Metal Fabricator (Fitter)

Guide to Course Content

2023

Online: www.saskapprenticeship.ca

Recognition:
To promote transparency and consistency, this document has been adapted from the 2012 Metal Fabricator (Fitter) 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 guide to course content contains the following sections:

Description of the Metal Fabricator (Fitter) 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.

Elements of harmonization of apprenticeship training: includes adoption of Red Seal trade name, number of levels of apprenticeship, total training hours (on-the-job and in-school) and consistent sequencing of technical training content. Implementation for harmonization will take place progressively. Level one to be implemented in 2016/2017, level two in 2017/2018 and level three in 2018/2019.

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 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.

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 METAL FABRICATOR (FITTER) TRADE

Metal Fabricator (Fitters) make and repair metal parts used in the construction of buildings, bridges, tanks, towers, boilers, pressure vessels and other structures and products. They develop patterns. They lay-out, cut and fabricate structural steel, plate, and miscellaneous ferrous and non-ferrous metals for use in a wide variety of manufacturing and construction industries. They also assemble and fit metal sections and plates together to form complete units or sub-units such as frames, plates, girders and chutes that are used later in the assembly process.

Metal Fabricator (Fitters) must have the ability to interpret fabrication drawings and specifications. They select materials to accomplish their work. Metal Fabricator (Fitters) use tools and equipment such as press brakes, shears, plasma cutters, oxy-fuel cutting torches, grinders and drills to bend, cut, punch, drill or form metal components. They may also use computer numerical controlled (CNC) equipment. They fasten components together by using methods such as welding, bolting and riveting. They also use material handling and rigging, hoisting and lifting equipment to move materials and completed assemblies.

Skills important to Metal Fabricator (Fitters) include the ability to visualize in three-dimensions, good coordination, mechanical aptitude, manual dexterity and the ability to perform work related mathematical calculations.

There are risks associated with this trade such as working in close quarters, at heights, and with power tools, welding equipment and heavy materials. Metal Fabricator (Fitters) usually work indoors in fabricating shops or factories. Some may also work outdoors fitting and fastening sub-assemblies. They may be employed by welding or ironworking companies, or by manufacturers of structural steel, boilers, heavy machinery and transportation equipment. They can also find employment in other sectors including maintenance, shipbuilding, fishing, agricultural equipment, railways, aviation, mining and the oil and gas industry.

This analysis recognizes similarities or overlaps with the work of welders, sheet metal workers, ironworkers, steamfitter/pipefitters, millwrights and boilermakers. Metal Fabricator (Fitters) often hold welding certification. With experience, Metal Fabricator (Fitters) may act as mentors and trainers to apprentices in the trade. They may advance to positions such as lead hand, supervisor, quality assurance/quality control inspector, or contract manager, or set up their own shops.

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 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. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

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

Designated Trade Name	**Math Credit** at the Indicated Grade Level❶	**Science Credit** at Grade Level
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

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: www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

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

Metal Fabricator (Fitters) require reading skills to gather information from forms and labels. They also need to read to understand more complex texts such as equipment and policy and procedure manuals, specifications, codes and standards.

DOCUMENT USE

Metal Fabricator (Fitters) locate and interpret information in several types of documents such as labels, signs, forms, lists, tables, technical drawings and specifications. They interpret fabrication drawings to determine how ferrous and non-ferrous materials should be cut and assembled by integrating plan views, elevation and section drawings as well as synthesizing information from other prints about adjacent components of the fabrication. Metal Fabricator (Fitters) also prepare documents such as sketches and forms.

WRITING

Writing skills are used by Metal Fabricator (Fitters) to write short texts. Examples of written work include logbook entries, quality assurance reports and production problem reports.

ORAL COMMUNICATION

Metal Fabricator (Fitters) discuss equipment maintenance and repair with suppliers, and specifications and plans with co-workers, supervisors and general contractors. They may supervise and direct the work of apprentices. Because of constant noise, Metal Fabricator (Fitters) may also communicate through hand signals, gestures and sometimes notes.

NUMERACY

Numeracy skills are very important in the everyday work of Metal Fabricator (Fitters). Mathematical skills are used in taking measurements, doing material layout, using formulas, preparing cut lists and preparing jigs according to specifications in fabrication drawings.

THINKING

Metal Fabricator (Fitters) may suggest modifications to project designs to correct flaws, for example when fabrication drawing specifications do not take into account the space needed for welds. They need the ability to think spatially and visualize in three dimensions. On the job they are required to problem solve on a regular basis, such as trouble shooting equipment problems and making repairs.

WORKING WITH OTHERS

Metal Fabricator (Fitters) generally work independently to fabricate and fit metal structures following fabrication drawing specifications, though they may work with others to complete large projects. Metal Fabricator (Fitters) co-ordinate work with supervisors, co-workers, quality control staff and with workers from other trades such as millwrights or welders.

DIGITAL TECHNOLOGY

Metal Fabricator (Fitters) may input parameters for CNC equipment such as press brakes or cutting tables. They may also use computer technology during pattern development. They may need to have a basic knowledge of CAD software to prepare layouts and interpret plans and drawings.

CONTINUOUS LEARNING

Metal Fabricator (Fitters) have a need to engage in ongoing learning to acquire information about health and safety, new products, metal fabrication procedures, metal properties and quality assurance standards. They must maintain skills and certification according to industry and jurisdictional regulatory authorities. New learning is acquired as part of regular work activities, by participating in industry specific training sessions, reading trade journals and talking to other Metal Fabricator (Fitters).

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 Metal Fabricator (Fitter).

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for the Metal Fabricator (Fitter) trade is three.

3. Total Training Hours during Apprenticeship Training

The total hours of training, including both on-the-job and in-school training for the Metal Fabricator (Fitter) trade is 5400.

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

Harmonization for the Metal Fabricator (Fitter) trade has been fully implemented for each level of technical training. See the “Technical Training Course Content” section of this guide for more details

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 (2016/2017 implementation)	Level 2 (2017/2018 implementation)	Level 3 (2018/2019 implementation)
Quality Assurance	Quality Assurance	Quality Assurance
Safety		
Tools and Equipment		
Stationary Machinery		
Access Equipment		
Hoisting, Lifting and Rigging		
Layout and Pattern Development	Layout and Pattern Development	Layout and Pattern Development
	Layout – Simple and Complex Components and Templates	Layout – Simple and Complex Components and Templates
Cutting – Oxy-fuel Cutting		
Cutting – Plasma Arc Cutting	Cutting – Plasma Arc Cutting	
Welding – Shielded Metal Arc Welding (SMAW)	Welding – Shielded Metal Arc Welding (SMAW)	
Welding – Gas Metal Arc Welding (GMAW)	Welding – Gas Metal Arc Welding (GMAW)	
Welding – Flux Core Arc Welding (FCAW)	Welding – Flux Core Arc Welding (FCAW)	
Welding – Metal Core Arc Welding (MCAW)	Welding – Metal Core Arc Welding (MCAW	
	Form Materials using Equipment	
	Metallurgy	
	Heat Forming	
		Communication and Trade Documentation
		Work Planning

Level 1 (2016/2017 implementation)	Level 2 (2017/2018 implementation)	Level 3 (2018/2019 implementation)
		Automated Shape Cutting Machines and Shape Rolling Equipment
	Fabrication (Simple)	Fabrication (Complex)
	Fit and Assemble (Simple)	Fit and Assemble (Complex)
		Finish Preparation

METAL FABRICATOR (FITTER) TASK MATRIX

This chart outlines the major work activities, tasks and sub-tasks from the 2012 Metal Fabricator (Fitter) National Occupational Analysis. 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. Harmonization for the Metal Fabricator (Fitter) trade has been fully implemented for each level of technical training.

A - COMMON OCCUPATIONAL SKILLS — 24%

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 Maintains and uses tools and equipment	**2.01 Maintains hand, power, layout and measuring tools and equipment** 1	**2.02 Maintains Stationary machinery** 1	**2.03 Maintains cutting and welding equipment** 1	**2.04 Uses access equipment** 1
A-3 Organizes work	**3.01 Interprets plans, drawings and specifications** 1, 2	**3.02 Communicates with others** 3	**3.03 Organizes project tasks** 3	
A-4 Performs quality assurance throughout fabrication and assembly process	**4.01 Performs visual inspections** 3 (In Context 1, 2)	**4.02 Verifies measurements, welds and layout** 3 (In Context 1, 2)	**4.03 Tracks material and parts for traceability** 3 (In Context 1, 2)	
A-5 Handles materials	**5.01 Organizes material** 3	**5.02 Determines weights** 1	**5.03 Applies rigging practices** 1	**5.04 Operates material handling equipment** 1

B – FABRICATION OF COMPONENTS 44%

B-6 Performs layout	6.01 Performs pattern development 2, 3	6.02 Calculates Material allowances for various processes 1	6.03 Determines dimensions 2, 3	6.04 Transfers dimensions 2, 3	6.05 Makes templates 2, 3
B-7 Cuts materials	7.01 Cuts material using manual plasma cutting equipment 2	7.02 Cuts material using manual oxy-fuel cutting equipment 1	7.03 Cuts material using shears 2	7.04 Cuts material using saws 1	7.05 Cuts material Using ironworkers 2
	7.06 Cuts material using computer numerical controlled (CNC) equipment 3	7.07 Drills holes 1	7.08 Cuts threads 1	7.09 Prepares joints 1, 2	
B-8 Forms materials	8.01 Forms materials using plate rollers 2	8.02 Forms materials using shape rollers 3	8.03 Forms materials using conventional and computer numerical controlled (CNC) press brakes 2	8.04 Forms materials using benders 2	8.05 Applies heat for forming 2

C – ASSEMBLY OF COMPONENTS 32%

C-9 Fits and fastens sub-components and components	9.01 Assembles jigs 1	9.02 Determines proper sequence for assembly 3	9.03 Assembles sub-components and components 3	9.04 Sets fabricated component in place 3	9.05 Fastens components on-site 3

C-10 Performs welding activities	**10.01 Applies heat prior to tack welding** **1**	**10.02 Performs tack welding** **1**	**10.03 Minimizes welding distortions** **1**	**10.04 Applies welding processes** **1**	**10.05 Corrects welding distortions** **1**
C-11 Completes project	**11.01 Determines finishing process** **3**	**11.02 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	26
	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 National Occupational Analysis 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

NOA topics covered in this section of training:

B-6 Performs layout

B-6.04 Transfers dimensions

- transferring dimensions

B-7 Cuts materials

B-7.01 Cuts material using manual plasma arc cutting equipment

- plasma cutting equipment, their characteristics, applications, limitations and operation
- cutting material using plasma cutting equipment

B-7.02 Cuts material using manual oxy-fuel cutting equipment

- oxy-fuel cutting equipment, their components, consumables, characteristics, applications, limitations and operation
- cutting material using oxy-fuel cutting equipment

B-7.03 Cuts material using shears

- shears, their characteristics, applications, limitations and operation
- cutting material using shears

B-7.04 Cuts materials using saws

- saws, their characteristics, applications, limitations and operation
- cutting material using saws

B-7.05 Cuts materials using ironworkers

- ironworkers their characteristics, applications, limitations and operation
- cutting material using ironworkers

B-7.07 Drills holes

- holes, their characteristics, applications and limitations

- drilling equipment, their characteristics, applications, limitations and operation
- drilling holes

B-7.08 Cuts threads
- threads, their characteristics, applications, limitations and operation
- procedures to cut threads

B-7.09 Prepares joints
- joints, their characteristics, applications and limitations
- preparing joints

B-8 Forms materials

B-8.01 Forms materials using plates rollers
- materials, their applications, metallurgy and characteristics
- plate rollers, their characteristics, applications, limitations and operation
- forming material using plate rollers

B-8.02 Forms materials using shape rollers
- materials, their applications, metallurgy and characteristics
- shape rollers, their characteristics, applications, limitations and operation
- forming material using shape rollers

B-8.03 Forms materials using conventional and Computer Numerical Controlled (CNC) press brakes
- materials, their applications, metallurgy and characteristics
- conventional and CNC press brakes, their characteristics, applications, limitations and operation
- forming material using conventional and CNC press brakes

B-8.04 Forms materials using benders
- materials, their applications, metallurgy and characteristics
- enders, their characteristics, applications, limitations and operation
- forming material using benders

Mathematics for Fabricator 1 — 24 hours

- use arithmetic
- use equation fundamentals
- use metric units

NOA topics covered in this section of training:

No specific task covered in NOA

Print Reading and Drafting — 24 hours

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

NOA topics covered in this section of training:

A-3 Organizes work

A-3.01 Interprets plans, drawings and specifications
- plans, drawings and specifications, their characteristics, applications and limitations
- interpreting plans, drawings and specifications

B-6 Performs layout

B-6.01 Performs pattern development

- layout methods, and describe their characteristics, applications and limitations
- tools and equipment used for pattern development and describe their characteristics, applications, limitations and operation
- characteristics and applications of CAD produced layouts

B-6.02 Calculates material allowances for various processes

- calculating material allowances for various processes
- procedures used to convert between imperial and metric systems
- bending, rolling and cutting allowances, and describe their characteristics and applications

B-6.03 Determines dimensions

- layout and measuring tools used for pattern development and describe their characteristics, applications, limitations and operation
- convert between imperial and metric systems

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 log book
- describe use of jacks
- describe the use of equipment aids
- identify strengths of ropes and knots

NOA topics covered in this section of training:

A-5 Handles materials

A-5.02 Determines weights

- determining weight of materials
- tools and equipment used to determine weight of materials, and describe their characteristics, applications, limitations and operation

A-5.03 Applies rigging practices

- rigging equipment and components, their characteristics, applications, limitations and operation
- applying rigging practices and procedures
- regulatory and certification requirements pertaining to rigging and use of rigging equipment and components

A-5.04 Operates material handling equipment

- material handling equipment, their characteristics, applications and limitations
- operating material handling equipment
- regulatory and certification requirements for material handling equipment

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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

NOA topics covered in this section of training:

A-1 Performs safety related functions

A-1.01 Maintains safe work environment

- maintaining safe work environments
- regulatory requirements pertaining to safety
- training requirements for specific PPE, safety equipment and safety procedures

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

- PPE and safety equipment
- procedures to use PPE and safety equipment
- training requirements for specific PPE, safety equipment and safety procedures

A-2 Maintains and uses tools and equipment

A-2.04 Uses access equipment

- access equipment, characteristics, applications, limitations, operation and maintenance

A-3 Organizes work

A-3.02 Communicates with others

- use drawings, and written and verbal instruction to minimize misunderstandings
- consult with colleagues to resolve problems, find solutions and establish best practices

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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

NOA topics covered in this section of training:

A-2 Maintains and uses tools and equipment

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

- hand, power, layout and measuring tools and equipment, their characteristics, applications, limitations, maintenance and operation

A-2.02 Maintains stationary machinery

- stationary machinery, their components, characteristics, applications, limitations, maintenance and operation

B-7 Cuts materials

B-7.03 Cuts material using shears

- shears, their characteristics, applications, limitations and operation
- cutting material using shears

B-7.04 Cuts material using saws

- saws, their characteristics, applications, limitations and operation
- cutting material using saws

B-7.05 Cuts material using ironworkers

- ironworkers their characteristics, applications, limitations and operation
- cutting material using ironworkers

B-7.06 Cuts material using computer numerical controlled (CNC) equipment

- CNC equipment, their consumables, characteristics, applications, limitations and operation
- cutting material using CNC equipment

B-7.07 Drills holes
- holes, their characteristics, applications and limitations
- drilling equipment, their characteristics, applications, limitations and operation
- drilling holes

B-7.08 Cuts threads
- threads, their characteristics, applications, limitations and operation
- procedures to cut threads

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

NOA topics covered in this section of training:

A-2 Maintains and uses tools and equipment

A-2.03 Maintains cutting and welding equipment
- cutting and welding equipment, their components, characteristics, applications, limitations and maintenance

B-7 Cuts materials

B-7.09 Prepares joints
- joints, their characteristics, applications and limitations
- preparing joints

C-10 Performs welding activities

C-10.01 Applies heat prior to tack welding
- applying heat prior to tack welding
- codes, standards and certification requirements for tacking

C-10.02 Performs tack welding
- performing tack welding
- welding tools and equipment, their characteristics, applications, limitations and operation
- codes, standards and certification requirements for tacking and welding

C-10.03 Minimizes welding distortions
- restraints used to counteract distortion
- determine sequence of welding
- causes and effects of 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 manual 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

NOA topics covered in this section of training:

A-2 Maintains and uses tools and equipment
A-2.03 Maintains cutting and welding equipment
- cutting and welding equipment, their components, characteristics, applications, limitations and maintenance

B-7 Cuts materials
B-7.01 Cuts material using plasma cutting equipment
- plasma cutting equipment, their characteristics, applications, limitations and operation
- cutting material using plasma cutting equipment

B-7.02 Cuts material using manual oxy-fuel cutting equipment
- oxy-fuel cutting equipment, their components, consumables, characteristics, applications, limitations and operation
- cutting material using oxy-fuel cutting equipment

B-8 Forms materials
B-8.05 Applies heat for forming
- heating equipment, their characteristics, applications, limitations and operation
- applying heat for forming materials

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

A-3 Performs quality assurance throughout fabrication and assembly process

For details regarding the In Context Topic, see page 22

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

NOA topics covered in this section of training:

B-8 Forms materials

B-8.05 Applies heat for forming

- heating equipment, their characteristics, applications, limitations and operation
- applying heat for forming materials

C-10 Performs welding activities

C-10.01 Applies heat prior to tack welding

- applying heat prior to tack welding
- codes, standards and certification requirements for tacking

C-10.03 Minimizes welding distortions

- restraints used to counteract distortion
- determine sequence of welding
- causes and effects of welding distortions

C-10.05 Corrects welding distortions

- correcting welding distortions
- jurisdictional regulations and certification requirements for welding

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

NOA topics covered in this section of training:

B-6 Performs layout

B-6.04 Transfers dimensions

- transfer marks accurately by using measuring and layout tools such as bevel squares, measuring tapes, plumb bobs and soapstone
- work points such as centre lines and quarter marks to determine location and orientation of components according to drawings
- incline and slope using rise and run, and angular dimensions
- work point and mark surfaces on components according to layout and drawings

B-8 Forms materials

B-8.01 Forms materials using plate rollers

- materials, their applications, metallurgy and characteristics
- plate rollers, their characteristics, applications, limitations and operation
- forming material using plate rollers

B-8.02 Forms materials using shape rollers

- materials, their applications, metallurgy and characteristics
- shape rollers, their characteristics, applications, limitations and operation
- forming material using shape rollers

B-8.04 Forms materials using benders

- materials, their applications, metallurgy and characteristics
- benders, their characteristics, applications, limitations and operation
- forming material using benders

Drawing Interpretation — 24 hours

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

NOA topics covered in this section of training:

B-6 Performs layout

B-6.04 Transfers dimensions

- transfer marks accurately by using measuring and layout tools such as bevel squares, measuring tapes, plumb bobs and soapstone
- work points such as centre lines and quarter marks to determine location and orientation of components according to drawings
- incline and slope using rise and run, and angular dimensions
- work point and mark surfaces on components according to layout and drawings

B-7 Cuts materials

B-7.01 Cuts material using manual plasma arc cutting equipment

- plasma cutting equipment, their characteristics, applications, limitations and operation
- cutting material using plasma cutting equipment

B-7.02 Cuts material using manual oxy-fuel cutting equipment

- oxy-fuel cutting equipment, their components, consumables, characteristics, applications, limitations and operation
- cutting material using oxy-fuel cutting equipment

B-7.03 Cuts material using shears

- shears, their characteristics, applications, limitations and operation
- cutting material using shears

B-7.04 Cuts materials using saws

- saws, their characteristics, applications, limitations and operation
- cutting material using saws

B-7.05 Cuts materials using ironworkers

- ironworkers their characteristics, applications, limitations and operation
- cutting material using ironworkers

B-7.07 Drills holes

- holes, their characteristics, applications and limitations
- drilling equipment, their characteristics, applications, limitations and operation
- drilling holes

B-7.08 Cuts threads

- threads, their characteristics, applications, limitations and operation

- procedures to cut threads

B-7.09 Prepares joints
- joints, their characteristics, applications and limitations
- preparing joints

B-8 Forms materials

B-8.01 Forms materials using plates rollers
- materials, their applications, metallurgy and characteristics
- plate rollers, their characteristics, applications, limitations and operation
- forming material using plate rollers

B-8.02 Forms materials using shape rollers
- materials, their applications, metallurgy and characteristics
- shape rollers, their characteristics, applications, limitations and operation
- forming material using shape rollers

B-8.03 Forms materials using conventional and Computer Numerical Controlled (CNC) press brakes
- materials, their applications, metallurgy and characteristics
- conventional and CNC press brakes, their characteristics, applications, limitations and operation
- forming material using conventional and CNC press brakes

B-8.04 Forms materials using benders
- materials, their applications, metallurgy and characteristics
- benders, their characteristics, applications, limitations and operation
- forming material using benders

Forming Fitting and Fabrication – Theory **26 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

NOA topics covered in this section of training:

C-9 Fits and fastens sub-components and components

C-9.02 Determines proper sequence of assembly
- determining sequence of assembly
- utilize drawings for detailed information

C-9.03 Assembles sub-components and components
- assembling components and sub-components
- using tools and equipment such as impact and torque wrenches based on type of assembly and space limitations for assembly
- using processes such as bolting and welding

C9.04 Sets fabricated component in place
- setting fabricated components in place
- plan for possible installation difficulties
- fit, place and adjust ensuring component is level, plumb and orientated according to drawings

C-9.05 Fastens components on-site
- joining components on site
- fastening method from the drawings such as bolting and welding
- tools and equipment such as wrenches, impact wrenches and torque wrenches

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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

NOA topics covered in this section of training:

C-9 Fits and fastens sub-components and components

C-9.02 Determines proper sequence of assembly
- determining sequence of assembly
- utilize drawings for detailed information

C-9.03 Assembles sub-components and components
- assembling components and sub-components
- using tools and equipment such as impact and torque wrenches based on type of assembly and space limitations for assembly
- using processes such as bolting and welding

C-9.04 Sets fabricated component in place
- setting fabricated components in place
- plan for possible installation difficulties
- fit, place and adjust ensuring component is level, plumb and orientated according to drawings

C-9.05 Fastens components on-site
- joining components on site
- fastening method from the drawings such as bolting and welding
- tools and equipment such as wrenches, impact wrenches and torque wrenches

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Mathematics — 24 hours

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

NOA topics covered in this section of training:

No specific task covered in NOA

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

NOA topics covered in this section of training:

A-3 Organizes work
A-3.01 Interprets plans, drawings and specifications
- plans, drawings and specifications, their characteristics, applications and limitations
- interpreting plans, drawings and specifications

B-6 Performs layout
B-6.01 Performs pattern development
- layout methods, and describe their characteristics, applications and limitations
- tools and equipment used for pattern development and describe their characteristics, applications, limitations and operation
- characteristics and applications of CAD produced layouts

B-6.02 Calculates material allowances for various processes
- calculating material allowances for various processes
- procedures used to convert between imperial and metric systems
- bending, rolling and cutting allowances, and describe their characteristics and applications

B-6.03 Determines dimensions
- layout and measuring tools used for pattern development and describe their characteristics, applications, limitations and operation
- convert between imperial and metric systems

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

NOA topics covered in this section of training:

B-7 Cuts materials
B-7.09 Prepares joints
- joints, their characteristics, applications and limitations
- preparing joints

C-10 Performs welding activities
C-10.01 Applies heat prior to tack welding
- applying heat prior to tack welding
- codes, standards and certification requirements for tacking

C-10.02 Performs tack welding
- performing tack welding
- welding tools and equipment, their characteristics, applications, limitations and operation
- codes, standards and certification requirements for tacking and welding

C-10.03 Minimizes welding distortions
- restraints used to counteract distortion
- determine sequence of welding
- causes and effects of welding distortions

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

A-3 Performs quality assurance throughout fabrication and assembly process

For details regarding the In Context Topic, see page 22

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

NOA 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

- verifying measurements, welds and layouts
- tools and equipment used to verify measurements, welds and layouts and describe their characteristics, applications, limitations and operation

A-4.03 Tracks material and parts for traceability

- tracking materials and parts for traceability
- marking devices used to track materials and parts, and describe their characteristics, applications, limitations and operation

C-11 Completes project

C-11.01 Determines finishing process

- finishing processes, their characteristics, applications and limitations

C-11.02 Prepares material for finishing

- preparing material for finishing
- tools and equipment used to prepare material for finishing, and describe their characteristics, applications, limitations and operation

Drawing Interpretation — 28 hours

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

NOA topics covered in this section of training:

B-6 Performs layout

B-6.04 Transfers dimensions

- transfer marks accurately by using measuring and layout tools such as bevel squares, measuring tapes, plumb bobs and soapstone
- work points such as centre lines and quarter marks to determine location and orientation of components according to drawings
- incline and slope using rise and run, and angular dimensions
- work point and mark surfaces on components according to layout and drawings

B-6.05 Makes templates

- templates, their characteristics, applications and limitations
- making templates

C-9 Fits and fastens sub-components and components

C-9.01 Assembles jigs

- jigs, their characteristics, applications and limitations
- assembling jigs

C-9.02 Determines proper sequence of assembly
- determining sequence of assembly
- utilize drawings for detailed information

C-9.03 Assembles sub-components and components
- assembling components and sub-components
- using tools and equipment such as impact and torque wrenches based on type of assembly and space limitations for assembly
- using processes such as bolting and welding

C-9.04 Sets fabricated component in place
- setting fabricated components in place
- plan for possible installation difficulties
- fit, place and adjust ensuring component is level, plumb and orientated according to drawings

C-9.05 Fastens components on-site
- joining components on site
- fastening method from the drawings such as bolting and welding
- tools and equipment such as wrenches, impact wrenches and torque wrenches

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

NOA topics covered in this section of training:

A-3 Organizes work

A-3.01 Interprets plans, drawings and specifications
- plans, drawings and specifications, their characteristics, applications and limitations
- interpreting plans, drawings and specifications

B-6 Performs layout

B-6.01 Performs pattern development
- layout methods, and describe their characteristics, applications and limitations
- tools and equipment used for pattern development and describe their characteristics, applications, limitations and operation
- characteristics and applications of CAD produced layouts

B-6.02 Calculates material allowances for various processes
- calculating material allowances for various processes
- procedures used to convert between imperial and metric systems
- bending, rolling and cutting allowances, and describe their characteristics and applications

B-6.03 Determines dimensions
- layout and measuring tools used for pattern development and describe their characteristics, applications, limitations and operation
- convert between imperial and metric systems

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

NOA topics covered in this section of training:

A-3 Organizes work
A-3.03 Organizes project tasks
- equipment, material and manpower to complete job
- fabrication sequence required according to availability of resources

A-5 Handles materials
A-5.01 Organizes materials
- materials, components and sub-assemblies, and describe their characteristics, applications and limitations
- storage for dissimilar products and vulnerable materials

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

NOA topics covered in this section of training:

A-3 Organizes work
A-3.03 Organizes project tasks
- equipment, material and manpower to complete job
- fabrication sequence required according to availability of resources

A-5 Handles materials
A-5.01 Organizes materials
- materials, components and sub-assemblies, and describe their characteristics, applications and limitations
- storage for dissimilar products and vulnerable materials

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

NOA topics covered in this section of training:

A-3 Organizes work
A-3.02 Communicates with others
- use drawings, and written and verbal instruction to minimize misunderstandings
- consult with colleagues to resolve problems, find solutions and establish best practices

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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

NOA topics covered in this section of training:

B-7 Cuts materials

B-7.06 Cuts material using computer numerical controlled (CNC) equipment

- CNC equipment, their consumables, characteristics, applications, limitations and operation
- cutting material using CNC equipment

B-8 Forms materials

B-8.03 Forms materials using conventional and computer numerical controlled (CNC) press brake

- materials, their applications, metallurgy and characteristics
- conventional and CNC press brakes, their characteristics, applications, limitations and operation
- forming material using conventional and CNC press brakes

Mathematics — 12 hours

- use arithmetic
- use equation fundamentals
- use basic trigonometry

NOA topics covered in this section of training:

No specific task covered in NOA

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-4 Performs quality assurance throughout fabrication and assembly process

- 4.01 – performs visual inspections
- 4.02 – verifies measurements, welds and layout
- 4.03 – tracks material and parts for traceability

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.

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

SATCC Level One	Transcript Code	Hours	Pan-Canadian Harmonized Level One
			Quality Assurance (In Context)
Safety and Access Structures	SFTY 190	15	Safety
			Access Equipment
Tools and Equipment	TOOL 186	20	Tools and Equipment
			Stationary Machinery
Rigging and Overhead Cranes	RIGG 188	42	Hoisting Lifting and Rigging
Layout, Fitting and Fabrication	EQPT 170 – Theory	25	Layout and Pattern Development
	EQPT 171 – Shop	45	
Print Reading and Drafting	PRNT 182	24	
Oxy-fuel and Plasma Arc Cutting	WLDR 181	15	Cutting – Oxy-Fuel Cutting
			Cutting – Plasma Arc Cutting
SMAW/FCAW/MCAW/GMAW Welding and Cutting Processes	WLDR 180	30	Welding – SMAW
			Welding – GMAW
			Welding – FCAW
			Welding – MCAW
Mathematics (Exceed)		24	
		240	

SATCC Level Two	Transcript Code	Hours	Pan-Canadian Harmonized Level Two
			Quality Assurance (In Context)
Layout	EQPT 283	35	Layout and Pattern Development
Drawing Interpretation	DRAW 280	24	Layout – Simple and Complex Components and Templates
Welding and Cutting Processes	WELD 279	20	Cutting – Plasma Arc Cutting
			Welding – SMAW
			Welding – GMAW
			Welding – FCAW
			Welding – MCAW
Metallurgy and Material Designations	METL 280	30	Metallurgy
			Heat Forming
Fabrication Safety	SFTY 281	9	Form Materials using Equipment
Forming, Fitting and Fabrication	METL 281 – Theory	26	Fabrication (Simple)
	METL 282 – Shop	54	
Machine Operations	EQPT 282	26	Fit and Assemble (Simple)
Mathematics (Exceed)		24	
		240	

SATCC Level Three	Transcript Code	Hours	Pan-Canadian Harmonized Level Three
Quality Control	QC 380	28	Quality Assurance
			Finish Preparation
Layout	EQPT 380	16	Layout and Pattern Development
Drawing Interpretation	DRAW 380	28	Layout – Simple and Complex Components and Templates
			Fabrication (Complex)
			Fit and Assemble (Complex)
Shop Organization	SHOP 381	12	Communication and Trade Documentation
Project Planning and Estimating	ESTM 385	18	Working Planning
Engineered Design	DSGN 380	12	
Fitting and Fabrication	METL 300 – Theory	26	Automated Shape Cutting Machines and Shape Rolling Equipment
	METL 381 – Shop	88	
Mathematics (Exceed)		12	
		240	

Exceed Topics

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