



Ironworker (Reinforcing) Guide to Course Content

2023

Online: www.saskapprenticeship.ca

Recognition:

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

A complete version of the Occupational Standard can be found at www.red-seal.ca.



STRUCTURE OF THE GUIDE TO COURSE CONTENT

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.

Training Profile Chart: a chart which outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training.

Technical Training Course Content for the Ironworker (Reinforcing) trade: a chart which outlines the model for SATCC technical training sequencing. For the harmonized level of training, a cross reference to the Harmonized apprenticeship technical training sequencing, at the learning outcome level, is provided.

Appendix A: Post Harmonization Training Profile Chart: a chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

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:

Level One: 7 weeks
 Level Two: 7 weeks

The information contained in this pamphlet serves as a guide for employers and apprentices. The pamphlet briefly summarizes the training delivered at each level of apprenticeship training. An apprentice spends approximately 15% of the apprenticeship term in a technical training institute learning the technical and theoretical aspects of the trade. The hours and percentages of technical and practical training may vary according to class needs and progress.

The content of the technical 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 journey person 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 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 Level ^❶	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: http://www.curriculum.gov.sk.ca/#</p> <p>Individuals not meeting the entrance requirements will be subject to an assessment and any required training.</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.

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.

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.

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.

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.

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.

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.

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.

DIGITAL TECHNOLOGY

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

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.

Due to the low number of Ironworker Reinforcing apprentices, implementation for harmonization has not been exercised, however, the technical training curriculum materials have been developed.

White boxes are “Topics” , grey boxes are “In-Context”. In-context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in-context topics are accomplished in other topics in that level.

Level 1	Level 2
Safety Awareness	
Tools and Equipment	
Access Equipment	
Hoisting, Lifting and Rigging	Hoisting, Lifting and Rigging
Communication and Trade Documentation	
Welding I	
Oxy-fuel Cutting	
	Work Planning
Structural Components	
Drawings	Drawings
Reinforcing	Reinforcing
Introduction to Cranes	Cranes
Pre-Stressed/Post-Tensioning Systems	Pre-Stressed/Post-Tensioning Systems

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

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

B – Rigging and Hoisting

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

C – Cranes

Task C-7 Selects, assembles and erects cranes and components.	7.01 Assesses crane site limitations.	7.02 Determines crane position.	7.03 Erects cranes and components.
	2	2	2
Task C-8 Disassembles cranes.	8.01 Disassembles crane components.	8.02 Prepare crane and components for transport.	
	2	2	

D – Reinforcing

Task D-9 Fabricates on-site.	9.01 Cuts material.	9.02 Bends material.	
	1, 2	1, 2	
Task D-10 Installs reinforcing material.	10.01 Places reinforcing material.	10.02 Ties material.	10.03 Joins material.
	1, 2	1, 2	1, 2

E – Pre-Stresses/Post-Tensions

Task D-11 Places pre-stressed/post-tensioning systems.	11.01 Lays out profile.	11.02 Places tendons and accessories.	11.03 Installs bursting steel and anchorages.	11.04 Connects tendons to anchors	11.05 Protects exposed tendons.
	1, 2	1, 2	1, 2	1, 2	1, 2
Task D-12 Installs reinforcing material.	12.01 Sets up stressing equipment.	12.02 Tensions tendons.	12.03 Cuts and caps tendons.	12.04 Removes stressing equipment.	12.05 De-stresses tendons.
	1, 2	1, 2	1, 2	1, 2	1, 2
Task D-13 Grouts tendons.	13.01 Sets up grouting equipment.	13.02 Installs grouts.			
	1, 2	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
		210

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
		210

TECHNICAL TRAINING COURSE CONTENT

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing. For the harmonized level of training, a cross reference to the Red Seal National Occupational Analysis (NOA) apprenticeship technical training sequencing, at the learning outcome level, is provided.

The Red Seal Ironworker (Reinforcing) Curriculum Outline, which provides additional detail of the Harmonized technical training, can be found at www.red-seal.ca.

Level One	7 weeks	210 hours
Safety Awareness and Access Equipment		14 hours
<ul style="list-style-type: none">• discuss industry and government regulatory requirements pertaining to safety• describe Personal Protective Equipment (PPE) requirements and use• describe the use of ladders, scaffolding, and aerial lifts• discuss fall protection, fall arrest, confined space, and tag out/lockout procedures		
NOA topics covered in this section of training:		
A-3 Uses and maintains tools and equipment		
A-3.08 Uses personal protective equipment (PPE)		
<ul style="list-style-type: none">• types and uses of PPE such as hard hats, safety glasses, hearing protection, high-visibility clothing, welding PPE, safety footwear and fall arrest equipment• PPE safety• manufacturers recommended uses, limitations and maintenance of PPE• workplace rules and regulations• select PPE for conditions encountered• uses fall protection equipment such as harnesses, safety belts (double D rings), belly/work positioning hooks and safety lines• identifies damaged, worn or otherwise unsafe PPE• stores PPE		
A-4 Organizes work		
A-4.03 Maintains safe work environment		
<ul style="list-style-type: none">• safety regulations• building codes• applications of safety equipment such as fall arrest, fall restraint and work positioning• safe work practices and limitations• applies safety standards applicable to workplace• installs safety equipment such as guardrails, static lines, lifelines, screens, temporary flooring, warning signs and barriers• maintains good housekeeping		
A-4.04 Assesses site hazards.		
<ul style="list-style-type: none">• policies and procedures• codes and regulations• recognize hazards such as floor openings, leading edges, and obstructions, temporary supports, dowels, and chemical/corrosive/UV environments• controls hazards• performs and documents a Job Hazard analysis (JHA) or a task hazard analysis (THA)		

Communication and Trade Documentation

21 hours

- demonstrate effective communication practices
- demonstrate the procedures used to prepare and complete trade documentation
- identify job site barriers and signage requirements
- describe requirements of team members
- demonstrate appropriate means to offer and accept criticism

NOA topics covered in this section of training:

A-2 Communicates in the workplace

A-2.01 Communicates with co-workers

- types of communication
- interpersonal communication techniques
- trade vocabulary
- barriers to communication
- writes clearly and concisely
- actively listens
- confirms understanding

A-2.02 Communicates with others

- job-related terminology
- report formats
- actively listens
- translates technical terms into layperson language
- addresses others' concerns
- writes reports in prescribed formats
- confirms understanding

A-2.03 Communicates with apprentices

- capability of apprentice
- listens, teaches, coaches and mentors
- supervises
- assesses and records ongoing progress

A-2.04 Uses hand signals

- types of signs such as crane signals
- hand signals
- explaining signal terminology
- using correct signals
- interpreting signals
- selecting signals for type of equipment

A-2.05 Communicates electronically

- types of electronic communication devices such as cellular/smart phones, two-way radios, and lap-top computers and tablets
- protocols and company reporting policies
- operates electronic communication devices
- sends, receives and retrieves information from computers
- communicates through two-way radios and cellular phones

A-4 Organizes work

A-4.01 Organizes materials and supplies

- placing and assembly
- equipment capabilities and limitations
- site preparation
- shipping documentation
- storage principles
- types of materials and their identification requirements

- schedules material and supplies required for job
- unloads materials
- places and sorts materials and supplies
- reconciles load with shipping documents
- secures equipment and materials

A-4.05 Plans work tasks

- procedures, specifications and drawings
- interprets specifications and drawings
- improvises to suit site conditions
- maintains schedule
- selects materials and supplies required for task
- selects equipment and tools required for task

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

NOA topics covered in this section of training:

D-10 Places reinforcing material

- interprets placing drawings
- reinforcing material such as rebar, welded wire mesh fabric and composite materials
- installation sequencing such as laying out and placing ties and supports
- pre-assembly and pre-fabrication procedures
- applies manual and mechanical lifting and carrying techniques
- places material within tolerances
- applies covers as per specifications

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

NOA topics covered in this section of training:

A-3 Uses and maintains tools and equipment

A-3.01 Uses hand tools and measuring equipment

- types and uses of hand tools
- hand tool safety
- manufacturers' specifications on the use and care of hand tools
- types of measuring equipment
- selects hand tools required for a task
- identifies damaged, worn or otherwise unsafe hand tools
- cleans and stores hand tools
- maintains hand tools

A-3.02 Uses surveying equipment

- types of layout instruments such as theodolite, transit, scales, laser level and builders level
- measurement techniques
- blueprint interpretation
- marking techniques
- selects equipment for a task
- calculates angles and distances

- transfers blueprint information to site
- sets up and check calibration of equipment
- stores surveying equipment

A-3.03 Uses power tools

- types and uses of power tools such as pneumatic, electric, gas powered and hydraulic
- power tool components
- operating procedures for power tools
- power tool safety
- uses manufacturers recommended uses, limitations and maintenance of power tools
- power tools required for a task
- identifies damaged, worn or otherwise unsafe power tools
- cleans and stores power tools
- maintains power tools

A-3.04 Uses bending tools and equipment

- types and uses of bending equipment
- uses manufacturers recommended uses and limitations
- potential hazards and safety issues
- selects bending equipment
- sets up and check calibration of bending equipment
- identifies damaged, worn or otherwise unsafe bending equipment

A-3.09 Uses welding equipment

- provincial/territorial and applicable welding regulations
- Canadian Welding Bureau (CWB) standards and Canadian Standards Association (CSA)
- welding processes and procedures
- welding symbols
- welding hazards
- welding equipment
- welding consumables
- welding defects
- sets up welding equipment
- performs welding processes
- adjusts welding parameters to suit site conditions
- identifies damaged, worn or otherwise unsafe welding equipment
- stores welding equipment

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

NOA topics covered in this section of training:

A-2 Communicates in the workplace

A-2.04 Uses hand signals

- types of signs such as crane signals
- hand signals
- explaining signal terminology
- using correct signals
- interpreting signals
- selecting signals for type of equipment

B-5 Selects rigging equipment

B-5.01 Matches load to lift capacity

- lifting equipment
- capacity of lifting equipment
- basic geometry
- weights and measures
- calculating weights of loads
- selecting rigging equipment
- calculating choker tension based on choker angle and load

B-5.02 Inspects rigging equipment

- types of rigging equipment
- manufacturers' specifications
- policies and procedures
- tools and materials
- identifying defects and damage
- reporting defects and damage

B-5.03 Maintains rigging equipment

- types of rigging equipment
- manufacturers' specifications
- policies and procedures
- tools and materials
- performing maintenance procedures
- storing rigging equipment

B-6 Uses hoisting and lifting equipment

B-6.01 Uses hoisting equipment

- provincial/territorial and applicable regulations and certification requirements
- types of hoisting equipment such as come-alongs, Talfors®, chain block hoists, tuggers and derricks
- anchorage locations and capabilities
- policies and procedures
- selecting hoisting equipment
- selecting anchorage locations
- following manufacturers' specifications
- participating in engineered (critical) lifts

B-6.02 Uses lifting equipment

- types of lifting equipment such as hydraulic jacks, fork lifts and air pallets
- policies and procedures
- selecting lifting equipment
- following manufacturers' specifications and recommendations

B-6.03 Attaches rigging to load.

- hoisting procedures such as engineer's plan, multi-member and tandem lift
- placement and attachment location
- hoisting specifications
- following lifting procedures
- using and tying knots, bends and hitches
- following rigging procedures using rigging equipment

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

NOA topics covered in this section of training:

A-3 Uses and maintains tools and equipment

A-3.09 Uses welding equipment

- provincial/territorial and applicable welding regulations
- Canadian Welding Bureau (CWB) standards and Canadian Standards Association (CSA)
- welding processes and procedures
- welding symbols
- welding hazards
- welding equipment
- welding consumables
- welding defects
- sets up welding equipment
- performs welding processes
- adjusts welding parameters to suit site conditions
- identifies damaged, worn or otherwise unsafe welding equipment
- stores welding equipment

A-3.10 Uses oxy-fuel cutting equipment

- cutting processes
- cutting equipment
- cutting consumables
- sets up equipment
- inspects equipment
- adjusts cutting parameters
- recognizes cutting hazards
- identifies damaged, worn or otherwise unsafe cutting equipment
- stores cutting equipment and consumables

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

NOA topics covered in this section of training:

C-7 Selects, assembles, and erects cranes and components

C-7.01 Assesses crane site limitations

- types of hazards such as overhead power lines, underground services, ground conditions, other workers and obstructions to swing radius
- swing area (radius) of crane
- crane limitations due to inclement weather
- calculating crane radius
- identifying potential hazards
- reading load charts
- minimizing overhead dangers

C-7.02 Determines crane position

- crane types
- crane capacity
- crane radius
- maximum weight of lifts
- crane limitations due to inclement weather

- determining weights of components
- calculating the available headroom
- selecting crane for required task

7.03 Erects cranes and components

- sequence of assembly
- crane components such as boom sections, counterweights and jibs
- crane signals
- tools used in assembly of cranes components
- safe rigging practices
- ensures adequate space for assembly
- installs components
- reeve/lace blocks
- participates in engineered (critical) lifts

C-8 Disassembles cranes

8.01 Disassembles crane components

- method of disassembly
- sequence of disassembly
- equipment and tools required for task
- rigging
- recognizes hazards of disassembly such as tensioned pins and overloads
- disconnects components
- rigs crane components
- blocks boom sections

8.02 Prepare crane and components for transport

- safe rigging practices
- jurisdictional transportation regulations
- selects type of rigging
- places and secures components on transportation deck

Structural Components

14 hours

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

NOA topics covered in this section of training:

A-Organizes work

A-4.02 Marks layouts

- drawings
- interprets drawings
- uses measuring devices and layout tools
- applies marking and layout techniques
- visualizes finished product
- transfers drawing information to accommodate site conditions

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

NOA topics covered in this section of training:

D-9 Fabricates on site

D-9.01 Cuts material

- reinforcing material such as rebar, welded wire mesh fabric and composite materials
- material specifications
- cutting techniques
- measures and marks material for cutting
- uses cutting equipment

D-9.02 Bends material

- reinforcing material such as rebar and welded wire mesh fabric
- material specifications
- bending techniques
- measures and marks material for bending
- maintains bend standards

D-10 Installs reinforcing material

D-10.01 Places reinforcing material

- reinforcing material such as rebar, welded wire mesh fabric and composite materials
- installation sequencing such as laying out and placing ties and supports
- pre-assembly and pre-fabrication procedures
- applies manual and mechanical lifting and carrying techniques
- places material within tolerances
- applies covers as per specifications

D-10.02 Ties material

- types of wire ties such as figure-8, snap tie and saddle tie
- tying specifications
- tying tools and equipment
- tying sequence
- selects wire type and gauge depending on application
- ties variety of ties such as figure-8, snap tie and double wire tie depending on the application

D-10.03 Joins material

- CSA and applicable welding regulations
- welding techniques
- splicing techniques
- mechanical splicing and coupling techniques
- specialty anchoring systems and their installation
- selects joining tools and equipment
- operates joining tools and equipment

Forklift Training

7 hours

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

NOA topics covered in this section of training:

- This section of training exceeds the minimum sequencing as set out in the Ironworker (Reinforcing) NOA.

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

NOA topics covered in this section of training:

- This section of training exceeds the minimum sequencing as set out in the Ironworker (Reinforcing) NOA
-

Level One topics from the NOA that are taught in-context:

Interprets occupational documentation

Communicates in the workplace

Selects rigging equipment

Uses hoisting and lifting equipment

Selects, assembles, and erects cranes and components

Places pre-stressed/post-tensioning systems

Stresses Tendons

Grouts tendons

For details regarding the In-Context Topic, see pages 27-30

Level Two

7 weeks

210 hours

Drawing Interpretation and Work Planning

38 hours

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

NOA topics covered in this section of training:

A-4 Organizes work

4.01 Organizes materials and supplies

- placing and assembly
- equipment capabilities and limitations
- site preparation
- shipping documentation
- storage principles
- types of materials and their identification requirements
- schedules material and supplies required for job
- unloads materials
- places and sort materials and supplies
- reconciles load with shipping documents
- secures equipment and materials

4.05 Plans work tasks

- procedures, specifications and drawings
- interprets specifications and drawings
- improvises to suit site conditions
- maintains schedule
- selects materials and supplies required for task
- selects equipment and tools required for task

D-10 Installs reinforcing material

10.01 Interprets placing drawings

- reinforcing material such as rebar, welded wire mesh fabric and composite materials
- installation sequencing such as laying out and placing ties and supports
- pre-assembly and pre-fabrication procedures
- applies manual and mechanical lifting and carrying techniques
- places material within tolerances
- applies covers as per specifications

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

NOA topics covered in this section of training:

D-9 Fabricates on site

D-9.01 Cuts material

- reinforcing material such as rebar, welded wire mesh fabric and composite materials
- material specifications
- cutting techniques
- measures and marks material for cutting
- uses cutting equipment

D-9.02 Bends material

- reinforcing material such as rebar and welded wire mesh fabric
- material specifications
- bending techniques
- measures and marks material for bending
- maintains bend standards

D-10 Installs reinforcing material

D-10.01 Places reinforcing material

- reinforcing material such as rebar, welded wire mesh fabric and composite materials
- installation sequencing such as laying out and placing ties and supports
- pre-assembly and pre-fabrication procedures
- applies manual and mechanical lifting and carrying techniques
- places material within tolerances
- applies covers as per specifications

D-10.02 Ties material

- types of wire ties such as figure-8, snap tie and saddle tie
- tying specifications
- tying tools and equipment
- tying sequence
- selects wire type and gauge depending on application
- ties variety of ties such as figure-8, snap tie and double wire tie depending on the application

D-10.03 Joins material

- CSA and applicable welding regulations
- welding techniques
- splicing techniques
- mechanical splicing and coupling techniques
- specialty anchoring systems and their installation
- selects joining tools and equipment

- operates joining tools and equipment

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

NOA topics covered in this section of training:

E-11 Places pre-stressed/post-tensioning systems.

E-11.01 Lays out profile

- pre-stressed/post-tensioning systems such as bonded, and un-bonded, mono-strand and multi-strand
- pre-stressed/post-tensioning materials such as duct, strand, bar and anchors
- pre-stressed/post-tensioning installation practices
- placement tolerances of tendons, anchors and supports
- benchmarks and elevations
- lays out anchorage and tendon position

E-11.02 Places tendons and accessories

- types of pre-stressed/post-tensioning systems such as bonded, and un-bonded, mono-strand and multi-strand
- pre-stressed/post-tensioning materials such as strand, bar and anchors
- pre-stressed/post-tensioning installation and storage practices
- pre-stressed/post-tensioning installation sequences tolerances
- positions tendons and accessories
- secures tendons and accessories
- recognizes and repair damage to ducts and tendons

E-11.03 Installs bursting steel and anchorages

- types of bursting steel
- types of anchorages
- types of components such as blocks, wedges, anchors and coils bursting steel and anchorage installation procedures and placing tolerances
- places, modifies and ties bursting steel
- installs anchorages

E-11.04 Connects tendons to anchors

- types of anchors such as barrel (trumpet) and cable
- types of tendons
- tendon and anchor connection procedures
- fastening techniques
- installs anchors
- secures wedges

E-11.05 Protects exposed tendons

- tendon protection materials such as duct tape, heat shrink and grease/caulking
- protection techniques
- potential contaminants
- selects tendon protection material
- identifies and correct faults
- installs tendon protection materials

E-12 Stresses Tendons

E-12.01 Sets up stressing equipment

- types of stressing equipment
- stressing sequence
- limitations of equipment



- power supplies
 - positions equipment
 - connects components
 - inspects equipment
- E-12.02 Tensions tendons
- stressing sequence and procedures
 - standards and specifications of stressing equipment
 - potential deficiencies of tendons
 - tolerance
 - tendon locking methods
 - connects stressing equipment to tendons
 - operates stressing equipment
 - documents elongation and gauge reading
- E-12.03 Cuts and caps tendons
- standards and procedures
 - cutting methods
 - capping methods
 - operates cutting equipment
 - secures caps to anchors
- E-12.04 Removes stressing equipment
- dismantling and disconnecting procedures
 - storage procedures
 - methods of disconnecting equipment from tendons
 - troubleshoots hung up jack
 - disconnects equipment from tendons
 - cleans and maintains equipment
 - stores equipment
- E-12.05 De-stresses tendons
- engineered procedures and specifications
 - methods of restricting access to work zones
 - possible structure failure during de-stressing procedure
 - identifies and rectifies potential hazards such as equipment failure, material failure and danger zones
- E-13 Grouts tendons**
- E-13.01 Sets up grouting equipment
- types of grouting equipment
 - grouting procedures
 - equipment inspection procedures
 - types of testing equipment
 - material storage procedures
 - organizes material and equipment
 - cleans and maintains equipment
 - troubleshoots grouting systems
 - tests systems and equipment
- E-13.02 Installs grout
- grouting procedures
 - measuring quantities and ratios
 - types of grouting equipment
 - environmental concerns of grouting
 - sequence of mixing
 - cleaning and maintaining procedures
 - identifies and rectifies obstructions in ducts and hoses
 - operates grouting equipment



- maintains grouting equipment
- uses precision instruments to set machines

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

NOA topics covered in this section of training:

C-7 Selects, assembles, and erects cranes and components

C-7.01 Assesses crane site limitations

- types of hazards such as overhead power lines, underground services, ground conditions, other workers and obstructions to swing radius
- swing area (radius) of crane
- crane limitations due to inclement weather
- calculating crane radius
- identifying potential hazards
- reading load charts
- minimizing overhead dangers

C-7.02 Determines crane position

- crane types
- crane capacity
- crane radius
- maximum weight of lifts
- crane limitations due to inclement weather
- determining weights of components
- calculating the available headroom
- selecting crane for required task

C-7.03 Erects cranes and components

- sequence of assembly
- crane components such as boom sections, counterweights and jibs
- crane signals
- tools used in assembly of cranes components
- safe rigging practices
- ensures adequate space for assembly
- installs components
- reeve/lace blocks
- participates in engineered (critical) lifts

C-8 Disassembles cranes

C-8.01 Disassembles crane components

- method of disassembly
- sequence of disassembly
- equipment and tools required for task
- rigging
- recognizes hazards of disassembly such as tensioned pins and overloads
- disconnects components
- rigs crane components
- blocks boom sections

C-8.02 Prepare crane and components for transport

- safe rigging practices
- jurisdictional transportation regulations
- selects type of rigging
- places and secures components on transportation deck

Surveying

10 hours

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

NOA topics covered in this section of training:

A-Uses and maintains tools and equipment

A-3.02 Uses surveying equipment

- types of layout instruments such as theodolite, transit, scales, laser level and builder's level
- measurement techniques
- blueprint interpretation
- marking techniques
- selects equipment for a task
- calculates angles and distances
- transfers blueprint information to site
- sets up and check calibration of equipment
- stores surveying equipment

Ironworker Mathematics

20 hours

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

NOA topics covered in this section of training:

- This section of training exceeds the minimum sequencing as set out in the Ironworker (Reinforcing) NOA.

Level Two topics from the NOA that are taught in-context:

Interprets occupational documentation

Communicates in the workplace

Selects rigging equipment

Uses hoisting and lifting equipment

Selects, assembles, and erects cranes and components

Places prestressed/posttensioning systems

Stresses Tendons

Grouts tendons

For details regarding the In-Context Topics, see pages 27-30.

In-Context Topics

In-context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in-context topics are accomplished in other topics in that level.

A - Occupational Skills

A-1 Interprets occupational documentation

1.01 Interprets placing drawings

- types of drawings and their applications
- procedures used to interpret and extract information from drawings

A-2 Communicates in the workplace

2.04 Uses hand signals

- types of signs such as crane signals
- hand signals
- explaining signal terminology
- using correct signals
- interpreting signals
- selecting signals for type of equipment

B-Rigging and hoisting

B-5 Selects rigging equipment

B-5.01 Matches load to lift capacity

- lifting equipment
- capacity of lifting equipment
- basic geometry
- weights and measures
- calculating weights of loads
- selecting rigging equipment
- calculating choker tension based on choker angle and load

B-5.02 Inspects rigging equipment

- types of rigging equipment
- manufacturers' specifications
- policies and procedures
- tools and materials
- identifying defects and damage
- reporting defects and damage

B-5.03 Maintains rigging equipment

- types of rigging equipment
- manufacturers' specifications
- policies and procedures
- tools and materials
- performing maintenance procedures
- storing rigging equipment

B-6 Uses hoisting and lifting equipment

B-6.01 Uses hoisting equipment

- provincial/territorial and applicable regulations and certification requirements
- types of hoisting equipment such as come-alongs, Talfors®, chain block hoists, tuggers and derricks
- anchorage locations and capabilities
- policies and procedures
- selecting hoisting equipment
- selecting anchorage locations

- following manufacturers' specifications
- participating in engineered (critical) lifts

B-6.02 Uses lifting equipment

- types of lifting equipment such as hydraulic jacks, fork lifts and air pallets
- policies and procedures
- selecting lifting equipment
- following manufacturers' specifications and recommendations

B-6.03 Attaches rigging to load

- hoisting procedures such as engineer's plan, multi-member and tandem lift
- placement and attachment location
- hoisting specifications
- following lifting procedures
- using and tying knots, bends and hitches
- following rigging procedures
- using rigging equipment

C - Cranes

C-7 Selects, assembles, and erects cranes and components

C-7.01 Assesses crane site limitations

- types of hazards such as overhead power lines, underground services, ground conditions, other workers and obstructions to swing radius
- swing area (radius) of crane
- crane limitations due to inclement weather
- calculating crane radius
- identifying potential hazards
- reading load charts
- minimizing overhead dangers

C-7.02 Determines crane position

- crane types
- crane capacity
- crane radius
- maximum weight of lifts
- crane limitations due to inclement weather
- determining weights of components
- calculating the available headroom
- selecting crane for required task

E - Pre-stresses/post-tensions

E-11 Places pre-stressed/post-tensioning systems

E-11.01 Lays out profile

- types of pre-stressed/post-tensioning systems such as bonded, and un-bonded, mono-strand and multi-strand
- pre-stressed/post-tensioning materials such as duct, strand, bar and anchors
- pre-stressed/post-tensioning installation practices
- placement tolerances of tendons, anchors and supports
- benchmarks and elevations
- lay out anchorage and tendon position

E-11.02 Places tendons and accessories

- types of pre-stressed/post-tensioning systems such as bonded, and un-bonded, mono-strand and multi-strand
- stressed/post-tensioning materials such as strand, bar and anchors
- pre-stressed/post-tensioning installation and storage practices
- pre-stressed/post-tensioning installation sequences

- tolerances
- position tendons and accessories
- secure tendons and accessories
- recognize and repair damage to ducts and tendons
- operate winching equipment

E-11.03 Installs bursting steel and anchorages

- types of bursting steel
- types of anchorages
- types of components such as blocks, wedges, anchors and coils
- bursting steel and anchorage installation procedures and placing tolerances
- place, modify and tie bursting steel
- install anchorages

E-11.04 Connects tendons to anchors

- types of anchors such as barrel (trumpet) and cable
- types of tendons
- tendon and anchor connection procedures
- fastening techniques
- install anchors
- secure wedges

E-11.05 Protects exposed tendons

- tendon protection materials such as duct tape, heat shrink and grease/caulking
- protection techniques
- potential contaminants
- select tendon protection material
- identify and correct faults
- install tendon protection materials

E-12 Stresses Tendons

E-12.01 Sets up stressing equipment

- types of stressing equipment
- stressing sequence
- limitations of equipment
- power supplies
- positions equipment
- connects components
- inspects equipment

E-12.02 Tensions tendons

- stressing sequence and procedures
- standards and specifications of stressing equipment
- potential deficiencies of tendons
- tolerance
- tendon locking methods
- connect stressing equipment to tendons
- operate stressing equipment
- document elongation and gauge reading

E-12.03 Cuts and caps tendons

- standards and procedures
- cutting methods
- capping methods
- operate cutting equipment
- secure caps to anchor

E-12.04 Removes stressing equipment

- dismantling and disconnecting procedures



- storage procedures
- methods of disconnecting equipment from tendons
- troubleshoot hung up jack
- disconnect equipment from tendons
- clean and maintain equipment
- store equipment

E-12.05 De-stresses tendons

- engineered procedures and specifications
- methods of restricting access to work zones
- possible structure failure during de-stressing procedure
- identify and rectify potential hazards such as equipment failure, material failure and danger zones

E-13 Grouts tendons

E-13.01 Sets up grouting equipment

- types of grouting equipment
- grouting procedures
- equipment inspection procedures
- types of testing equipment
- material storage procedures
- organize material and equipment
- clean and maintain equipment
- troubleshoot grouting systems
- test systems and equipment

E-13.02 Installs grout

- grouting procedures
 - measuring quantities and ratios
 - types of grouting equipment
 - environmental concerns of grouting
 - sequence of mixing
 - cleaning and maintaining procedures
 - identify and rectify obstructions in ducts and hoses
 - operate grouting equipment
 - maintain grouting equipment
 - use precision instruments to set machines
-

APPENDIX A: POST HARMONIZATION TRAINING PROFILE CHART

This chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

SATCC Level One	Transcript Code	Hours	Pan-Canadian Harmonized Level One
Safety Awareness and Access Equipment	SFTY 137	14	Safety Awareness
			Access Equipment
Tools and Equipment	EQPT 175	14	Tools and Equipment
Rigging for Ironworkers	RIGG 122	25	Hoisting, Lifting and Rigging
Fork Lift Training	MATE 101	7	
Communication and Trade Documentation	COM 112	21	Communication and Trade Documentation
Welding and Cutting	WLDR 129	30	Cutting
			Oxy-fuel Cutting
			Welding I
Structural Components	STRU 102	14	Structural Components
Drawing Interpretation and Work Plan	BPRT 106	35	Drawings
Reinforcing I	STRU 103	20	Reinforcing
			Pre-Stressed/Post-Tensioning Systems
Introduction to Cranes	EQPT 174	16	Introduction to Cranes
Ironworker Mathematics (Exceeds)	MATH 137	14	
		210	

SATCC Level Two	Transcript Code	Hours	Pan-Canadian Harmonized Level Two
Hydraulic Tower Cranes	EQPT 205	67	Cranes
			Hoisting, Lifting and Rigging
Drawing Interpretation and Work Planning	BPRT 203	38	Drawings
			Work Planning
Surveying	SRVY 207	10	
Reinforcing II (Reinforcing)	STRU 206	45	Reinforcing
Pre-stressed Post-tensioning Systems	STRU 207	30	Pre-Stressed/Post Tensioning Systems
Ironworker Mathematics (Exceeds)	MATH 202	20	
		210	

Exceed Topics

Throughout this guide to course content there are topics which exceed the minimum scope of work as set out in the 2015 Ironworker (Reinforcing) NOA. Industry in Saskatchewan has deemed certain topics to fall within the scope of work of the Ironworker (Reinforcing) trade in Saskatchewan and therefore require technical training to cover these topics.