

# Ironworker (Generalist) Level 1

## Ironworker (Generalist)

**Unit: A1 Orientation I: Structure and Scope of Ironworker Trade-Learning**

**Level:** One

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

One sign that an Ironworker (Generalist) has mastered a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to Ironworker trade-learning. Even trade veterans rely on peers to refine their knowledge and skill.

The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and construction deadlines. As adult trade-learners, Ironworker apprentices at all levels of training must use their eyes, ears, prior knowledge, and interpersonal skills to encourage journeypersons to teach as well as to supervise them. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order jobsite work-life.

This unit profiles the trade's historical and modern significance, core tasks and skill requirements, as well as its job-ladders and long-term career options. It includes information about learning styles/strategies, stressing their application to apprenticeship and journey-level trade education. The unit also introduces the concept of skills stewardship, stressing the obligation that apprentices incur to help convey what their own journeypersons teach them to those who in turn follow them into the trade.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit is part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honoured foundation of Ironworker (Generalist) journeywork.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<p><b>1. Describe structure and scope of the modern Ironworker (Generalist) trade.</b></p> <ul style="list-style-type: none"> <li>a. Historical background, incl. apprentice experience</li> <li>b. Structure/scope of the trade               <ul style="list-style-type: none"> <li>• International and national characteristics</li> <li>• Characteristics and practice of the trade in Manitoba</li> <li>• Trade organizations</li> </ul> </li> <li>c. Opportunities and career ladders               <ul style="list-style-type: none"> <li>• Generalists and specialists</li> <li>• 'lead hands and other immediate supervisors</li> <li>• Geographic mobility</li> <li>• Job hierarchies and innovations</li> </ul> </li> </ul>	<b>30%</b>
<p><b>2. Describe the Manitoba Ironworker (Generalist) Apprenticeship Program.</b></p> <ul style="list-style-type: none"> <li>a. Concept and significance of skills stewardship               <ul style="list-style-type: none"> <li>• To the trade</li> <li>• To apprentices</li> <li>• To journeypersons</li> </ul> </li> </ul>	<b>30%</b>

- To employers
- To the community
- b. Practical Training (on-the-job)
  - Roles/responsibilities of employer and journey person(s)
  - Roles/responsibilities of Apprenticeship Training Coordinator (ATC)
  - Roles/responsibilities of apprentice(s)
  - Role/responsibilities of instructors (including 'Related'-area faculty)
- c. Technical Training (offsite)
- d. Attendance requirements
- e. Progression requirements
- f. Reporting of Grades
- g. Trade Regulation and its significance
- h. Policies (e.g. re: personal conduct, "missed" units, fees, harassment, etc.)
  - Apprenticeship Manitoba
  - Training provider(s)

**3. Explain special challenges and opportunities re: apprenticeship training.**

**40%**

- a. Adapting personal learning goals to program contexts
  - Characteristics and 'domains' (types) of adult learning
  - Description/recognition of learning and teaching styles
  - Work culture (incl. work-crew hierarchy), interpersonal skills, and trade-learning
  - Integrating Technical Training and Practical Training content
  - Possibilities and perils of peer-learning
  - Budgeting and other necessary personal arrangements
  - Handling common varieties of stress at work and in school
- b. On-the-job challenges/opportunities
  - Description/recognition of jobsite teaching styles/roles
  - Communicating with journeypersons and employers
  - Coverage/documentation of formally prescribed tasks and subtasks
  - Personal record of achievements/needs: the Trade Learning Journal option
  - Getting help and fixing mistakes
- c. In-school opportunities/challenges
  - Personal arrangements that support in-school progress
  - "Baggage handling" – self-assessing potential impacts of previous school experience on current learning (favourable / unfavourable); resources
  - Techniques for note-taking, record-keeping, and review
  - Relations with instructors (including 'Related'-area faculty)
  - College resources (library, support services, etc.)
  - 'Missed Units' – policies re: supplementals, re-tests, make-up assignments, etc.

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## Ironworker (Generalist)

**Unit: A2 Trade Safety Awareness (AC Board Standard)**

**Level:** One

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury. It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment. It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of Ironworker apprenticeship training both in school and on-the-job. Unit content is supplemented throughout Technical Training by trade-specific information about Ironworker safety hazards and precautions presented in the appropriate contexts of discussion and study.

**Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety..**

<b>Objectives and Content:</b>	<b>Percent of Unit Mark (%)</b>
<p><b>1. Identify safety and health requirements.</b></p> <ul style="list-style-type: none"> <li>a. Overview of the Workplace Safety and Health Act               <ul style="list-style-type: none"> <li>• Rights and responsibilities of employees under the Act</li> <li>• Rights and responsibilities of employers under the Act</li> <li>• Rights and responsibilities of supervisors under the Act</li> </ul> </li> <li>b. Fourteen (14) Regulations</li> <li>c. Codes of Practice</li> <li>d. Guidelines</li> <li>e. Right to refuse               <ul style="list-style-type: none"> <li>• Explanation of right to refuse process</li> <li>• Rights and responsibilities of employees</li> <li>• Rights and responsibilities of employers</li> <li>• Rights and responsibilities of supervisors under the Act</li> </ul> </li> </ul> <p><b>2. Identify personal protective equipment (PPE) and procedures.</b></p> <ul style="list-style-type: none"> <li>a. Employer and employee responsibilities as related to PPE</li> <li>b. Standards: CSA, ANSI and guidelines</li> <li>c. Work protective clothing and danger if it fits poorly</li> <li>d. Importance of selecting and using appropriate gloves to suit task (e.g. re: chemicals, cold/hot items, slivers, etc.)</li> <li>e. Standards and requirements re: selection/use of appropriate headwear</li> </ul>	<p><b>NA</b></p>

- f. Eye protection – Comparison/contrast eyeglasses, industrial safety glasses and safety goggles
- g. Foot protection - when required according to safety standards
- h. Hearing protection
  - hazards of various noise levels (hearing protection must be worn)
  - laws
  - types of hearing protection
- i. Respiratory protection – Types; selection
- j. Fall protection - Manitoba requirements Standards Guidelines
  - ANSI (U.S.A. standards), etc.
- k. Ladders and scaffolding
- l. Safety principles for working with or around industrial trucks site specific (forklifts, pallet trucks, etc.)

**3. Identify electrical safety.**

- a. Effects of electric current on the human body
- b. Three factors that affect the severity of an electric shock
- c. The effects of electrical arcs/blasts on the human body and on equipment
- d. Hazards/precautions re: working with energized equipment

**4. Identify fire safety.**

- a. Types of fires
- b. Types of fire fighting equipment
- c. Classifications of fire extinguishers (A, B and C)
- d. Location of fire extinguishers and fire exits
- e. Fire alarms and drills

**5. Identify ergonomics.**

- a. Definition of ergonomics and conditions that may affect the body
  - Working postures
  - Repetition
  - Force
  - Lifting
  - Special hazards and precautions re: materials handling
  - Special hazards/precautions re: lifting, carrying, and setting down a load
  - Tools
  - Identify tool and safety equipment
  - Causes of hand tool accidents
  - Equipment

**6. Describe hazard recognition and control.**

- a. Safe work practices
- b. Basic risk assessment
- c. Injury prevention and control measures
- d. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them

**7. Describe the hazards of confined-space entry.**

- a. Identification of a confined space
- b. Hazards of a confined space
  - Physical
  - Biological
- c. Working in a confined space
- d. Emergency response plan
- e. Self-Contained Breathing Apparatus (SCBA)

**8. Identify First Aid/CPR.**

- a. Overview of First Aid Regulation
- b. Obligations of employers regarding First Aid
  - Who is certified to provide First Aid
  - What to do while waiting for help

- Location of, and access to, First Aid kit
- c. Define First Aid, and explain First Aid requirements and techniques
  - Scope and limits of First Aid intervention
  - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
  - Interface with other services and agencies (e.g. Workers Compensation claims)
- d. Describe basic CPR requirements and techniques
  - Obtaining certification
  - Scope and limits of CPR intervention (include varieties of CPR certification)

**9. Identify safety requirements as they apply to WHMIS.**

- a. WHMIS as a system
- b. Provincial Regulation under the Safety and Health Act
  - Each province has a WHMIS regulation
- c. Federal Hazardous Products Act
- d. WHMIS generic training:
  - WHMIS defined and the format used to convey information about hazardous materials in the workplace
  - Information found on supplier and workplace labeling using WHMIS
  - Hazardous materials in accordance with WHMIS
  - Compliance with government safety standards and regulations
- e. Description of WHMIS (include varieties of WHMIS Certification)
  - Typology of WHMIS labels, symbols, and classifications
  - Scope and use of Materials Safety Data Sheets (MSDS)

**10. Describe the identification and control of specified hazards.**

- a. Basic control measures (injury prevention)
- b. Safe work procedures
- c. Explanation on the importance of industrial housekeeping
- d. Employer responsibilities
- e. How and where to store materials
- f. Safety measures related to walkways, stairs and floor openings
- g. Traffic-pathway protection of workers and persons

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## Ironworker (Generalist)

**Unit:** A3 Tools and Equipment

**Level:** One

**Duration:** 21 hours

Theory: 14 hours

Practical: 7 hours

### Overview:

This unit's major outcomes feature improved knowledge of Ironworker tools and equipment with regard to their selection, use, and maintenance.

<b>Objectives and Content:</b>	<b>Percent of Unit Mark (%)</b>
1. Describe hand tools used in the Ironworker trade, including procedures for their inspection, maintenance, and storage.	25%
2. Describe power tools used in the Ironworker trade, including procedures for their inspection, maintenance, and storage.	25%
a. electric	
b. hydraulic	
c. gas	
d. pneumatic	
3. Describe and demonstrate the use of measurement/ layout tools.	40%
a. Types of measurement/layout tools, including their selection and application re: instructor-specified tasks	
• Handling common varieties of stress at work and in school	
b. Procedures for inspection, maintenance, and storage	
c. Types of leveling and alignment instruments tools, including their selection and application re: instructor-specified tasks	
d. Procedures for inspection, maintenance, and storage	
4. Describe and demonstrate procedure for using powder-actuated equipment.	10%

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## Ironworker (Generalist)

**Unit:** B1 Computer Applications and the Ironworker Trade

**Level:** One

**Duration:** 16 hours

Theory: 16 hours

Practical: 0 hours

### Overview:

This unit of instruction is designed to provide Insulator apprentices with general skills and knowledge required to benefit from computer technology as it currently applies to the trade, and to serve as a foundation for further learning which technological change will make necessary during their careers as 21<sup>st</sup>-century tradespeople.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe basic computer components and their functions.</b>	<b>25%</b>
a. Aspects of Windows-platform software	
b. Auxiliary drives	
c. Care/handling of diskettes, CD-ROMs, and DVDs	
d. CPU	
e. DOS	
f. Hard drive	
g. Input/output devices	
h. Keyboard	
i. Monitor	
j. Mouse	
k. Parallel, serial and USB ports	
l. Printer (impact/non-impact)	
<b>2. Perform basic word-processing operations.</b>	<b>15%</b>
a. Boot computer and start applications	
b. Execute common commands	
c. Perform file-management tasks	
<b>3. Describe Internet system components.</b>	<b>5%</b>
a. Conceptualizing the Web (including precautions against viruses/trojans)	
b. Routers	
c. File servers	
d. Network addresses	
e. Bookmarks	
f. Search engines (e.g. Dogpile)	
<b>4. Perform Web searches using various search engines.</b>	<b>15%</b>
a. Accessing search engines via URL addresses	
b. Selecting/using key words to guide searches	
c. Filtering/refining and organizing search results	



- 5. Send/receive e-mail messages.** **5%**
- a. Accessing public domain e-mail services
  - b. E-mail addresses
  - c. Sending/retrieving e-mail
  - d. Replying to/forwarding e-mail
  - e. E-mail attachments (text/graphics)
  - f. E-mail website links
- 6. Identify/describe important areas of trade practice to which computer technology is applied.** **30%**
- a. Communications and general documentation
  - b. Business records (including payroll) and project management
  - c. Cost estimating, preparing tenders, and cost control
  - d. Optimized use of sheet-goods and other construction materials
  - e. Architectural, survey, and other technical documents
  - f. CAD, CAD/CAM, and CNC applications in Insulator fabrication and installation projects
  - g. Other (as specified by instructor)
- 7. Identify methods/resources for ongoing, self-directed learning re: personal knowledge of trade-related computer applications.** **15%**
- a. Conventional trade periodicals and books
  - b. Subject-specific websites, e-publications, and listserv groups
  - c. CD-ROMS, DVDs, and other instructional software

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## Ironworker (Generalist)

**Unit:** B2 Communication and Trade Documentation

**Level:** One

**Duration:** 7 hours

Theory: 4 hours

Practical: 3 hours

### Overview:

Outcomes include improved knowledge of effective communication practices of trade-related documents and their use, and of the procedures used to prepare and complete trade documents.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe effective verbal and nonverbal communication.</b> a. Other tradespersons b. Coworkers/colleagues c. Supervisors d. apprentices	<b>15%</b>
<b>2. Describe/demonstrate communication devices with reference to their application and operation.</b> a. Cellular b. Two-way radio c. Computer	<b>30%</b>
<b>3. Describe/demonstrate trade-related documentation, including its application and procedures for use.</b> a. Manufacturer specifications b. Codes and standards c. Manuals d. Drawings e. Shipping documentation f. Safety documentation	<b>40%</b>
<b>4. Describe procedures used to prepare and complete trade-related documentation.</b>	<b>15%</b>

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## Ironworker (Generalist)

**Unit:** B3 Drawings

**Level:** One

**Duration:** 12 hours

Theory: 7 hours

Practical: 14 hours

### Overview:

Outcomes include improved knowledge of effective communication practices, of trade-related documents and their use, and of the procedures used to prepare and complete trade documentation.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terms associated with technical drawings.</b>	<b>10%</b>
<b>2. Describe types of drawings and their applications.</b> <ul style="list-style-type: none"><li>a. Civil/site/plot</li><li>b. Architectural</li><li>c. Mechanical</li><li>d. Structural</li><li>e. Shop/detail drawings</li><li>f. Sketches</li></ul>	<b>10%</b>
<b>3. Describe/demonstrate drawing projections and views, including their application to trade practice.</b> <ul style="list-style-type: none"><li>a. orthographic</li><li>b. Oblique</li><li>c. Isometric</li><li>d. Section</li><li>e. Auxiliary</li></ul>	<b>15%</b>
<b>4. Interpret drawings and extract information from same.</b> <ul style="list-style-type: none"><li>a. Lines</li><li>b. Legend</li><li>c. Symbols and abbreviations</li><li>d. Title block</li><li>e. Notes and specifications</li><li>f. Tolerances/allowances</li><li>g. Bill of materials</li><li>h. Schedules</li></ul>	<b>15%</b>
<b>5. Describe/demonstrate procedure to obtain dimensions from drawings.</b> <ul style="list-style-type: none"><li>a. scales</li><li>b. calculations</li></ul>	<b>5%</b>

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## Ironworker (Generalist)

**Unit:** C1 Oxy-Fuel Cutting

**Level:** One

**Duration:** 20 hours

Theory: 10 hours

Practical: 10 hours

### Overview:

Outcomes include improved knowledge of oxy-fuel equipment, accessories, and associated procedures for cutting.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terms associated with oxy-fuel cutting.	5%
2. Identify hazards and safe work-practices pertaining to oxy-fuel cutting.	20%
a. Personal	
b. Shop/facility	
c. Equipment	
d. ventilation	
e. Storage/handling	
3. Identify and interpret codes and regulations pertaining to oxy-fuel equipment.	5%
4. Identify oxy-fuel equipment and accessories and describe their applications.	5%
5. Describe the selection of fuels and gases used in oxy-fuel cutting operations, and describe the characteristics and application of these substances.	10%
6. Describe/demonstrate types of cutting flames, including their application and the procedures for flame-adjustment.	10%
a. oxidizing	
b. carburizing	
c. neutral	
7. Describe/demonstrate procedure to set-up, adjust, and shut down oxy-fuel equipment.	15%
8. Describe/demonstrate procedure to inspect, maintain, and store oxy-fuel equipment.	15%
9. Describe/demonstrate procedure to cut materials using oxy-fuel equipment.	5%
a. Free-hand	
b. track	
10. Describe common cutting faults and demonstrate procedure to prevent /correct them.	5%
a. scales	
b. calculations	

## Ironworker (Generalist)

**Unit:** C2 Introduction to Welding

**Level:** One

**Duration:** 27 hours

Theory: 10 hours

Practical: 17 hours

### Overview:

Outcomes include improved knowledge of shielded-metal arc welding (SMAW) equipment, accessories, and procedures.

<b>Objectives and Content:</b>	<b>Percent of Unit Mark (%)</b>
<b>1. Define terms associated with SMAW.</b>	<b>5%</b>
<b>2. Interpret information re: SMAW as found on technical drawings.</b>	<b>5%</b>
a. Symbols	
b. Abbreviations	
<b>3. Identify SMAW-related hazards and precautions.</b>	<b>20%</b>
a. Personal	
b. Shop/facility	
c. Equipment	
d. Ventilation	
e. Storage/handling	
<b>4. Identify codes and standards re: welding, including those associated with the Canadian Welding Bureau (CWB).</b>	<b>5%</b>
<b>5. Describe and demonstrate SMAW procedures as specified by instructor, including:</b>	<b>25%</b>
a. Set-up and adjustment of SMAW equipment	
b. Inspection and maintenance of SMAW equipment	
c. Types of welds performed using SMAW equipment, including positions for welding	
<b>6. Describe/demonstrate welding procedures using SMAW equipment.</b>	<b>15%</b>
<b>7. Identify common weld-faults and describe procedures to prevent/correct them.</b>	<b>5%</b>
<b>8. Describe and demonstrate set-up, operation, and shut-down procedure for using SMAW equipment.</b>	<b>20%</b>
a. SMAW welding processes, characteristics, and basic applications	
b. SMAW welding equipment consumables, accessories	

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## Ironworker (Generalist)

**Unit:** D1 Access Equipment

**Level:** One

**Duration:** 21 hours

Theory: 10 hours

Practical: 11 hours

### Overview:

Outcomes include improved knowledge of ladders, scaffolding, and aerial work-platforms.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe and demonstrate the types of ladders, scaffolding, and aerial work-platforms used as access equipment in the Ironworker trade.</b>	<b>15%</b>
a. Important technical terminology	
b. Types of ladders, scaffolding, and aerial work-platforms	
<b>2. Identify codes and regulations pertaining to ladders, scaffolding, and aerial work-platforms.</b>	<b>5%</b>
<b>3. Describe and demonstrate the use of ladders, scaffolding, and aerial work-platform equipment in jobsite applications as specified by the instructor.</b>	<b>30%</b>
a. Special hazards and precautions	
b. Selection/use of fall-protection equipment	
<b>4. Describe and demonstrate specified procedures for using access equipment.</b>	<b>50%</b>
a. Erect, secure, and dismantle ladders.	
b. Erect, secure, and dismantle scaffolding.	
c. Inspect and maintain ladders, scaffolding, and aerial work-platform equipment	

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## Ironworker (Generalist)

**Unit:** D2 Hoisting, Lifting, and Rigging

**Level:** One

**Duration:** 42 hours

Theory: 35 hours

Practical: 14 hours

### Overview:

Significant outcomes include improved knowledge of hoisting, lifting, and rigging equipment, including the applications, limitations, and practical procedures (e.g. calculations; knots) associated with these key practices within the Ironworker trade.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Identify and explain significant technical terminology associated with hoisting, lifting, and rigging.	5%
2. Describe instructor-specified equipment and accessories for rigging, hoisting, and lifting including their limitations, as well as their preferred application(s).	10%
3. Describe procedure to inspect, maintain, and store equipment for rigging, hoisting, and lifting operations.	5%
4. Describe and demonstrate instructor-specified knots, hitches, and bends, including their preferred uses and practical execution in Ironworker trade-practice.	15%
5. Perform instructor-specified calculations re: rigging of equipment for hoisting and lifting operations. <ul style="list-style-type: none"> <li>a. Safe working loads</li> <li>b. Breaking strength</li> <li>c. Sling angle</li> </ul>	15%
6. Describe and demonstrate procedures to rig materials/equipment for hoisting and lifting. <ul style="list-style-type: none"> <li>a. General procedures, including:               <ul style="list-style-type: none"> <li>• Determination of load weight and weight-distribution, including use of load charts, determination of load-type, and engineered-lift requirements</li> <li>• Selection of rigging hardware</li> <li>• Methods of communication</li> <li>• Placement of load</li> <li>• Pre-lift and post-lift inspections</li> </ul> </li> <li>b. Specific hazards, precautions, and safe work-practices, including procedures to ensure work area is safe for hoisting and lifting               <ul style="list-style-type: none"> <li>• Supervision of lift</li> </ul> </li> </ul>	50%

- Securement of area
- Communication, including hand signals and electronic
- c. Codes and regulations
- d. Detailed procedure re: rigging materials/equipment for lifting and hoisting, including significance of specified factors:
  - Load characteristics, including weight, size, shape, gravitational centre
  - Environment (e.g. meteorological conditions such as freezing rain)

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## Ironworker (Generalist)

**Unit:** D3 Introduction to Cranes

**Level:** One

**Duration:** 21 hours

Theory: 14 hours

Practical: 7 hours

### Overview:

This unit's major outcomes include improved knowledge of crane equipment and its operation, as well as the limitations and preferred application(s) of this technology

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<p><b>1. Describe the variety of modern crane equipment including such considerations as important components, preferred applications, specific limitations, and associated technical terminology.</b></p> <ul style="list-style-type: none"> <li>a. Conventional crane vs. hydraulic crane</li> <li>b. Tower crane</li> <li>c. Electrical overhead travelling cranes (EOTC)</li> <li>d. Crawler crane</li> <li>e. Carrier-mounted</li> <li>f. Rough-terrain vs. all-terrain</li> <li>g. High-capacity</li> <li>h. Knuckle-boom</li> <li>i. Derrick</li> <li>j. Boom truck</li> </ul>	<b>40%</b>
<p><b>2. Describe and demonstrate the interpretation of technical documents pertaining to crane equipment and its operation.</b></p> <ul style="list-style-type: none"> <li>a. Deriving and using information from technical drawings and specifications</li> <li>b. Deriving and using information from tables and charts (including information re: limitations of specific equipment)</li> </ul>	<b>20%</b>
<p><b>3. Describe and demonstrate procedure for assembling/installing crane equipment on-site, including interpretation of all relevant codes and regulations.</b></p> <ul style="list-style-type: none"> <li>a. Principles of leverage and applicability to the use of crane technology</li> <li>b. General hazards, precautions, and safe work-practices</li> <li>c. Specific considerations re on-site assembly/installation, including:               <ul style="list-style-type: none"> <li>• Site-hazard assessment (e.g. re: overhead powerlines; underground services; obstructions; soil/ground conditions, etc.)</li> <li>• Crane position (radius/swing area; headroom, etc.)</li> </ul> </li> </ul>	<b>40%</b>

## Ironworker (Generalist)

**Unit:** E1 Reinforcing I

**Level:** One

**Duration:** 42 hours

Theory: 21 hours

Practical: 21 hours

### Overview:

This unit's major outcomes include improved knowledge of materials/accessories and procedures used to reinforce concrete.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe the rationale and the technical requirements associated with the reinforcement of concrete in modern construction-industry practice.</b>	<b>15%</b>
a. General purpose and effects of reinforcing concrete, including associated technical terminology.	
b. The stresses that act upon concrete structures, including:	
• Compression	
• Tension	
• Shear	
• Live/dead loads	
• Physical and mechanical bonds	
<b>2. Identify hazards and describe safe work-practices (e.g. fall-protection) associated with the use of reinforcing steel.</b>	<b>10%</b>
a. Specific precautions (e.g. selection/use of fall-protection equipment)	
b. Compliance with codes and regulations	
<b>3. Describe and demonstrate the use of technical documents as required in reinforcement-steel projects.</b>	<b>20%</b>
a. Deriving and using relevant information about reinforcement from technical drawings and project specifications	
b. Interpretation of standards and identification systems, including:	
• Grades and diameters	
• Mill standards	
• Concrete Reinforcing Steel Institute (CSRI)	
• Coloured codes and tags	
<b>4. Describe and demonstrate the tools, materials, accessories and procedures that Ironworkers use to reinforce concrete structures.</b>	<b>55%</b>
a. Selection and use of tools and equipment for instructor-specified procedures, including:	
• Bending	
• Cutting	
• Placing	
• Tying	
• Splicing	

- b. Selection and use of instructor-specified reinforcing materials/accessories, including their properties, characteristics, and preferred application(s)
  - Rebar
  - Embedded plates
  - Welded wire mesh
  - Composite material
  - Tie-wires
  - Bar supports
  - Coupling devices
- c. Reinforcing-steel procedures and preferred practices, including
  - Site preparation
  - Interpretation of technical drawings, specifications and industry standards (e.g. Concrete Reinforcing Steel Institute [CSRI])
  - Selection and set-up of equipment
  - Requirements/rationale re: maintaining prescribed clearances and tolerances (e.g., protection of reinforcing steel, maintenance of structural integrity, etc.)

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## Ironworker (Generalist)

**Unit:** F1 Structural Components

**Level:** One

**Duration:** 21 hours

Theory: 14 hours

Practical: 7 hours

### Overview:

This unit's major outcomes include improved knowledge of structural steel components and their characteristics, as well as the procedures, standards, and practices associated with their preferred uses.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Describe the types, characteristics, preferred uses, and major shapes of structural-steel components that ironworkers erect, fashion, and dismantle.</b>	<b>40%</b>
a. Major structural steel shapes, including their designation, characteristics, and application(s) <ul style="list-style-type: none"><li>• I-beam</li><li>• H-beam</li><li>• Wide flange</li><li>• Welded wide flange</li><li>• Angle</li><li>• Channel</li><li>• Tee</li><li>• Hollow structural shapes (HSS)</li><li>• Miscellaneous shapes</li></ul>	
b. Primary Steel structural components and their purpose <ul style="list-style-type: none"><li>• Columns</li><li>• Girders</li><li>• Beams</li><li>• Trusses</li><li>• Joists</li></ul>	
c. Secondary Steel structural components and their purpose <ul style="list-style-type: none"><li>• Decking</li><li>• Girts</li><li>• Purlins</li><li>• Sag rods</li><li>• Bracing</li><li>• Bridging</li><li>• Lintels</li></ul>	
c. Miscellaneous structural components and their purpose <ul style="list-style-type: none"><li>• Precast</li><li>• Glued laminated timber products</li><li>• Composite</li></ul>	
e. Significant technical terminology associated with structural-steel projects	
d. Major structural steel shapes, including their designation, characteristics, and application(s)	

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|--|------------|
| <b>2. Describe and demonstrate the use of technical documents to identify special hazards and fulfill other technical requirements associated with erecting and dismantling structural-steel components.</b> | <b>10%</b> |
| 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  |            |
| <b>3. Describe and demonstrate specified structural-steel procedures including their major characteristics, applications and limitations.</b>  | <b>25%</b> |
| a. Installing fasteners  |            |
| b. Welding   |            |
| <b>4. Describe and demonstrate specified procedures and preferred applications re: erecting and dismantling falsework.</b>   | <b>25%</b> |
| a. Types of falsework, including characteristics and preferred applications.   |            |
| b. Procedures for erecting and dismantling falsework   |            |

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## Ironworker (Generalist)

**Unit:** F2 Pre-Engineered Structures

**Level:** One

**Duration:** 35 hours

Theory: 17 hours

Practical: 18 hours

### Overview:

This unit's major outcomes include improved knowledge of structural steel components and their characteristics, as well as the procedures, standards, and practices associated with their preferred uses.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<p><b>1. Describe the rationale, technical requirements, and major design-types associated with the use of pre-engineered metal buildings.</b></p> <p>a. Significant technical terminology re: erecting pre-engineered metal buildings</p> <p>b. Major types of pre-engineered structure built using pre-engineered products components</p> <p>c. Major varieties, characteristics, and preferred uses of pre-engineered structures including:</p> <ul style="list-style-type: none"> <li>• Tapered-beam</li> <li>• Single-span rigid frame</li> <li>• Multi-span rigid frame</li> <li>• Single-span and continuous trusses</li> <li>• Lean-to</li> </ul>	<b>30%</b>
<p><b>2. Describe and demonstrate the use of technical documents to identify special hazards and fulfill other technical requirements associated with pre-engineered structures.</b></p> <p>a. Special hazards, precautions and safe work-practices</p> <p>b. Identification and use of relevant codes, regulations, and standards</p> <p>c. Practical use of technical drawings and project specifications</p>	<b>20%</b>
<p><b>3. Describe and demonstrate specified procedures to erect pre-engineered</b></p> <p>a. Procedures for planning and preparing to erect pre-engineered structures</p> <p>b. Procedures for erecting pre-engineered structures, including selection of tools and equipment.</p>	<b>50%</b>

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