



Metal Fabricator (Fitter)

Guide to Course Content

Online: www.saskapprenticeship.ca

Recognition:

To promote transparency and consistency, portions of this document has been adapted from the 2021 Metal Fabricator (Fitter) Red Seal Occupational Standard (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 guide to course content contains the following sections:

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. The Task Matrix is broken down into the following:

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 Metal Fabricator (Fitter) 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.

TRAINING REQUIREMENTS FOR THE METAL FABRICATOR (FITTER) TRADE

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 by Saskatchewan Polytechnic in Saskatoon.

Level One: 8 weeks

Level Two: 8 weeks

Level Three: 8 weeks

The information contained in this guide to course content details the technical training delivered for each level of apprenticeship. An apprentice spends approximately 15% of their 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 journeyperson 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.

Designated Trade Name	Math Credit at the Indicated Grade Level❶	Science Credit at Grade Level
Metal Fabricator (Fitter)	Grade 10	Grade 10
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.). *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. For information about high school curriculum, including Math and Science course names, please see: http://www.curriculum.gov.sk.ca/ Individuals not meeting the entrance requirements will be subject to an assessment and any required training		

METAL FABRICATOR (FITTER) TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2021 Metal Fabricator (Fitter) Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered.

* Sub-tasks with numbers in the boxes is where the content will be delivered in training.

A - Performs Common Occupational Skills

26%

A-1 Performs safety-related functions	1.01 Maintains safe work environment 1	1.02 Uses personal protective equipment (PPE) and safety equipment 1		
A-2 Uses and maintains tools and equipment	2.01 Maintains hand, power, layout and measuring tools and equipment 1	2.02 Uses stationary machinery 1	2.03 Maintains cutting and welding equipment 1, 2	2.04 Uses access equipment 1
A-3 Organizes work	3.01 Interprets plans, drawings and specifications 1, 2, 3	3.02 Organizes project tasks 3		
A-4 Performs quality assurance throughout fabrication and assembly process	4.01 Performs visual inspections 1	4.02 Verifies measurements, welds and layout 2, 3	4.03 Tracks materials and parts for traceability 2, 3	
A-5 Handles materials	5.01 Organizes material 3	5.02 Determines weights 1, In Context in 2, 3	5.03 Applies rigging practices 1, In Context in 2, 3	5.04 Operates material handling equipment 1, In Context in 2, 3

A-6 Uses communication and mentoring techniques

A-6.01 Uses communication techniques
1

A-6.02 Uses mentoring techniques
3

B – Fabricates Components

43%

B-7 Performs layout

7.01 Performs pattern development
1, 2, 3

7.02 Calculates material allowances for various processes
1, 2, 3

7.03 Determines dimensions
1, 2, 3

7.04 Transfers dimensions
2, 3

7.05 Makes templates
2, 3

B-8 Cuts materials

8.01 Cuts material using plasma cutting equipment
1, 2, 3

8.02 Cuts material using oxy-fuel cutting equipment
1, 2, 3

8.03 Cuts material using shears
1, 2, 3

8.04 Cuts material using saws
1, 2, 3

8.05 Cuts material using ironworkers
1, 2, 3

8.06 Cuts material using computer numerical controlled (CNC) equipment
1, 3

8.07 Drills holes
1, 2, 3

8.08 Cuts threads
1, 2, 3

8.09 Prepares joints
1, 2, 3

B-9 Forms materials

9.01 Forms materials using plate rollers
2, 3

9.02 Forms materials using shape rollers
2, 3

9.03 Forms materials using conventional and computer numerical controlled (CNC) press brakes
2, 3

9.04 Forms materials using benders
2, 3

9.05 Applies heat for forming
1, 2

C – Assembles Components

31%

C-10 Fits and fastens sub-components and components	10.01 Assembles jigs 1	10.02 Determines proper sequence for assembly 1, 2, 3	10.03 Assembles sub-components and components 1, 2, 3	10.04 Sets fabricated component in place 1, 2, 3	10.05 Joins components on-site 1, 2, 3
C-11 Performs welding activities	11.01 Applies heat prior to tack welding 1, 2 In Context in 3	11.02 Performs tack welding 1, In Context in 2, 3	11.03 Minimizes welding distortions 1, 2 In Context in 3	11.04 Applies welding processes 2, In Context in 3	11.05 Corrects welding distortions 2, In Context in 3
C-12 Completes project	12.01 Identifies type of finish 3	12.02 Prepares material for finishing 3			

TRAINING PROFILE CHART

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

Level One	Transcript Code	Hours
Layout, Fit and Fabrication	EQPT 170 – Theory	25
	EQPT 171 – Shop	45
Mathematics	MATH 190	24
Print Reading and Drafting	PRNT 182	24
Rigging and Overhead Crane	RIGG 188	42
Safety and Access Structures	SFTY 190	15
Tools and Equipment	TOOL 186	20
SMAW/FCAW/MCAW/GMAW Welding and Tacking Processes	WLDR 180	30
Oxy-Fuel/Plasma Arc Cutting	WLDR 181	15
		240

Level Two	Transcript Code	Hours
Metallurgy and Material Designation	METL 280	30
Fabrication Safety	SFTY 281	9
Drawing Interpretation	DRAW 280	24
Forming Fitting and Fabrication	METL 281 – Theory	18
	METL 282 – Shop	54
Machine Operations	EQPT 282	26
Mathematics	MATH 279	24
Layout	EQPT 283	35
Welding and Cutting Processes	WELD 279	20
		240

Level Three	Transcript Code	Hours
Quality Control	QC 380	28
Drawing Interpretation	DRAW 380	28
Layout	EQPT 380	16
Project Planning and Estimating	ESTM 385	18
Engineered Design	DSGN 380	12
Shop Organization	SHOP 381	12
Fitting and Fabrication	METL 300 – Theory	26
	METL 381 – Shop	88
Mathematics	MATH 392	12
		240

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 Occupational Standard apprenticeship technical training sequencing, at the learning outcome level, is provided.

Sub-tasks listed are the minimum to be covered in a topic. Related sub-tasks not listed may be used as a reference and taught “in context” in other topics.

Harmonization for the Metal Fabricator (Fitter) trade has been fully implemented for each level of technical training.

Level One	8 weeks	240 hours
Layout, Fit, and Fabrication – Theory		25 hours
- perform geometric constructions - develop two dimensional templates - describe use and advantages of jigs		
Layout, Fit, and Fabrication – Shop		45 hours
- make a bend set template - make sweep templates - layout flanges - layout square grid on floor - determine plum and level - fabricate small projects		
RSOS topics covered in this section of training:		
B-7 Performs layout		
B-7.01 Performs pattern development		
B-7.02 Calculates material allowances for various processes		
B-7.03 Determines dimensions		
B-9 Forms materials		
B-9.05 Applies heat for forming		
Mathematics for Fabricator 1		24 hours
- use arithmetic - use equation fundamentals - use metric units		
This section of training exceeds the minimum sequencing as set out by the Metal Fabricator (Fitter) RSOS.		

Print Reading and Drafting

24 hours

- develop shop drawings
- interpret drawings
- calculate materials
- interpret welding symbols
- describe joint preparation

RSOS topics covered in this section of training:

A-3 Organizes Work

A-3.01 Interprets plans, drawings and specifications

A-4 Performs quality assurance throughout fabrication and assembly process

A-4.01 Performs visual inspections

C-10 Fits and fastens sub-components and components

C-10.01 Assembles jigs

C-10.02 Determines proper sequence for assembly

C-10.03 Assembles sub-components and components

C-10.04 Sets fabricated component in place

C-10.05 Joins components on-site

B-7 Performs layout

B-7.01 Performs pattern development

B-7.02 Calculates material allowances for various processes

B-7.03 Determines dimensions

Rigging and Overhead Crane

42 hours

- discuss occupational health and safety regulations
- discuss types of cranes
- apply rigging
- demonstrate signaling
- calculate load estimate
- establish capability of crane
- demonstrate effective site evaluation
- use crane controls
- operate crane
- discuss crane maintenance
- fill out a logbook
- describe use of jacks
- describe the use of equipment aids
- identify strengths of ropes and knots

RSOS topics covered in this section of training:

A-5 Handles materials

A-5.02 Determines weights

A-5.03 Applies rigging practices

A-5.04 Operates material handling equipment

Safety and Access Structures

15 hours

- practice safety in the workplace
- interpret safety legislation
- describe the safe use of scaffolds, walkways, and ladders
- promote safety in the workplace
- describe confined space entry procedures

RSOS topics covered in this section of training:

A-1 Performs safety related functions

A-1.01 Maintains safe work environment

A-1.02 Uses personal protective equipment (PPE) and safety equipment

A-6 Uses communication and mentoring techniques

A-6.01 Uses communication techniques

Tools and Equipment

20 hours

- use measuring tools
- use layout tools
- use benchwork tools
- describe assembly tools
- use metal working equipment such as band saw, iron worker, press brake
- use stationary and portable grinders and sanders
- demonstrate drill, tap and thread procedures
- demonstrate deburring methods
- describe the operation of Computer Numerical Control (CNC) equipment

RSOS topics covered in this section of training:

A-2 Uses and maintains tools and equipment

A-2.01 Uses hand, power, layout and measuring tools and equipment

A-2.02 Uses stationary machinery

A-2.03 Maintains cutting and welding equipment

A-2.04 Uses access equipment

SMAW/FCAW/GMAW/ Welding and Tacking

30 hours

- describe the fundamentals of electrical theory
- describe the design and operation of a SMAW power source
- tack weld specified joints using SMAW
- describe the design and operation of a GMAW power source
- describe the design and operation of a FCAW power source
- describe the design and operation of a MCAW power source
- tack weld specific joint using GMAW
- weld in flat and horizontal positions using GMAW

RSOS topics covered in this section of training:

C-11 Performs welding activities

- C-11.01 Applies heat prior to tack welding
- C-11.02 Performs tack welding
- C-11.03 Minimizes welding distortions

Oxy-Fuel and Plasma Arc Cutting

15 hours

- oxy-fuel and plasma arc safety, equipment and consumables
- complete 90 degree and bevel cuts using oxy-fuel equipment
- cut structural shapes using oxy-fuel process
- use motorized cutting carriage
- cut plate using plasma arc cutting
- cut plate using CNC plasma arc cutting

RSOS topics covered in this section of training:

B-8 Cuts materials

- B-8.01 Cuts material using plasma cutting equipment
 - B-8.02 Cuts material using oxy-fuel cutting equipment
 - B-8.03 Cuts material using shears
 - B-8.04 Cuts materials using saws
 - B-8.05 Cuts materials using ironworkers
 - B-8.07 Drills holes
 - B-8.08 Cuts threads
 - B-8.09 Prepares joints
-

Level Two

8 weeks

240 hours

Metallurgy and Material Designation

30 hours

- describe the steel making process
- discuss the properties of metals
- evaluate weldability
- apply heat treatment
- apply heat forming
- identify industrial, structural and vessel fasteners
- identify structural shapes and hollow structural sections
- identify plate, sheet, grating and mesh
- interpret CSA Code G40.21M
- identify pipe fittings
- discuss proper storage and handling procedures

RSOS topics covered in this section of training:

B-9 Forms materials

B-9.01 Forms materials using plates rollers

B-9.02 Forms materials using shape rollers

B-9.03 Forms materials using conventional and Computer Numerical Controlled (CNC) press brakes

B-9.04 Forms materials using benders

B-9.05 Applies heat for forming

Fabrication Safety

9 hours

- select personal protection equipment
- describe fall protection procedures
- develop accident prevention awareness
- interpret applicable sections of the Occupational Health and Safety Act and Regulations
- complete reporting forms
- identify additional Health and Safety organizations and their function

RSOS topics covered in this section of training:

A-4 Performs quality assurance throughout fabrication and assembly process

A-4.02 Verifies measurements, welds and layout

A-4.03 Tracks materials and parts for traceability

Drawing Interpretation

24 hours

- interpret drawings for miscellaneous fabrication, frames, structural members and tanks
- interpret tank drawings
- interpret structural drawings

RSOS topics covered in this section of training:

A-3 Organizes Work

A-3.01 Interprets plans, drawings and specifications

B-7 Performs layout

- B-7.01 Performs pattern development
- B-7.02 Calculates material allowances for various processes
- B-7.03 Determines dimensions
- B-7.04 Transfers dimensions
- B-7.05 Makes templates

Forming Fitting and Fabrication – Theory**18 hours**

- describe structural connections
- describe pressure vessels
- describe types of power saws and their operation
- describe types of shears and their operation
- describe plate rolls and their operation
- describe types of ironworkers and their operation
- describe types of press brakes and their operation
- describe fixed ladder fabrication

Forming Fitting and Fabrication – Shop**54 hours**

- operate power saws
- operate shears
- operate iron worker
- operate plate rolls
- bend structural shapes, pipe and hollow structural shapes
- operate press brake
- perform stair layout
- fabricate guard rails and hand rails

RSOS topics covered in this section of training:**B-9 Forms materials**

- B-9.01 Forms materials using plates rollers
- B-9.02 Forms materials using shape rollers
- B-9.03 Forms materials using conventional and Computer Numerical Controlled (CNC) press brakes
- B-9.04 Forms materials using benders
- B-9.05 Applies heat for forming

C-10 Fits and fastens sub-components and components

- C-10.02 Determines proper sequence of assembly
- C-10.03 Assembles sub-components and components
- C-10.04 Sets fabricated component in place
- C-10.05 Joins components on site

Machine Operations**26 hours**

- use drill press to drill, ream and tap
- perform power threading and tapping
- practice tool sharpening and metal finishing
- describe basic turning and milling operations

RSOS topics covered in this section of training:

A-2 Uses and maintains tools and equipment

A-2.03 Maintains cutting and welding equipment

Mathematics

24 hours

- use basic mathematics skills
- apply perimeter, area, and volume fundamentals
- use percentages

This section of training exceeds the minimum sequencing as set out by the Metal Fabricator (Fitter) RSOS.

Layout

35 Hours

- use parallel line development to develop templates
- use radial line development to develop templates
- use triangulation to develop templates
- develop stretch-out templates
- layout vessel components

RSOS topics covered in this section of training:

B-7 Performs layout

B-7.01 Performs pattern development

B-7.02 Calculates material allowances for various processes

B-7.03 Determines dimensions

B-7.04 Transfers dimensions

B-7.05 Makes templates

Welding and Cutting Processes

20 hours

- operate GMAW and SMAW equipment
- perform the FCAW and MCAW process
- evaluate SAW and its applications
- evaluate stud welding and its applications
- operate air carbon arc cutting equipment
- operate oxy-fuel cutting equipment to prepare components

RSOS topics covered in this section of training:

B-8 Material Cutting

B-8.01 Cuts material using plasma cutting equipment

B-8.02 Cuts material using oxy-fuel cutting equipment

B-8.03 Cuts material using shears

B-8.04 Cuts material using saws

B-8.05 Cuts material using ironworkers

B-8.07 Drills holes

C-11 Performs welding activities

C-11.01 Applies heat prior to tack welding

C-11.03 Minimizes welding distortions

C-11.04 Applies welding processes

C-11.05 Corrects welding distortions

Level Two topics from the RSOS that are taught in context:

A-5 Handles Materials

For details regarding the In Context Topic, see page 21.

Level Three

8 weeks

240 hours

Quality Control

28 hours

- discuss the benefits of quality assurance
- identify documents typical to quality assurance
- discuss codes and standards
- discuss inspection methods and stages of inspection

RSOS topics covered in this section of training:

A-4 Performs quality assurance throughout fabrication and assembly process

A-4.02 Verifies measurements, welds and layout

A-4.03 Tracks materials and parts for traceability

Drawing Interpretation

28 hours

- interpret complex welding symbols
- interpret structural drawings
- interpret tank drawings
- interpret vessel drawings
- interpret heat exchanger drawings
- interpret piping drawings

RSOS topics covered in this section of training:

A-3 Organizes work

A-3.01 Interprets plans, drawings and specifications

A-3.02 Organizes project tasks

Layout

16 hours

- perform parallel line development for fabrication
- perform radial line development for fabrication
- perform triangulation for fabrication
- perform layout for vessels including: shells, nozzles, fittings, heads, flanges, saddles, skirts, re-pads
- perform layout for structural connections

RSOS topics covered in this section of training:

A-3 Organizes work

A-3.01 Interprets plans, drawings and specifications

B-7 Performs layout

B-7.01 Performs pattern development

B-7.02 Calculates material allowances for various processes

B-7.03 Determines dimensions

B-7.04 Transfers dimensions

B-7.05 Makes templates

Project Planning and Estimating**18 hours**

- determine project plan and sequence of operations
- describe methods and processes of fabrication estimating
- select estimating method
- estimate material costs
- estimate labour time and costs

RSOS topics covered in this section of training:**C-10 Fits and fastens sub-components and components**

C-10.02 Determines proper sequence of assembly

C-10.03 Assembles sub-components and components

C-10.04 Sets fabricated component in place

C-10.05 Joins components on site

Engineered Design**12 hours**

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

RSOS topics covered in this section of training:**A-3 Organizes work**

A-3.01 Interprets plans, drawings and specifications

A-3.02 Organizes project tasks

Shop Organization**12 hours**

- describe the elements of good shop organization as defined by considerations for safety, productivity and efficiency
- evaluate shop organization
- organize shop to suit project requirements

RSOS topics covered in this section of training:**A-5 Handles Materials**

A-5.01 Organizes Materials

A-6 Uses communication and mentoring techniques

A-6.02 Uses mentoring techniques

Fitting and Fabrication – Theory**26 hours**

- describe tank fabrication procedures and codes

Fitting and Fabrication – Shop**88 hours**

- fabricate cones and transitions
- fabricate structural steel assemblies
- fabricate pressure vessel
- complete short run manufacturing project

RSOS topics covered in this section of training:

B-8 Cuts materials

- B-8.01 Cuts material using plasma cutting equipment
- B-8.02 Cuts material using oxy-fuel cutting equipment
- B-8.03 Cuts material using shears
- B-8.04 Cuts material using saws
- B-8.05 Cuts material using ironworkers
- B-8.06 Cuts material using computer numerical controlled (CNC) equipment
- B-8.07 Drills holes
- B-8.08 Cuts threads
- B-8.09 Prepares joints

B-9 Forms materials

- B-9.01 Forms materials using plate rollers
- B-9.02 Forms materials using shape rollers
- B-9.03 Forms materials using conventional and computer numerical controlled (CNC) press brakes
- B-9.04 Forms material using benders

C-12 Completes project

- 12.01 Identifies type of finish
- 12.02 Prepares material for finishing

Mathematics

12 hours

- use arithmetic
- use equation fundamentals
- use basic trigonometry

This section of training exceeds the minimum sequencing as set out by the Metal Fabricator (Fitter) RSOS.

Level Three topics from the RSOS that are taught in context:

C-11 Performs welding activities

For details regarding the In Context Topic, see page 21.

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-5 Handles Materials

A-5.01 Organizes material

A-5.02 Determines weights

A-5.03 Applies rigging practices

A-5.04 Operates material handling equipment

C-11 Performs Welding Activities

11.01 Applies heat prior to tack welding

11.02 Performs tack welding

11.03 Minimizes welding distortions

11.04 Applies welding processes

11.05 Corrects welding distortions