



# **Ironworker (Reinforcing) On-the-Job Training Guide**

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Saskatchewan  
Apprenticeship and  
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Commission

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*Recognition:*

*To promote transparency and consistency, this document has been adapted from the 2015 Ironworker (Reinforcing) National Occupational Analysis (NOA) (Employment and Social Development Canada).*

*A complete version of the Occupational Standard can be found at [www.red-seal.ca](http://www.red-seal.ca).*

# STRUCTURE OF THE ON-THE-JOB TRAINING GUIDE

To facilitate understanding of the occupation, this on-the-job training guide contains the following sections:

**Description of the Ironworker (Reinforcing) trade:** an overview of the trade's duties and training requirements.

**Essential Skills Summary:** an overview of how each of the nine essential skills is applied in this trade.

**Harmonization:** a brief description on the Pan-Canadian Harmonization Initiative for the Ironworker (Reinforcing) trade.

**Task Matrix:** a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard detailing the essential skills and the level of training where the content is covered.

**Major Work Activity (MWA):** the largest division within the standard that is comprised of a distinct set of trade activities.

**Task:** distinct actions that describe the activities within a major work activity.

**Sub-task:** distinct actions that describe the activities within a task.

**On-the-Job Training Content for the Ironworker (Reinforcing) trade:** a chart which outlines the topics of technical training with on-the-job examples for apprentice to achieve relevant experience at work.

# DESCRIPTION OF THE IRONWORKER (REINFORCING) TRADE

*Ironworker (reinforcing) workers field fabricate and weld rebar. They also handle, cut, sort, bend, tie and install rebar and other materials used in reinforcing concrete.*

Ironworkers (reinforcing) cut, bend, lay out, hoist, place, tie, couple, and weld reinforcing steel rods, welded wire fabric and composite materials in a wide variety of reinforced concrete products and structures such as buildings, highways, bridges, stadiums, wind turbines, solar panels and towers. They also place and stress various post-tensioning systems in structures such as parking garages, bridges and stadiums where longer unsupported spans are required.

Ironworkers (reinforcing) unload fabricated or straight reinforcing materials and place it for hoisting as needed. While the reinforcing material is usually pre-cut and fabricated off-site, ironworkers (reinforcing) may be called upon to cut and bend them in the field according to design specifications and drawings. Ironworkers (reinforcing) may pre-assemble reinforcing material by laying it out and connecting sub-assemblies on the ground prior to final placement. They organize the hoisting of the components by connecting cables and slings to the components and directing crane operators. They position, align and secure components according to drawings, using a variety of methods. After placing post-tensioning systems, they stress the tendons to predetermined forces using hydraulic jacks and pumps and then grout the tendons.

Ironworkers (reinforcing) work outside in all weather. They may also work in underground work sites. They work in a variety of locations ranging from remote areas where they could work on dams, bridges, or mining projects, to urban environments where they could work on high-rise buildings, parking garages, transit systems, tunnels, stadiums, roads, or highways. The work may require that they be away from home for extended periods of time. The work often requires considerable standing, bending, crawling, lifting, climbing, pulling, and reaching and is often conducted in cramped, confined spaces or at heights. Hazards include injury from repetitive movements, electrocution, crushing, falls or falling objects.

Ironworkers (reinforcing) are required to have good mechanical aptitude, the ability to visualize finished products in three dimensions, and the ability to work at heights in varying extreme climates. A thorough knowledge of the principles of lifting and hoisting is required as is a familiarity with a variety of metal fastening and joining methods. All ironworkers (reinforcing) are required to be competent in the use and care of a variety of hand and power tools and equipment such as tying tools, pry bars, jacks, torches, cut-off saws, hydraulic benders, shears, welding equipment, stressing equipment and cranes.

Because of the nature of the work, a primary concern of the ironworkers (reinforcing) is workplace safety; therefore ironworkers (reinforcing) must be thoroughly familiar with the applicable sections of local, provincial, and federal building and safety codes.

Ironworkers (reinforcing) tend to work in teams, and team coordination is a large component of the occupation especially when hoisting and placing large, heavy components high above the ground.

Ironworkers (reinforcing) interact and work cooperatively with a wide variety of construction tradespeople such as ironworkers (structural/ornamental), electricians, plumbers, crane operators, steel detailers, welders, carpenters, concrete finishers, and metal fabricators.

**Training Requirements:** To graduate from each level of the apprenticeship program, an apprentice must successfully complete the required technical training and compile enough on-the-job experience to total at least 1800 hours each year. Total trade time required is 3600 hours and at least 2 years in the trade.

There are two levels of technical training delivered by Saskatchewan Polytechnic in Moose Jaw.

Journeyman to apprentice ratio for this trade is: 1:2

The information contained in this document serves as a guide for employers and apprentices. Apprenticeship training is mutually beneficial to both employer and apprentice. The employer's investment in training apprentices' results in skilled and certified workers. The document summarizes the tasks to be covered by the apprentice during their on-the-job portion of apprenticeship training. An apprentice spends approximately 85% of their apprenticeship term training on-the-job.

**It is the employer's or journeyman's responsibility to supervise an apprentice's practical skills development until a satisfactory level of proficiency has been reached.**

#### **EMPLOYER TRAINING RESPONSIBILITY**

- promote safety in the workplace
- expose the apprentice to all appropriate tools, equipment
- provide guided, hands-on practice in rigging, hoisting, and crane signals
- document hours of work and work experiences
- provided guided instruction setting up and dismantling various types of cranes

Employers should make every effort to expose their apprentices to work experience in as many areas of the trade as possible.

In the On-the-Job Training Guide, in-school instruction is listed first; on-the-job suggestions to help employers assist the apprentice to prepare for in-school training are listed next.

The content of the training components is subject to change without notice.

#### **Entrance Requirements for Apprenticeship Training**

Your grade twelve transcripts (with no modified classes) or GED 12 is your guarantee that you meet the educational entrance requirements for apprenticeship in Saskatchewan. In fact, employers prefer and recommend apprentices who have completed high school. This ensures the individual has all of the necessary skills required to successfully complete the apprenticeship program and receive journeyman certification.

Individuals with "modified" or "general" classes in math or science do not meet our entry requirements. These individuals are required to take an entrance assessment prescribed by the Saskatchewan Apprenticeship and Trade Certification Commission (SATCC.).

English is the language of instruction in all apprenticeship programs and is the common language for business in Saskatchewan. Before admission, all apprentices and/or "upgraders" must be able to understand and communicate in the English language. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

Note: A CLB assessment is valid for a one-year period from date of issue.

Designated Trade Name	Math Credit at the Indicated Grade Level❶	Science Credit at Grade Level
Ironworker (Reinforcing)	Grade 10	Grade 10
<p>❶ - (One of the following) WA – Workplace and Apprenticeship; or F – Foundations; or P – Pre-calculus, or a Math at the indicated grade level (Modified and General Math credits are not acceptable.).</p> <p>*Applicants who have graduated in advance of 2015-2016, or who do not have access to the revised Science curricula will require a Science at the minimum grade level indicated by trade.</p> <p>For information about high school curriculum, including Math and Science course names, please see: <a href="http://www.curriculum.gov.sk.ca/#">http://www.curriculum.gov.sk.ca/#</a></p> <p><b>Individuals not meeting the entrance requirements will be subject to an assessment and any required training.</b></p>		

# ESSENTIAL SKILLS SUMMARY

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: <https://www.canada.ca/en/employment-social-development/programs/essential-skills/tools.html>.

The application of these skills may be described throughout this document within the skills and knowledge which support each sub-task of the trade. The most important essential skills for each sub-task have also been identified. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at [www.red-seal.ca](http://www.red-seal.ca).

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## READING

Ironworker (reinforcing) workers require strong reading skills to consult installation procedures, reference manuals, Safety Data Sheets (SDS), and industry standards and safety requirements when they install rebar and other materials used in reinforcing concrete. They also refer to project specifications and work orders when planning a job.

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## DOCUMENT USE

Document use is important in the work of Ironworker (Reinforcing) trade. Ironworkers (reinforcing) interpret diagrams in the National Building Code (NBC) to ensure compliance with regulatory standards. They interpret schematics and working drawings when planning the installation of rebar and other materials used in reinforcing concrete.

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## WRITING

Writing skills are used by Ironworker (reinforcing) workers to perform tasks such as writing lists of materials required for a job, completing order forms to request materials, and keeping daily logs to track work status and reminders. When required, they must write incident or accident reports. They may be required to communicate in writing to other trade professionals such as engineers and architects.

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## **ORAL COMMUNICATION**

Ironworker (reinforcing) workers require good oral communication skills to interact with colleagues, apprentices, supervisors, suppliers, inspectors, clients and other tradespersons when co-ordinating work, resolving problems and ensuring safety.

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## **NUMERACY**

Ironworker (reinforcing) workers work in both imperial and metric systems of measurement. They locate and mark positions for rebar and other materials used in reinforcing concrete. They perform a variety of calculations pertaining to rigging equipment safe working loads and breaking strength. They perform a variety of calculations such as performing area, perimeter and volume calculations.

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## **THINKING**

Ironworker (reinforcing) workers diagnose and solve problems. They decide on work priorities and plan and organize their work accordingly. Ironworker (reinforcing) workers may determine the most cost effective way to use materials and supplies when installing rebar and other materials used in reinforcing concrete.

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## **WORKING WITH OTHERS**

During the course of a work day, Ironworker (reinforcing) workers must interact with others such as co-workers, suppliers, clients and other trades.

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## **DIGITAL TECHNOLOGY**

Ironworker (reinforcing) workers use computers and other digital devices more commonly as sources of resource information, communication and cost reporting.

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## **CONTINUOUS LEARNING**

Because of the nature of the work, a primary concern of the ironworkers (reinforcing) is workplace safety; therefore ironworkers (reinforcing) must be thoroughly familiar with the applicable sections of local, provincial and federal building and safety codes. This means that related training and certification is often mandatory for both apprentices and journeypersons.



# ELEMENTS OF HARMONIZATION FOR APPRENTICESHIP TRAINING

At the request of industry, the Harmonization Initiative was launched in 2013 to *substantively align* apprenticeship systems across Canada by making training requirements more consistent in the Red Seal trades. Harmonization aims to improve the mobility of apprentices, support an increase in their completion rates and enable employers to access a larger pool of apprentices.

As part of this work, the Canadian Council of the Directors of Apprenticeship (CCDA) identified four main harmonization priorities in consultation with industry and training stakeholders:

## 1. Trade name

The official Red Seal name for this trade is Ironworker (Reinforcing).

## 2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for the Ironworker (Reinforcing) trade is 2.

## 3. Total Training Hours during Apprenticeship Training

The total hours of training, including both on-the-job and in-school training for the Ironworker (Reinforcing) trade is 3600.

## 4. Consistent sequencing of training content (at each level) using the most recent Occupational Standard

The total training content taught in each jurisdiction is generally aligned nationally allowing for greater apprentice mobility.

# IRONWORKER (REINFORCING) TASK MATRIX CHART

This chart outlines the major work activities, tasks, and sub-tasks from the 2015 Ironworker (Reinforcing) National Occupational Analysis (NOA). Each sub-task details the corresponding essential skill and level of training where the content is covered.

## A - Occupational Skills

<b>Task A-1 Interprets occupational documentation.</b>	<b>1.01 Interprets drawings and specifications.</b>  (In-Context)	<b>1.02 Interprets standards, regulations, and procedures.</b>  (In-Context)			
<b>Task A-2 Communicates in the workplace.</b>	<b>2.01 Communicates with co-workers.</b>  1	<b>2.02 Communicates with others.</b>  1	<b>2.03 Communicates with apprentices.</b>  1	<b>2.04 Uses hand signals.</b>  1, 2	<b>2.05 Communicates electronically.</b>  1
<b>Task A-3 Uses and maintains tools and equipment.</b>	<b>3.01 Uses hand tools and measuring equipment.</b>  1	<b>3.02 Uses surveying equipment.</b>  1	<b>3.03 Uses power tools.</b>  1	<b>3.04 Uses bending tools and equipment.</b>  1	<b>3.05 Uses aerial work platforms.</b>  1
	<b>3.06 Uses ladders.</b>  1	<b>3.07 Uses scaffolding.</b>  1	<b>3.08 Uses personal protective equipment (PPE).</b>  1	<b>3.09 Uses welding equipment.</b>  1	<b>3.10 Uses oxy-fuel cutting equipment.</b>  1
<b>Task A-4 Organizes work.</b>	<b>4.01 Organizes materials and supplies.</b>  2	<b>4.02 Marks layouts.</b>  1	<b>4.03 Maintains safe work environment.</b>  1	<b>4.04 Assesses site hazards.</b>  1	<b>4.05 Plans work tasks.</b>  2

## B - Rigging and Hoisting

<b>Task B-5 Selects rigging equipment.</b>	<b>5.01 Matches load to lift capability.</b>  1, 2	<b>5.02 Inspects rigging equipment.</b>  1, 2	<b>5.03 Maintains rigging equipment.</b>  1, 2
<b>Task B-6 Uses hoisting and lifting equipment.</b>	<b>6.01 Uses hoisting equipment.</b>  1, 2	<b>6.02 Uses lifting equipment.</b>  1, 2	<b>6.03 Attaches rigging to load.</b>  1, 2

## C – Cranes

Task C-7 Selects, assembles and erects cranes and components.	7.01 Assesses crane site limitations. 1, 2	7.02 Determines crane position. 1, 2	7.03 Erects cranes and components. 1, 2
	8.01 Disassembles crane components. 1, 2	8.02 Prepare crane and components for transport. 1, 2	

## D – Reinforcing

Task D-9 Fabricates on-site.	9.01 Cuts material. 1, 2	9.02 Bends material. 1, 2	
	10.01 Places reinforcing material. 1, 2	10.02 Ties material. 1, 2	10.03 Joins material. 1, 2

## E – Pre-Stresses/Post-Tensions

Task D-11 Places pre-stressed/post-tensioning systems.	11.01 Lays out profile. 1, 2	11.02 Places tendons and accessories. 1, 2	11.03 Installs bursting steel and anchorages. 1, 2	11.04 Connects tendons to anchors. 1, 2	11.05 Protects exposed tendons. 1, 2
	12.01 Sets up stressing equipment. 1, 2	12.02 Tensions tendons. 1, 2	12.03 Cuts and caps tendons. 1, 2	12.04 Removes stressing equipment. 1, 2	12.05 De-stresses tendons. 1, 2
Task D-13 Grouts tendons.	13.01 Sets up grouting equipment. 1, 2	13.02 Installs grouts. 1, 2			

# TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training at the topic level.

SATCC Level One	Transcript Code	Hours
Safety Awareness and Access Equipment	SFTY 137	14
Communication and Trade Documentation	COM 112	21
Draw Interpretations and Work Plan	BPRT 106	35
Tools and Equipment	EQPT 175	14
Rigging for Ironworkers	RIGG 122	25
Welding and Cutting	WLDR 129	30
Introduction to Cranes	EQPT 174	16
Structural Components	STRU 102	14
Reinforcing I	STRU 103	20
Forklift Training	MATE 101	7
Ironworker Mathematics (Exceeds)	MATH 137	14
		<b>210</b>

SATCC Level Two	Transcript Code	Hours
Drawing Interpretation and Trade Mathematics	BPRT 203	38
Reinforcing II	STRU 206	45
Pre-Stressed/Post-Tensioning Systems	STRU 207	30
Hydraulic and Tower Cranes	EQPT 205	67
Surveying	SRVY 207	10
Ironworker Mathematics (Exceeds)	MATH 202	20
		<b>210</b>

# ON-THE JOB AND IN-SCHOOL TRAINING

## CONTENT FOR THE IRONWORKER

### (REINFORCING) TRADE

This chart outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for the topics of technical training. Topics of technical training are provided with the associated learning outcomes.

Level One	7 weeks	210 hours
<b>Safety Awareness and Access Equipment</b>		<b>14 hours</b>
<ul style="list-style-type: none"><li>• discuss industry and government regulatory requirements pertaining to safety</li><li>• describe Personal Protective Equipment (PPE) requirements and use</li><li>• describe the use of ladders, scaffolding, and aerial lifts</li><li>• discuss fall protection, fall arrest, confined space, and tag out/lockout procedures</li></ul>		
<b>Mentors can assist the apprentice to prepare for this section of technical training by:</b>		
<ul style="list-style-type: none"><li>• <i>providing opportunities to learn and apply safety regulations/company policies such as fall protection, use of safeguards, WHMIS and proper PPE</i></li><li>• <i>providing opportunities to identify hazards and apply safe work practices such as lock out/tag out, confined space procedures, and good house keeping</i></li><li>• <i>identifying and describing the safe use of fall protection systems including correct fit, vertical and horizontal lifelines and inspection/maintenance requirements</i></li></ul>		
<b>Communication and Trade Documentation</b>		<b>21 hours</b>
<ul style="list-style-type: none"><li>• demonstrate effective communication practices</li><li>• demonstrate the procedures used to prepare and complete trade documentation</li><li>• identify job site barriers and signage requirements</li><li>• describe requirements of team members</li><li>• demonstrate appropriate means to offer and accept criticism</li></ul>		
<b>Mentors can assist the apprentice to prepare for this section of technical training by:</b>		
<ul style="list-style-type: none"><li>• <i>providing opportunities to interpret trade documentation such as codes/standards, manuals, and drawings</i></li><li>• <i>identifying the types and applications of drawings such as architectural, mechanical, and structural</i></li><li>• <i>identifying the types of drawing projections and views used at the job site such as perspective, isometric, oblique, section, auxiliary and orthographic drawings</i></li><li>• <i>providing opportunities to prepare and complete trade/job related documentation</i></li><li>• <i>providing opportunities to give direction by using hand signals</i></li><li>• <i>identify job site barriers and signage requirements such as tapes (yellow/red), fences, and 'men working above' signs</i></li></ul>		

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## Drawing Interpretations and Work Plan

35 hours

- identify types of drawings and their applications
- explain the procedures used to interpret and extract information from drawings
- prepare trade related documentation
- organise work tasks to facilitate effective handling of work materials

### Mentors can assist the apprentice to prepare for this section of technical training by:

- *describing considerations and responsibilities when handling, ordering and coordinating materials*
- *providing opportunities to select locations for material lay down and equipment set up*
- *providing instruction on rebar marking, sizing, and tagging methods*
- *identify information sources such as trade documentation, related trades/professionals and clients*

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## Tools and Equipment

14 hours

- identify types of hand, electric, hydraulic, pneumatic and gasoline powered tools
- describe use of levelling and aligning tools
- demonstrate use of power actuated tools
- demonstrate the care and use of tools and equipment

### Mentors can assist the apprentice to prepare for this section of technical training by:

- *providing opportunities to use levelling instruments including transit, spirit and laser levels*
- *providing opportunities to select, use and maintain power tools such as electric, hydraulic, pneumatic, powder actuated, and gas powered tools*

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## Rigging for Ironworkers

25 hours

- describe hoisting, lifting, and rigging equipment, their applications, limitations, and procedures for use
- discuss the procedures used to perform hoisting and lifting operations
- perform calculations required when hoisting and lifting
- demonstrate international crane hand signals

### Mentors can assist the apprentice to prepare for this section of technical training by:

- *identifying hazards and describing safe work practices pertaining to ladders, scaffolding and aerial work platforms*
- *providing opportunities to interpret associated codes and regulations*
- *providing opportunities to erect, secure and dismantle ladders and scaffolding including assessing base conditions and determining tying and bracing requirements*
- *providing opportunities to erect various scaffolding systems such as frame, modular, and tube & clamp*
- *describing and explaining aerial work platform components, thrust outs and support hooks, wall rollers and tie offs, manual winches, and power swing stage hoists*
- *providing opportunities to operate material and personal lifts*
- *providing opportunities to calculate safe working loads for various rope types and sizes*
- *discussing criteria for selecting hoisting and rigging equipment, and provide opportunities to select and install various rigging equipment including wire, and synthetic fibre ropes*
- *discussing various knots, hitches and bends and their advantages*
- *providing opportunities to tie knots and hitches such as bowline, clove hitch, and self-centering bowline*
- *discussing the uses for spreader bars, balance beams and equalizing beams*
- *providing opportunities to use various fittings such as clips, sockets, thimbles, rings, shackles and hooks*
- *providing instruction on equipment safety inspection and proper handling and storage practices*
- *providing opportunities to use formulas to calculate breaking strength, sling tension, sling angle and working load limits for rigging equipment*

- *providing opportunities to practice communication during hoisting, lifting and rigging operations such as hand signals, electronic communications, audible/visual, and relay of signals*
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## **Welding and Cutting**

**30 hours**

- describe oxy-fuel equipment, operation, and safety concerns
- perform oxy-fuel cutting
- perform zip cutting
- describe SMAW equipment, operation, and safety concerns
- perform SMAW welding
- describe GMAW equipment, operation, and safety concerns
- perform GMAW welding

### **Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing opportunities to select and set up SMAW and GMAW welding equipment and perform flat welds*
  - *providing instruction on equipment storage and maintenance requirements*
  - *providing instruction on handling, transporting and storing cylinders*
  - *providing instruction on equipment components and maintenance such as regulator, rectifier, tips, valves and hoses*
  - *demonstrating the correct pressures and flame adjustments*
  - *identifying types of cutting flames and their applications such as oxidizing, carburizing, and neutral*
  - *providing opportunities to set up, operate and shut down oxy-fuel equipment*
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## **Introduction to Cranes**

**16 hours**

- describe types of cranes, their applications, and limitations
- interpret basic load charts
- use appropriate terminology to communicate with the crane operator

### **Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing opportunities to set up and position mobile cranes and secure work areas*
  - *providing opportunities to interpret load charts*
  - *providing opportunities to lace and reeve multi sheave rope blocks and install multi part lines on cranes*
  - *discussing types of cranes and describing their components, characteristics and applications such as hydraulic, conventional, tower, crawler, carrier mounted, rough terrain, and knuckle boom*
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## **Structural Components**

**14 hours**

- describe structural shapes and components, their characteristics and applications
- describe fastening methods relating to structural steel erection

### **Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing opportunities to interpret codes, regulations, standards and drawings associated with structural components*
- *discussing types of structural steel shapes and their characteristics such as I-beam, H-beam, angle, tee and channel*
- *discussing types of structural components and their purpose such as columns, girders, beams, trusses, joists and decking*
- *provide opportunities to use various fastening methods such as hardware and welding*

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## Reinforcing 1

20 hours

- describe the properties of reinforcing steel and concrete
- describe the forces and stresses associated with reinforced concrete
- explain reinforcing standards and identification systems
- describe the procedures used to prepare for reinforcing concrete and joining rebar
- demonstrate use of equipment and tools related to reinforcing including material accessories

### **Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing opportunities to interpret codes, regulations, and drawings associated with reinforcing*
- *explaining the forces and stresses associated with reinforced concrete such as compression, tension, shear and live and dead loads*
- *explaining standards and identification systems such as grades and diameters, mill standards, CRSI, and colour codes and tags*
- *providing opportunities to bend, cut, place, tie, and splice*
- *provide opportunities to tie wire ties in the horizontal and vertical positions*
- *providing opportunities to work with rebar, embedded plates, welded wire mesh, and composite material*
- *providing opportunities to work with accessories such as tie wires, bar supports and coupling devices*

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## Forklift Training

7 hours

- identify lift truck types and capacities
- describe lift truck safety considerations
- operate lift trucks

### **Mentors can assist the apprentice to prepare for this section of technical training by:**

- *identifying lift trucks*
- *explaining standards of lift trucks*
- *providing opportunities to operate lift trucks*

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## Ironworker Mathematics

14 hours

- calculate lineal dimensions and weights
- perform trade related conversions and comparisons with fractions, decimals, and percentages
- perform calculations and conversions with the metric and imperial systems
- calculate area, volume, and averages
- calculate the solutions to basic worksite problems

### **Mentors can assist the apprentice to prepare for this section of technical training by:**

- *having the apprentice perform calculations using basic math, algebra and formulas for trade related activities.*



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## Level Two

7 weeks

210 hours

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### Drawing Interpretation and Work Planning

38 hours

- interpret complex shop drawings
- interpret drawings
- interpret trade documents
- develop work plans

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing opportunities to interpret structural engineering and reinforcing steel drawings*
  - *providing instruction on interpretation of post-tensioning drawings*
  - *discussing types of concrete construction shown on drawings such as foundations, footings, walls, columns, slabs, and beams*
  - *providing opportunities to prepare schedules for footings, columns, beams and joists, and slabs from structural engineering drawings*
  - *providing opportunities to practice trades math such as calculating perimeter and area of squares and rectangles, triangles, circular objects, and parallelograms*
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### Reinforcing 2

45 hours

- discuss the principles of stresses and deflection in concrete
- prepare reinforcing components for assembly and placement
- fabricate reinforcing material
- demonstrate the ability to sort, cut, place and tie reinforcing steel

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *discussing the principles of stresses in concrete such as compression, tension, shear, live and dead loads and physical/mechanical bonds*
  - *discussing the basic principles of deflection to counteract the stresses of concrete*
  - *providing opportunities to make various rebar splices (chemical joints, welding) including calculation of splice lengths*
  - *providing experience working with and handling various types of rebar (steel, epoxy coated, composite)*
  - *providing opportunities to fabricate utilizing various methods such as cutting, and bending including applying colour code to identify cut lengths*
  - *providing opportunities to work various components such as curtain walls, columns, and steel mats*
  - *discuss corrective action processes like untying, removal of chairing and replacing in correct location*
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### Pre-Stressed/Post-Tensioning Systems

30 hours

- describe the purpose and effects of pre-stressed systems for manufacturing pre-cast members
- describe placement of strands and accessories
- describe pre-stressed and post-tension operations and installations
- describe prepping, stressing, grouting and finishing equipment and materials

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *discussing the terminology associated with pre-stressed/post-tensioning systems such as pre-stressed, post-tensioning, and pre-tensioning*
- *discussing the purpose and effects of pre-stressed/post-tensioning on structures*
- *providing information on bonded and unbonded applications including strand, wire and bar systems*
- *providing opportunities to work with various components such as tendons, bursting steel, anchoring devices, conduits, supports, grout and connectors*
- *discuss the benefits and applications for various anchorages such as bell, shim, and lock nut*
- *providing opportunities to conduct pre-stressed/post-tension operations and installations including de-pressurizing and removing the equipment*

- *providing opportunities to work with stressing equipment such as single/multi-strand jacks, pumps and gauges*
- *providing opportunities to work with grouting equipment such as mixer, storage hopper, screen, pump and pressure gauges*
- *providing opportunities to work with prepping equipment such as stapler, pocket formers, wedge seating tool, sheath and stripper*
- *providing opportunities to work with finishing equipment such as pocket shear, and oxy-fuel torch*
- *providing information on the properties of rebar used for various concrete applications*
- *provide opportunities to grout tendons in bonded systems including batching and mixing grout, testing grout, injecting grout, releasing trapped air and post-grouting inspection*

### **Hydraulic and Tower Cranes**

**67 hours**

- define terminology associated with cranes and lifting operations
- describe safe work practices pertaining to cranes and crane lifting operations
- interpret codes and regulations pertaining to cranes and crane lifting operations
- interpret information pertaining to crane lifting operations
- interpret load tables and charts
- explain the principle of leverage and the application to cranes
- identify the considerations for on-site crane assembly and operation

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing opportunities to assist with boom assembly and disassembly*
- *providing opportunities to assist in preparing cranes for transportation*
- *discuss load capacity reduction when the jib is fitted to the boom*
- *discuss load capacity reduction for various boom angles, radiuses and lifting positions*
- *providing information on deductions from gross capacity determine net capacity*
- *discuss safe crane set-up and operation including ground conditions (fully extended outriggers/tires), and hazards (power lines, swing hazards, blind lifts)*

### **Surveying**

**10 hours**

- demonstrate knowledge in setting up a laser level
- describe laser level safety
- demonstrate the use of a laser level

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing opportunities to set up transits to find differences in elevation relative to the same bench mark, perform reverse shot calculations, and set up and use laser levels*

### **Ironworker Mathematics**

**20 hours**

- perform conversions and comparisons using percentile, rates, ratios and proportions
- calculate angles
- apply geometric solutions to trade problems

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *having the apprentice perform calculations using basic math, algebra and formulas for trade related activities.*

**Consider apprenticeship training as an investment in the future of your company and in the future of your workforce. Ultimately, skilled and certified workers increase your bottom line.**

**Get involved in the apprenticeship training system. Your commitment to training helps to maintain the integrity of the trade.**

**Do you have employees who have been working in the trade for a number of years but don't have trade certification?**

**Contact your local apprenticeship office for details on how they might obtain the certification they need.**

### **Saskatchewan Apprenticeship & Trade Certification Commission**

2140 Hamilton St Regina SK S4P 2E3

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Fax: (306) 787-5105

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### **District Offices**

Estevan (306) 637-4930

La Ronge (306) 425-4385

Moose Jaw (306) 694-3735

North Battleford (306) 446-7409

Prince Albert (306) 953-2632

Saskatoon (306) 933-8476

Swift Current (306) 778-8945

Yorkton (306) 786-1394

