Ironworker (Reinforcing)
On-the-Job Training Guide

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.

Training Requirements: 3600 hours (2 years) including: two 7 week training sessions delivered by Saskatchewan Polytechnic in Moose Jaw.

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

The information contained in this pamphlet 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. This pamphlet summarizes the tasks to be covered by the apprentice during the on-the-job portion of apprenticeship training. An apprentice spends approximately 85% of the apprenticeship term training on-the-job.

It is the employer's or journeyperson's training 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.

Below, in-school instruction is listed first; 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.

Level One

Safety Awareness
Safety equipment
Safe work practices
Regulatory requirements

The employer can assist the apprentice to prepare for this section of technical training by:
- *providing opportunities to learn and apply safety regulations/company policies such as fall protection, use of safeguards, WHMIS and proper PPE*
- *providing opportunities to identify hazards and apply safe work practices such as lock out/tag out, confined space procedures, and good house keeping*
- *identifying and describing the safe use of fall protection systems including correct fit, vertical and horizontal lifelines and inspection/maintenance requirements*

Tools and Equipment
Applications and maintenance
Procedures for use

The employer can assist the apprentice to prepare for this section of technical training by:
- *providing opportunities to use hand and power tools safely including*
  - *measurement, layout and alignment tools*
  - *squaring and marking tools*
  - *heating, cutting, and bending tools*
  - *punching, boring, and drilling tools*
  - *securing and assembly tools*
  - *prying and dismantling tools*
  - *clamping tools*
  - *grinding tools*
- *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*

Communication and Trade Documentation
Effective communication practices
Trade documentation
Drawings and their applications
Interpretation and extraction of information
Hand signals

The employer can assist the apprentice to prepare for this section of technical training by:
- *providing opportunities to interpret trade documentation such as codes/standards, manuals, and drawings*
- *identifying the types and applications of drawings such as architectural, mechanical, and structural*
- *identifying the types of drawing projections and views used at the job site such as perspective, isometric, oblique, section, auxiliary and orthographic drawings*
- *providing opportunities to prepare and complete trade/job related documentation*
- *providing opportunities to give direction by using hand signals*
- *identify job site barriers and signage requirements such as tapes (yellow/red), fences, and 'men working above" signs*

Work Planning
Job planning
Material/equipment selection

The employer 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*

Cutting

Oxy-fuel equipment and accessories
Oxy-fuel cutting

The employer can assist the apprentice to prepare for this section of technical training by:

- *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*

Introduction to Welding

SMAW equipment and accessories
SMAW welding processes
Basic GMAW equipment and processes

The employer 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*

Access Equipment

Ladders/scaffolding
Aerial work platforms

The employer 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*

Hoisting, Lifting and Rigging

Equipment applications and limitations
Factors in selecting rigging equipment
Calculate basic safe working loads, sling tension/angle and breaking strength
Basic Load weight calculations

The employer can assist the apprentice to prepare for this section of technical training by:

- *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*

Introduction to Cranes
Applications and limitations
Lifting operations

The employer 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*

Structural Components
Characteristics and applications
Fastening methods
Falsework

The employer 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*

Reinforcing
Reinforcing materials and accessories
Reinforcing concrete

The employer 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*

Level Two

Drawing Interpretation and Trade Mathematics
Structural engineering and reinforcing steel drawings
Post-tensioning drawings
Ratios, proportions, slopes, percentages, area and volume math
Calculate advanced safe working loads, sling tension/angle and breaking strength
Advanced load weight calculations

The employer 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*

Rebar II
Fabrication of reinforcing material
Installation of reinforcing material

The employer 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*

Pre-Stressed/Post-Tensioning Systems
Systems and their components
Placing pre-stressed/post-tensioning systems
Stressing/post-tensioning systems
Grouting

The employer 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 Conventional Cranes
Components and accessories
Erection, set-up and disassembly

The employer 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
Tool use such as builders and laser levels

The employer 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*

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
Tel: (306) 787-2444
Fax: (306) 787-5105
Toll Free: 1-877-363-0536
web site: www.saskapprenticeship.ca

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