complex/critical hoisting, lifting and rigging operations.

2. Identify regulations pertaining to hoisting, lifting and rigging.
   i) heavy mobile equipment
   ii) training and certification requirements

3. Identify complex/critical lifts and describe their application and operation.
    i) multi-crane lifts
    ii) load transferring
    iii) lifts that involve personnel
    iv) lifts over personnel
    v) unbalanced load and positioning load
    vi) engineered lifts

4. Explain the procedures to perform complex/critical lifts and positioning.

5. Perform calculations pertaining to rigging, hoisting, lifting and positioning.
    i) sling tension and sling angle
    ii) load/weight
    iii) center of gravity

6. Identify documentation required for engineered lifts.

IRS-310 Tower Cranes

Learning Outcomes:

- Demonstrate knowledge of tower cranes, their components and accessories.
- Demonstrate knowledge of the procedures used to erect, set-up and disassemble tower cranes.

National Occupational Analysis Reference:

7.01 Assesses crane site limitations.
7.04 Erects cranes and components.
8.01 Disassembles crane components.
8.02 Prepares crane for transport.

Suggested Hours:

5 hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with tower cranes.

2. Identify and describe the procedures used to communicate during tower crane operations.
   i) hand signals
   ii) electronic communications
   iii) audible/visual

3. Identify types of tower cranes and describe their characteristics and applications.
   i) stationary
      - fixed
      - slewing
   ii) mobile

4. Identify tower crane components, accessories and attachments and describe their characteristics and applications.

5. Identify the considerations for tower crane assembly/installation on-site.
   i) site hazard assessment
      - overhead powerlines
      - obstructions
   ii) crane position
      - crane radius/swing area

6. Describe the procedures used to erect, set-up and climb/jump tower cranes.

7. Describe the procedures used to disassemble tower cranes, their components, accessories and attachments.

8. Describe the procedures used to prepare tower cranes for transport.

IRS-315 Electric Overhead Travelling Cranes

Learning Outcomes:

- Demonstrate knowledge of electric overhead travelling (EOT) cranes, their components and accessories.
- Demonstrate knowledge of the procedures to assemble and install EOT cranes.

National Occupational Analysis Reference:

7.02 Determines crane position.
7.04 Erects cranes and components.
8.01 Disassembles crane components.

Suggested Hours:

5 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with EOT cranes.

2. Identify and describe the procedures used to communicate during EOT crane operations.
   i) hand signals
   ii) electronic communications
   iii) audible/visual

3. Identify hazards and describe safe work practices pertaining to EOT cranes and EOT crane operations.
   i) bus bar

4. Identify EOT crane components, accessories and attachments and describe their characteristics and applications.
    i) crane rails
    ii) end trucks
    iii) wheels
    iv) bridge girders
    v) hoist and trolleys
    vi) crane stop
    vii) load blocks
    viii) cab
    ix) bus bar

5. Identify types of EOT controls and describe their characteristics and applications.
    i) cab operated
    ii) remote operated
    iii) pendant

6. Describe the procedures used to assemble and install EOT cranes.

Performance Outcomes:

Upon completion of this course, the apprentice will be able to:

1. Assemble and install EOT cranes.

IRS-320 Structural Steel 3

Learning Outcomes:

- Demonstrate knowledge of advanced structural steel members and components, their characteristics and applications.
- Demonstrate knowledge of the procedures used to erect and install advanced structural steel members and components.
- Demonstrate knowledge of the procedures used to repair and replace advanced structural steel members.
- Demonstrate knowledge of the procedures used to dismantle and remove advanced structural steel members and components.

National Occupational Analysis Reference:

3.08	Uses surveying equipment.
4.02	Marks layouts.
9.02	Attaches structure members.
9.03	Levels, plumbs and aligns structural members.
9.04	Completes installation of structural members.
12.01	Assess current condition of components.
12.02	Field-fabricates components.
12.03	Replaces components.
12.04	Preforms preventative maintenance.
13.01	Ensures decommissioning of structure or components.
13.02	Plans sequence of disassembly.
13.03	Removes components.

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with advanced structural steel erection and dismantling of members and components.

2. Identify hazards and describe safe work practices pertaining to advanced structural steel erection and dismantling of members and components.
   i) temporary bracing
   ii) environmental conditions
   iii) sequence

3. Interpret codes, regulations and standards pertaining to advanced structural steel erection and dismantling of members and components.
   i) industry standards
   ii) codes of practice
   iii) government regulations

4. Interpret information pertaining to advanced structural steel erection and dismantling found on drawings and specifications.

5. Identify tools and equipment relating to advanced structural steel erection and dismantling of members and components and describe their applications and procedures for use.
   i) erection
   ii) aligning
   iii) fastening
   iv) inspecting
   v) revision/fabrication

6. Identify advanced structural steel members and components and describe their characteristics and applications.
   i) tower sections
   ii) bridge girders
   iii) bridge beams
   iv) composite materials
   vi) bridge deck
   vi) modular structure
   vii) track systems
   viii) conveyor systems
   ix) bins and hoppers

7. Identify types of connections for advanced structural components and describe their characteristics and applications.
   i) adhesives and sealants
   ii) bevel washers
   iii) pins and bushings

8. Describe the procedures used to erect and install advanced structural steel members and components.

9. Describe the procedures used to level, plumb and align advanced structural steel members and components.

10. Describe the procedures used to inspect erected advanced structural steel to ensure conformity to standards.
   i) visual
   ii) mechanical

11. Describe the procedures used to repair and replace advanced structural steel members and components.

12. Describe the procedures used to dismantle and remove advanced structural steel members and components.

IRS-325 Pre-Engineered Structures 2

Learning Outcomes:

- Demonstrate knowledge of the procedures used to erect complex configurations of pre-engineered structures.
- Demonstrate knowledge of the procedures used to repair and renovate pre-engineered structures.

National Occupational Analysis Reference:

3.08	Uses surveying equipment
4.02	Marks layouts.
9.02	Attaches structural members
9.03	Levels, plumbs and aligns structural members.
9.04	Completes installation of structural members.
12.01	Assesses current condition of components.
12.02	Field-fabricates components.
12.03	Replaces components.
12.04	Performs preventative maintenance.
13.01	Ensures decommissioning of structure or components.
13.02	Plans sequence of disassembly.
13.03	Removes components.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with pre-engineered structures.

2. Identify hazards and describe safe work practices pertaining to pre-engineered structures.

3. Interpret codes and regulations pertaining to pre-engineered structures.

4. Interpret information pertaining to pre-engineered structures found on drawings and specifications.
5. Identify tools and equipment relating to pre-engineered structures and describe their applications and procedures for use.

6. Identify types of pre-engineered structures and describe their characteristics and applications.
   i) tapered beam
   ii) single-span rigid frame
   iii) multi-span rigid frame
   iv) single span and continuous trusses
   v) lean-to

7. Identify pre-engineered structure components and describe their characteristics and applications.

8. Describe the procedures used to plan and prepare for erection of complex configurations of pre-engineered structures.

9. Describe the procedures used to erect complex configurations of pre-engineered structures and their components.

10. Describe the procedures used to repair common problems and failures of existing pre-engineered structures and their components.

11. Describe the procedures used to renovate and add-on to existing pre-engineered structures.

Performance Outcomes:

Upon completion of this course, the apprentice will be able to:

1. Erect pre-engineered structures and their components.
2. Repair and renovate pre-engineered structures and their components.

IRS-330 Pre-Cast Concrete 2

Learning Outcomes:

- Demonstrate knowledge of the procedures used to erect pre-cast concrete.
- Demonstrate knowledge of the procedures to finish pre-cast concrete.
- Demonstrate knowledge of the procedures to dismantle and remove pre-cast concrete.

National Occupational Analysis Reference:

3.08	Uses surveying equipment.
4.02	Marks layouts.
9.02	Attaches structural members.
9.03	Levels, plumbs and aligns structural members.
9.04	Completes installation of structural members.
12.01	Assesses current condition of components.
12.02	Field-fabricates components.
12.03	Replaces components.
12.04	Performs preventative maintenance.
13.01	Ensures decommissioning of structure or components.
13.02	Plans sequence of disassembly.
13.03	Removes components.

Suggested Hours:

15 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with pre-cast concrete erection and dismantling.

2. Identify hazards and describe safe practices pertaining to pre-cast concrete erection and dismantling.

3. Interpret codes and regulations pertaining to pre-cast concrete erection and dismantling.

4. Interpret information pertaining to pre-cast concrete erection and dismantling found on drawings and specifications.

5. Identify tools and equipment relating to pre-cast concrete erection and dismantling and describe their applications and procedures for use.

6. Identify types of pre-cast concrete members and components and describe their characteristics and applications.
   - i) panels
     - horizontal
     - vertical
   - ii) beams
   - iii) joists
   - iv) columns
   - v) single tees
   - vi) twin tees

7. Describe the procedures used to plan and prepare for the erection of pre-cast concrete members and components.
   - i) site preparation
   - ii) equipment set-up
   - iii) determine weight
   - iv) rigging procedures
   - v) material handling
   - vi) layout

8. Describe the procedures used for the erection of pre-cast concrete members and components.
   - i) attaching to support clips
   - ii) aligning, leveling and plumbing
   - iii) fastening
     - welding
     - bolting
   - iv) grouting

9. Describe the procedures used to finish pre-cast concrete.
    i) removing lugs
    ii) grinding
    iii) painting
    iv) packing
    v) caulking
    vi) installing gaskets
    vii) air sealing
    viii) grouting

10. Describe the procedures used to dismantle and remove pre-cast concrete members.

Performance Outcomes:

Upon completion of this course, the apprentice will be able to:

1. Prepare for the erection of pre-cast concrete members and components.
2. Erect pre-cast concrete members and components.
3. Finish pre-cast concrete.
4. Dismantle and remove pre-cast concrete members.

IRS-335 Machinery and Equipment 2

Learning Outcomes:

- Demonstrate knowledge of the procedures used to install and remove machinery and equipment.

National Occupational Analysis Reference:

11.01 Installs material handling systems.
11.02 Aligns material handling systems.
11.03 Places machinery and equipment.

Suggested Hours:

20 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with machinery and equipment installation and removal.

2. Identify hazards and describe safe work practices pertaining to installation and removal of machinery and equipment.

3. Interpret codes and regulations pertaining to installation and removal of machinery and equipment.

4. Interpret information pertaining to installation and removal of machinery and equipment found on drawings and specifications.

5. Identify tools and equipment relating to installation and removal of machinery and equipment and describe their applications and procedures for use.

6. Identify types of machinery and equipment installed and removed by ironworkers and describe their characteristics.
   i) conveyors
   ii) storage tanks
   iii) bins
   iv) hoppers

7. Describe the procedures used to install machinery and equipment.
   i) move/transport
   ii) assemble
   iii) erect
   iv) level
   v) align
   vi) support
   vii) secure

8. Describe the procedures used to remove machinery and equipment.

9. Perform calculations related to machinery and equipment set-up.
   i) ratio
   ii) area
   iii) volume
   iv) perimeter
   v) circumference

Performance Outcomes:

Upon completion of this course, the apprentice will be able to:

1. Install and remove machinery and equipment.
2. Perform calculations related to machinery and equipment set-up.

IRS-340 Ornamental Ironwork 2

Learning Outcomes:

- Demonstrate knowledge of ornamental ironwork.
- Demonstrate knowledge of the procedures used to fabricate ornamental ironwork.
- Demonstrate knowledge of the procedures used to layout and install ornamental ironwork.
- Demonstrate knowledge of the procedures used to remove and repair ornamental ironwork.

National Occupational Analysis Reference:

10.02 Installs miscellaneous components

Suggested Horus:

20 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with ornamental ironwork.

2. Identify hazards and describe safe work practices pertaining to ornamental ironwork.

3. Interpret codes and regulations pertaining to ornamental ironwork.

4. Interpret information pertaining to ornamental ironwork found on drawings and specifications.

5. Identify tools and equipment relating to ornamental ironwork and describe their applications and procedures for use.

6. Identify types of ornamental ironwork and describe their components, characteristics and applications.
   i) stairs
   ii) ladders and platforms
   iii) railings
   iv) catwalks
   v) fences
   vi) grates

7. Describe the procedures used to fabricate ornamental ironwork.
   i) shop
   ii) field

8. Describe the procedures used to layout and install ornamental ironwork.
   i) site preparation
   ii) material handling and movement
   iii) layout
   iv) install and secure items

9. Describe the procedures used to finish ornamental ironwork.
   i) grinding
   ii) painting
   iii) filling procedures
   iv) polishing

10. Describe the procedures used to remove ornamental ironwork.

11. Describe the procedures used to repair ornamental ironwork.

IRS-345 Ornamental Ironwork 3

Learning Outcomes:

- Demonstrate knowledge of curtain and window walls, their characteristics and applications.
- Demonstrate knowledge of the procedures used to layout and install curtain walls.
- Demonstrate knowledge of the procedures used to glaze curtain walls
- Demonstrate knowledge of the procedures used to layout and install window walls.

National Occupational Analysis Reference:

10.02 Installs curtain walls and window walls.

Suggested Horus:

20 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with curtain and window walls.

2. Identify hazards and describe safe work practices pertaining to curtain and window walls.

3. Interpret codes and regulations pertaining to curtain and window walls.

4. Interpret information pertaining to curtain and window walls found on drawings and specifications.

5. Identify tools and equipment relating to the layout and installation of curtain and window walls and describe their applications and procedures for use.

6. Identify types of curtain walls and describe their characteristics and applications.
   i) stick systems
   ii) unitized systems

7. Identify types of window walls and describe their characteristics and applications.

8. Describe the procedures used to layout and install curtain walls.

9. Identify glazing methods and describe their procedures.

10. Describe the procedures used to layout and install window walls.

IRS-350 Program Review

Learning Outcomes:

- Demonstrate knowledge of the National Occupational Analysis and its relationship to the Interprovincial Red Seal Examination.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Interprovincial Red Seal Examination.

2015 National Occupational Analysis Reference:

Entire National Occupational Analysis (NOA)

Suggested Hours:

30 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with an NOA.
   i) blocks
   ii) tasks
   iv) sub-tasks

2. Explain how an NOA is developed and the link it has with the Interprovincial Red Seal Examination.
   i) development
   ii) validation
   iii) block and task weighting
   iv) examination breakdown (pie-chart)

3. Identify Red Seal products and describe their use for preparing for the Interprovincial Red Seal Examination.
   i) Red Seal website
   ii) examination preparation guide
   iii) sample questions
   iv) examination counselling sheets

4. Explain the relationship between the NOA and the Apprenticeship Curriculum Standard.

5. Review Occupational Skills for the Ironworker (Structural/Ornamental) trade as identified in the NOA.
   i) safety awareness
      - personal protective equipment (PPE)
      - safety work environment
      - site hazards
   ii) tools and equipment
      - hands tools and measuring equipment
      - surveying equipment
      - power tools
      - powder-actuated tools
      - cutting and welding equipment
   iii) access equipment
      - aerial work platforms
      - ladders
      - scaffolding
   iv) communication and trade documentation
      - drawings and specifications
      - standards, regulations and procedures
      - communication
      - electronic communication
   v) organizes work

6. Review Rigging and Hoisting for the Ironworker (Structural/Ornamental) trade as identified in the NOA.
   i) hand signals
   ii) load to lift capacity
   iii) rigging equipment
   iv) hoisting equipment
   v) lifting equipment
   vi) rigging/load

7. Review Cranes for the Ironworker (Structural/Ornamental) trade as identified in the NOA.
   i) site hazards
   ii) crane position
   iv) base position
   v) cranes and components
      - hydraulic and conventional
      - tower
      - electric overhead travelling
   vi) assembly
   vii) disassembly
   vi) transport

8. Review Erection, Assembly and Installation for the Ironworker (Structural/Ornamental) trade as identified in the NOA.
   i) structural members
   ii) ornamental components and systems
   iii) conveyors, machinery and equipment

9. Review Maintenance and Upgrading for the Ironworker (Structural/Ornamental) trade as identified in the NOA.
   i) preventative maintenance
   ii) repair and replace components
   iii) decommission, disassemble and remove structural, mechanical and miscellaneous components

Feedback and Revisions

This curriculum standard will be amended periodically; comments or suggestions for improvements should be directed to:

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Any comments or suggestions received will be reviewed and considered to determine the course of action required. If the changes are deemed to be minor, they will be held for implementation during the next review cycle. If immediate change is deemed appropriate, it will result in a revision to this version of the AACS and will be detailed in the following section.

Version Changes

Revision Date	Revision	Implementation Date
May 2024	Levels 1 & 3	Integration of MENT-700 Mentoring I and MENT-701 Mentoring II