Metal Fabricator (FITTER)  
A Guide to Course Content

*Metal Fabricators (FITTER) layout, fabricate, cut and assemble structural steel, plate and miscellaneous metals.*

**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 5400 hours and at least 3 years in the trade.

There are three levels of technical training delivered at Saskatchewan Polytechnic in Saskatoon:

- **Level One:** 8 weeks
- **Level Two:** 8 weeks
- **Level Three:** 8 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.
Level One - 8 weeks

Safety and Access Structures
- practicing and promoting safety in the workplace
- safety legislation
- scaffolds, walkways and ladders
- confined space entry procedures

Tools and Equipment
- measuring, layout and benchwork tools
- assembly tools
- metal working equipment - band saw, ironworker, press brake
- stationary and portable grinders and sanders
- drilling, deburring, tapping and threading procedures
- introduction to CNC equipment

Metallurgy and Material Designations
- milling of iron and steel and steel processing
- structural shapes and hollow structural sections
- plate and sheet metal
- pipe fittings
- industrial fasteners
- properties of metals
- chemical composition of steels
- storage and handling procedures

Rigging and Overhead Cranes
- OH&S Regulations
- types of cranes and establishing crane capability
- crane controls, operation, maintenance and log book
- effective site evaluation
- crane signaling
- load estimating
- use of jacks and equipment aids
- rigging equipment
- ropes and knots

Print Reading and Drafting
- shop drawing development
- drawing interpretation
- material calculations
- welding symbol interpretation
- joint preparations

Layout, Fitting and Fabrication
- geometric constructions
- two dimensional templates
- uses and advantages of jigs
- bend set templates
- sweep templates
- grid and flange layouts
- determining plumb and level
Oxy-fuel and Plasma Arc Cutting
- oxy-fuel and plasma arc safety, equipment and consumables
- 90° and bevel cuts using manual oxy-fuel equipment
- cutting structural shapes
- motorized cutting carriages
- cutting plate using plasma arc cutting equipment
- cutting plate using CNC plasma arc cutting equipment

SMAW and GMAW Welding and Tacking
- fundamentals of electrical theory
- design and operation of SMAW and GMAW power sources and equipment
- tack welding specified joints using SMAW and GMAW
- welding in the flat and horizontal positions using GMAW

Mathematics for Fabricator 1
- metric units
- basic arithmetic functions in the Metric and Imperial systems
- equation fundamentals

Level Two - 8 weeks

Fabrication Safety
- selection of personal protection equipment
- fall protection procedures
- accident prevention awareness
- OH&S regulations and reporting forms
- additional safety organizations and their functions

Drawing Interpretation
- interpretation of miscellaneous fabrication and framed structural member drawings
- interpretation of tank drawings
- interpretation of structural drawings

Metallurgy and Material Designations
- metal identification tests
- effects of physical properties on fabrication practices
- heat treatment, heat straightening and distortion control
- evaluating weldability
- effects of hot and cold metal working
- CSA Code G40.21 and G40.21-M; ASTM vs. CSA plate designations
- mesh, perforated sheets, grating and hollow sections
- structural and vessel fasteners

Layout
- parallel line development, radial line development and triangulation to make templates
- stretch-out templates
- layout of vessel components
Forming, Fitting and Fabrication
- structural connections
- pressure vessels
- fixed ladder fabrication
- types and operation of power saws, shears, plate rolls, ironworkers and press brakes
- bending structural shapes, pipe and hollow structural shapes
- stair layout
- guard rails and hand rails

Machine Operations
- drilling, reaming and tapping using a drill press
- power threading and tapping
- tool sharpening and metal finishing
- basic turning and milling operations

Welding and Cutting
- operating GMAW and SMAW equipment
- FCAW and MCAW processes
- SAW and its applications
- stud welding and its applications
- air carbon arc cutting equipment
- using oxy-fuel cutting equipment to prepare components

Mathematics
- basic math skills
- applying perimeter, area and volume fundamentals
- using percent

Level Three - 8 weeks

Shop Organization
- elements of good shop organization - safety, productivity and efficiency
- evaluating shop organization
- organizing a shop to suit project requirements

Drawing Interpretation
- complex welding symbols
- interpretation of structural, tank, vessel, heat exchanger and piping drawings

Project Planning and Estimating
- determining project plan and sequence of operations
- methods and processes of fabrication estimating
- selecting an estimating method
- estimating time requirements and costs for labour and materials

Engineered Design
- general considerations of design engineering
- forces acting on buildings, bridges and other load bearing structures
- engineering solutions to design considerations and forces

Layout
- using parallel line development, radial line development and triangulation for fabrication
- vessels - shells, nozzles, fittings, heads, flanges, saddles, skirts and re-pads
- layout for structural connections
Fitting and Fabrication
• cones and transitions
• structural steel assemblies
• tank fabrication procedures and codes
• pressure vessels
• complete short run manufacturing project

Quality Assurance
• benefits of quality assurance
• documents typical to quality assurance
• codes and standards
• inspection methods and stages of inspection

Math and Trigonometry
• arithmetic
• equation fundamentals
• basic trigonometry