

Ironworker (Generalist)

Level 2

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Unit: B1 Rigging II

Level: One

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about hoisting, lifting and rigging terminology, equipment accessories, and related aspects. The unit then focuses on the general procedures to rig materials and equipment, including rigging calculations for hoisting and hauling operations.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with hoisting, lifting and rigging.	10%
2. Identify equipment and accessories for rigging and hoisting, including their limitations and applications.	10%
3. Describe and demonstrate inspection, maintenance and storage procedures for hoisting, lifting and rigging.	10%
4. Perform rigging calculations for hoisting and hauling operations.	20%
a. Safe work loads	
b. Breaking strength	
c. Sling angle	
d. Tension calculations	
e. Load weight determination (net load, gross load, net capacity, gross capacity)	
f. Centre of gravity calculations (establishing pick points)	
5. Describe and demonstrate procedures to safely rig materials and equipment for hoisting and hauling.	50%
a. General procedures, including:	
• Determination of load weight, load type, and weight-distribution	
• Methods of communication	
• Placement of load	
• Pre-lift and post-lift inspections	
b. Specific hazards, precautions, and safe work practices	
• Procedures to ensure work area is safe for hoisting and lifting	
• Supervision of lift	
a. Sling configuration	
b. Hardware selection	

- c. Load control
- d. Safe practices
- e. Hazard identification
- f. Communication – hand signal and electronic
- g. Applicable jurisdictional codes and regulations

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Unit: B2 Welding II

Level: Two

Duration: 28 hours

Theory: 14 hours

Practical: 14 hours

Overview:

This unit builds on the principles introduced in Welding I and is designed to provide the apprentice knowledge and skills for advanced welding processes.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology and describe concepts associated with advanced welding processes.	10%
a. Technical terminology	
b. Welding processes, including description of characteristics and applications	
• Shielded metal arc welding (SMAW)	
• Gas metal arc welding (GMAW)	
• Gas tungsten arc welding (GTAW)	
• Flux core arc welding (FCAW)	
• Stud welding	
• Arc-spot welding (ASW)	
• Submerged arc welding (SAW)	
• Plasma arc cutting (PAC)	
c. Overview of types, welding positions, and their applications	
2. Describe and demonstrate application of industry standards.	20%
a. Codes and standards, including Canadian Welding Bureau (CWB)	
b. Interpreting welding information (including symbols and abbreviations) communicated via technical drawings	
3. Describe and demonstrate safe operation of advanced welding processes.	70%
a. Identification of hazards and precautions.	
• Personal	
• Shop/facility	
• Equipment	
• Ventilation	
• Storage/handling	
b. Setup and adjustment	
• SMAW	
• GMAW	
• GTAW	

- FCAW
 - ASW
 - PAC
- c. Inspection and non-destructive testing (NDT).
- Visual
 - Dye penetrant
 - Magnetic particle
 - Radiographic (X-ray, Gamma)
 - Ultrasonic testing
 - Eddy current
 - Hydrostatic testing
- d. Process-related consumables and accessories.
- SMAW
 - GMAW
 - GTAW
 - FCAW
 - ASW
 - PAC

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Unit: B3 Work Planning I

Level: Two

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about sources of information and procedures related to work planning. The unit also covers the procedures for organizing and storing tools, equipment, materials, and supplies on the jobsite.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify sources of information relevant to task planning.	10%
a. Documents	
b. Drawings	
c. Engineer of record	
d. Organizational structure	
e. Clients	
2. Describe procedures used to plan work tasks.	40%
a. Scheduling	
b. Equipment selection	
c. Material supply	
3. Describe and demonstrate procedures for organizing and storing tools, equipment, materials, and supplies on the jobsite.	50%
a. Pre-jobsite orientation	
• Identifying overhead obstruction/underground utilities	
• Establish laydown/storage area requirements	
• Power requirements and availability	
• Equipment selection/available access	
• Sequence of construction	
b. Scheduling	
c. Equipment selection	
d. Determine material supply	

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Unit: B4 Drawings II

Level: Two

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

This unit builds on Drawings I and reviews fundamental principles of blueprint interpretation. The unit introduces advanced technical drawings, types of drawings, application of drawing projects and advanced concepts associated with trade practice and interpretation drawings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terms associated with technical drawings.	10%
2. Describe and demonstrate types of drawings and their applications.	10%
a. Civil/site/plot	
b. Architectural	
c. Mechanical	
d. Structural	
e. Shop/detail drawings	
f. Sketches	
g. Placement drawings	
3. Describe and demonstrate drawing projections and views, including their application to trade practice.	20%
a. Orthographic	
b. Oblique	
c. Isometric	
d. Section	
e. Auxiliary	
4. Describe and demonstrate drawing interpretation to obtain dimensions from drawings.	60%
a. Extract information	
• Lines	
• Legend	
• Symbols and abbreviations	
• Title block	
• Notes and specifications	
• Tolerances/allowances	

- Bill of materials
 - Schedules
 - Scales
- b. Perform calculations

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Unit: B5 Cranes II: Tower Cranes

Level: Two

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit builds on Cranes I: Fundamentals and covers core concepts, procedures and operation associated with tower cranes.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology and describe core concepts.	20%
a. Lift plans	
b. Load transfer	
c. Pick-and-turn operations	
d. Lift point positions (determining pick points)	
2. Describe and demonstrate communication procedures associated with the operation of tower cranes.	20%
a. Hand signals	
b. Electronic (radio) communications	
c. Audible	
3. Describe and demonstrate safe operation, inspection, erection and transport of crane components.	60%
a. Inspection and safe transport of tower crane components	
• Crawler	
• Carrier mounted	
• Rail mounted	
• Derrick	
b. Assembly/disassembly and sequence of operations	
• Tower (fixed and mobile)	
• Crawler	
• Carrier mounted	
• Rail mounted	
• Derrick	

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Unit: B6 Structural-Steel II

Level: Two

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit builds on Structural Steel I and provides the apprentice with the knowledge associated with structural steel projects, hazards, technical requirements, related technical drawings, and erection and dismantling procedures.

Objectives and Content:	Percent of Unit Mark (%)
1. Define technical terminology associated with structural steel projects.	10%
a. Primary steel	
• Girders	
• Spandrel beams	
• Columns	
b. Intermediate steel	
• Beams	
• Open web steel joist	
• Bracing (horizontal and vertical bracing systems)	
c. False work	
• Shoring	
• Cribbing	
• Towers	
d. Bridge basics	
e. Connection types	
• Simple shear	
• Moment	
f. Building/erection tolerances	
2. Identify special hazards.	10%
a. PPE	
• Hearing protection	
• Eye protection	
• Approved footwear	
• Hard hats	
b. Job hazard analysis	
• Identify potentially unsafe conditions	

- Take corrective actions and steps
- c. Fire safety
- Extinguishers
 - Muster points
 - Prevention
- 3. Interpret technical documents to identify special hazards and fulfill other technical requirements associated with erecting and dismantling structural-steel components. 10%**
- a. Identification and use of relevant codes, regulations, and standards
- b. Shipping/receiving documents
- c. Erection drawings
- View identification
 - Elevations
 - Cutting planes
 - Weld symbols
 - Abbreviations
 - Detail drawings
- d. Erection sequence
- 4. Demonstrate and apply information from technical drawings. 10%**
- a. Technical drawings and project specifications
- b. Inspect structural steel and ensure compliance with project specifications and standards
- c. Preventative maintenance requirements
- 5. Demonstrate and perform steel erection and dismantling procedures. 60%**
- a. Foundation layout (surveying)
- b. Erection and installation (including field fabrication)
- c. Fastening and welding
- d. Structure steel alignment (surveying)
- Leveling
 - Plumbing/squaring
- e. Decommissioning, dismantling and removal

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Unit: B7 Pre-Engineered Structures I

Level: Two

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about pre-engineered building erection, including the technical requirements and major design-types. The unit also covers the best practices in pre-engineered building erection.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the rationale, technical requirements, and major design-types associated with the use of pre-engineered metal buildings.	30%
a. Terminology used in erection of pre-engineered metal buildings	
b. Major building characteristics, and preferred uses of pre-engineered structures including: <ul style="list-style-type: none">• Tapered-beam• Single-span rigid frame• Multi-span rigid frame• Lean-to	
2. Describe and demonstrate the use of pre-engineered building erection best practices.	70%
a. Special hazards, precautions and safe work-practices	
b. Identification and use of relevant codes, regulations, and standards	
c. Practical use of technical drawings and project specifications	
d. Planning and preparation	
e. Material storage and handling	
f. Layout (surveying)	
g. Sequence of erection (installation)	
h. Plumbing and alignment	
i. Roof and wall sheeting <ul style="list-style-type: none">• Accessories• Trim• Insulation	

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Unit: B8 Pre-Cast Concrete I

Level: Two

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about pre-cast concrete members, components and related terminology. The unit then covers safe work practices for precast construction and the procedures to finish, dismantle, and remove precast concrete members and components.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify precast concrete members, components, and significant technical terminology associated with their use.	30%
a. Precast concrete product terminology	
b. Identify precast concrete members, their applications, and characteristics	
• Panels (horizontal and vertical)	
• Beams	
• Girders	
• Columns	
• Single tees	
• Twin tees (double Tee)	
• Bearing piles	
2. Describe and demonstrate safe work practices associated with precast construction.	20%
a. Special hazards and precautions, and safe work practices	
b. Interpreting codes and regulations	
c. Deriving information from technical drawings and specifications	
d. Bracing requirements	
3. Describe and demonstrate procedures to finish, dismantle, and remove precast-concrete members and components on the jobsite.	50%
a. Tools/equipment selection	
b. Procedures for erecting and finishing precast components	
• Site preparation	
• Equipment set-up	
• Determination of weight(s)	
• Rigging	
• Materials handling	
• Lay-out (surveying)	

- Connections
 - Aligning, leveling, and plumbing
 - Fastening (including welding and bolting)
 - Painting/corrosion control
 - Installing gaskets and sealants
 - Grouting
- c. Maintaining prescribed clearances and tolerances
- d. Procedures for dismantling and removing precast concrete members
- Sequence of operation
 - Establishing centre of gravity
 - Safe rigging practices
 - Identifying load transfer

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Unit: B9 Machinery and Equipment I

Level: Two

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about types of machinery and equipment, including safe work practices and interpretation of technical documents. The unit then covers the procedures for the installation and removal of machinery and equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the types of machinery and equipment and associated terminology.	35%
a. Types and significant characteristics, including: <ul style="list-style-type: none">• Storage tanks• Bins• Hoppers• Belted conveyance	
b. Selection and use of tools and equipment required for installation/removal	
2. Describe and demonstrate safe work practices including interpretation of technical documents.	15%
a. Special hazards, precautions, and safe work practices	
b. Interpreting codes and regulations	
c. Deriving information from technical drawings and specifications	
3. Describe and demonstrate procedures for installation and removal of machinery and equipment.	50%
a. Installation and removal procedures <ul style="list-style-type: none">• Communications methods (hand signals, radio contact, and two-way radio)• Moving/transporting• Storage• Assembly and erection• Leveling and alignment (surveying)• Commissioning• Preventative maintenance• Lockout/tagout (LOTO) procedures• Disassembly and safe removal practices (decommissioning)	

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Unit: B10 Miscellaneous Ironwork I

Level: Two

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about miscellaneous ironwork, including the characteristics, applications, codes, regulations and other related information. The unit then covers the procedures for fabricating, installing, finishing, and repairing miscellaneous ironwork.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify types of miscellaneous ironwork, including their characteristics, applications, and significant technical terminology.	30%
a. Stairways and their components	
b. Railings and their components	
c. Ladders and platforms and their components	
d. Catwalks and their components	
e. Fences and their components	
f. Canopies	
2. Interpret codes, regulations, and other technical sources.	20%
a. Codes and regulations	
b. Technical drawings and project specifications	
c. Identification of special hazards, precautions, and safe work procedures.	
3. Describe and demonstrate procedures for fabricating, installing, finishing, and repairing of miscellaneous ironwork.	50%
a. Proper selection and use of applicable tools	
b. Procedures for fabricating miscellaneous ironwork, including:	
• Shop	
• Field	
c. Procedures for fabrication and installation of miscellaneous ironwork, including:	
• Site preparation	
• Materials handling and transport	
• Layout (surveying)	
• Anchorage	
• Alignment	
• Final finishing	
d. Procedures for finishing miscellaneous ironwork	
• Grinding	

- Painting
 - Filing
 - Polishing
- e. Procedures for repair and removal (decommissioning)

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Unit: B11 Reinforcing II

Level: Two

Duration: 28 hours

Theory: 14 hours

Practical: 14 hours

Overview:

This unit's major outcomes include improved ability to demonstrate knowledge of trade procedures for assembling and installing reinforcing material.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Interpret standards and codes that are prescribed by the following reinforcing governing bodies.	10%
a. Canadian Standards Association (CSA)	
b. Concrete Reinforcing Steel Institute (CRSI)	
c. American Concrete Institute (ACI)	
d. American National Standards Institute	
2. Describe and demonstrate procedures for fabricating, installing, and stabilizing reinforcing materials.	40%
a. Procedure for pre-fabricating	
• Observing codes and standards	
• Material layout	
• Cutting, bending, and splicing	
b. Installation procedures	
• Observing codes and standards	
• Material placement	
• Securement of materials	
3. Perform calculations for reinforcing concrete.	50%
a. Length	
b. Coverage	
c. Splices	
d. Weights	
e. Quantities	
f. Bar spacing	
g. Colour code	

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Unit: B12 Pre-Stressed Concrete: Unbonded Monostrand Post-Tensioning

Level: Two

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit is designed to provide the apprentice with the knowledge about pre-stressed concrete, specifically unbonded monostrand, and its characteristics, components and applications. The unit also covers installation procedures for installing pre-stressed concrete, and for finishing and grouting tendons in bonded systems.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
<p>1. Define terminology associated with unbonded monostrand systems.</p> <ul style="list-style-type: none"> a. Minimum ultimate breaking strength. b. Yield strength. c. Jack force. d. Initial force. e. Final effective force. 	20%
<p>2. Explain the purpose and effects of unbonded monostrand systems.</p>	10%
<p>3. Describe the characteristics, components, and applications of unbonded monostrand post-tensioned concrete.</p> <ul style="list-style-type: none"> a. Materials, components, and accessories, including their defining characteristics and applications <ul style="list-style-type: none"> • Tendons • Bursting steel • Anchorage • Supports and accessories • Tendon finishing (grouting) • Encapsulated systems • Stressing and de-stressing 	20%
<p>4. Interpret codes, regulations, and other technical documents that govern pre-stressed concrete practices.</p> <ul style="list-style-type: none"> a. Special hazards and safe work practices associated with pre-stressed concrete <ul style="list-style-type: none"> • Restricted access to work zone • Structural failure • Equipment failure 	10%

- Personal protective equipment (PPE)
 - b. Codes and regulations
 - Engineered products and specifications
 - Documentation/stressing records
5. **Describe and demonstrate installation procedures for unbonded monostrand post-tensioned concrete.** 40%
- a. Tools and equipment
 - Layout
 - Stressing equipment
 - Grouting equipment
 - b. Safe work procedures
 - Setup
 - Operation
 - Dismantling
 - c. Equipment inspection, maintenance and storage procedures
 - d. Tendon placement
 - Layout profile
 - Place tendons and accessories
 - Install bursting steel and anchorage
 - Connect tendons to anchors
 - Protect exposed tendons
 - Cut and couple tendons
 - e. Tendon stressing
 - Calculate required forces
 - Installation of stressing equipment
 - Securing anchorage
 - Depressurize and remove equipment
 - Elongation and gauge pressure calculations
