



# **Welder**

# **On-the-Job Training Guide**

**2024**

Online: [www.saskapprenticeship.ca](http://www.saskapprenticeship.ca)

*Recognition:*

*To promote transparency and consistency, portions of this document has been adapted from the 2014 Welder National Occupational Analysis (Employment and Social Development Canada).*

*A complete version of the Occupational Standard can be found at [www.red-seal.ca](http://www.red-seal.ca)*

# STRUCTURE OF THE ON-THE-JOB TRAINING GUIDE

To facilitate understanding of the occupation, this on-the-job training guide 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.

**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.

**On-the-Job and In-school Training Content for the Welder Trade:** a chart which outlines the topics of technical training with on-the-job examples for apprentices to achieve relevant experience at work.

# TRAINING REQUIREMENTS FOR THE WELDER 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.

Journeyman to apprentice ratio for this trade is: 1:3

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

**It is the employer's or journeyman's responsibility to supervise an apprentice's practical skills development until a satisfactory level of proficiency has been reached.**

## EMPLOYER TRAINING RESPONSIBILITY

- promote a safety-conscious workplace
- provide mentored, hands-on practice in the use of tools and equipment
- demonstrate procedures relevant to layout, forming, framing, exterior and interior finishing
- further the apprentice's ability to interpret technical drawings
- allow the apprentice to apply procedures used for estimating materials, costing projects and supervising personnel
- ensure that the apprentice can evaluate the end product
- where possible, expose the apprentice to new technology in the Carpenter trade

Employers should make every effort to expose their apprentices to work experience in as many areas of the trade as possible.

In the On-the-Job Training Guide, in-school instruction is listed first; on-the-job 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.

# WELDER TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2014 Welder 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.

## A – Common Occupational Skills

19%

<b>A-1 Maintains tools and equipment</b>	<b>1.01 Maintains hand, power, layout and measuring tools</b>  1, In Context in 2, 3	<b>1.02 Maintains stationary machinery</b>  1, In Context in 2, 3	<b>1.03 Maintains thermal cutting equipment</b>  1, In Context in 2, 3	<b>1.04 Maintains welding equipment</b>  1, In Context in 3	
<b>A-2 Uses access and material handling equipment</b>	<b>2.01 Uses access equipment</b>  1	<b>2.02 Uses rigging, hoisting and lifting equipment</b>  1			
<b>A-3 Performs safety-related activities</b>	<b>3.01 Performs hazard assessments</b>  1, In Context in 2, 3	<b>3.02 Maintains safe work environment</b>  1, In Context in 3	<b>3.03 Uses personal protective equipment (PPE) and safety equipment</b>  1, In Context in 2, 3		
<b>A-4 Organizes work</b>	<b>4.01 Uses documentation and reference material</b>  1	<b>4.02 Plans job tasks</b>  2	<b>4.03 Organizes materials</b>  1, 2		
<b>A-5 Performs routine trade activities</b>	<b>5.01 Performs quality inspection</b>  2, 3	<b>5.02 Marks welds, materials and parts</b>  2, 3	<b>5.03 Controls temperature of weldments</b>  1, 2, 3	<b>5.04 Stores welding consumables</b>  1, 2, 3	<b>5.05 Selects welding processes and power source</b>  1, 2, 3
	<b>5.06 Performs equipment start-up and shut-down</b>  1, 2, 3	<b>5.07 Finishes final product</b>  1, 2			

## B – Fabrication and Preparation of Components For Welding

20%

<b>B-6 Performs layout</b>	<b>6.01 Develops templates</b>  1, 2	<b>6.02 Transfers dimensions from drawings to materials</b>  1, 2	
<b>B-7 Fabricates components</b>	<b>7.01 Prepares materials</b>  1, 2	<b>7.02 Fits components for welding</b>  1, 2	<b>7.03 Assembles components</b>  1, 2

## C – Cutting and Gouging

17%

<b>C-8 Uses tools and equipment for non-thermal cutting and grinding</b>	<b>8.01 Selects cutting and grinding tools</b>  1	<b>8.02 Cuts using stationary band saws and power hacksaws</b>  1	<b>8.03 Cuts using shears and ironworkers</b>  1	<b>8.04 Cuts using hand tools</b>  1	<b>8.05 Cuts using handheld power tools</b>  1
<b>C-9 Uses oxy-fuel gas cutting (OFC) process for cutting and gouging</b>	<b>9.01 Selects OFC gas equipment</b>  1	<b>9.02 Sets up OFC equipment</b>  1	<b>9.03 Sets operating parameters for OFC equipment</b>  1	<b>9.04 Performs cut and gouge using OFC equipment</b>  1	
<b>C-10 Uses plasma arc cutting (PAC) process for cutting and gouging</b>	<b>10.01 Selects PAC equipment and consumables</b>  1	<b>10.02 Sets up PAC equipment</b>  1	<b>10.03 Sets operating parameters for PAC equipment</b>  1	<b>10.04 Performs cut and gouge using PAC equipment</b>  1	
<b>C-11 Uses air carbon arc cutting (CAC-A) process for cutting and gouging</b>	<b>11.01 Selects CAC-A equipment and consumables</b>  1	<b>11.02 Sets up CAC-A equipment</b>  1	<b>11.03 Sets up parameters for CAC-A equipment</b>  1	<b>11.04 Performs cut and gouge using CAC-A equipment</b>  1	

## D – Welding Processes

44%

<p><b>D-12 Welds using shielded metal arc welding (SMAW) process</b></p>	<p><b>12.01 Selects SMAW equipment and consumables</b></p> <p>1, 2, 3</p>	<p><b>12.02 Sets up SMAW equipment</b></p> <p>1, 2, 3</p>	<p><b>12.03 Sets operating parameters for SMAW</b></p> <p>1, 2, 3</p>	<p><b>12.04 Performs weld with SMAW equipment</b></p> <p>1, 2, 3</p>
<p><b>D-13 Welds using flux cored arc welding (FCAW), metal cored arc welding (MCAW) and gas metal arc welding (GMAW) processes</b></p>	<p><b>13.01 Selects FCAW, MCAW and GMAW gas, equipment and consumables</b></p> <p>1, 2, 3</p>	<p><b>13.02 Sets up FCAW, MCAW, and GMAW equipment</b></p> <p>1, 2, 3</p>	<p><b>13.03 Sets operating parameters for FCAW, MCAW and GMAW</b></p> <p>1, 2, 3</p>	<p><b>13.04 Performs weld using FCAW, MCAW, and GMAW equipment</b></p> <p>1, 2, 3</p>
<p><b>D-14 Welds using gas tungsten arc welding (GTAW) process</b></p>	<p><b>14.01 Selects GTAW gas, equipment and consumables</b></p> <p>2, 3</p>	<p><b>14.02 Sets up GTAW equipment</b></p> <p>2, 3</p>	<p><b>14.03 Sets operating parameters for GTAW</b></p> <p>2, 3</p>	<p><b>14.04 Performs weld using GTAW equipment</b></p> <p>2, 3</p>
<p><b>D-15 Welds using submerged arc welding (SAW) process</b></p>	<p><b>15.01 Selects SAW equipment and consumables</b></p> <p>2, 3</p>	<p><b>15.02 Sets up SAW equipment</b></p> <p>2, 3</p>	<p><b>15.03 Sets operating parameters for SAW</b></p> <p>2, 3</p>	<p><b>15.04 Performs weld using SAW equipment</b></p> <p>2, 3</p>

# 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
Industrial Mathematics	MATH 125A	21
Metallurgy and Material Designations	METL 106	10
Oxy-Fuel Processes	WLDR 112 – Theory	12
	WLDR 128 – Shop	18
Print Reading	BPRT 105	10
Shielded Metal Arc Welding	WLDR 111 – Theory	13
	WLDR 110 – Shop	33
Thermal Cutting	WELD 134	14
Trade Safety	SFTY 132	12
Wire Feed Processes	WLDR 115 – Theory	13
	WLDR 116 – Shop	54
		210

Level Two	Transcript Code	Hours
Gas Tungsten Arc Welding	WELD 254 – Theory	9
	WELD 255 – Shop	21
Welding Mathematics 2	MATH 203	14
Metallurgy and Material Designation	WELD 215	11
Print Reading and Fabrication	BPRT 251	10
Quality Assurance	WELD 213	12
Shielded Metal Arc Welding	WELD 252 – Theory	18
	WELD 253 – Shop	92
Wire Feed Processes	WELD 216	23
		210

Level Three	Transcript Code	Hours
Gas Tungsten Arc Welding	WELD 337	12
Welding Mathematics 3	MATH 310	10
Metallurgy	WELD 334	10
Print Reading and Fabrication	BPRT 322	17
SMAW Plate/Pipe Process	WELD 311 – Theory	25
SMAW Pipe Process	WELD 318 – Shop	20
SMAW Plate Process	WELD 317 – Shop	95
Special Welding and Cutting Processes	WELD 338	18
Wire Feed Processes	WELD 335 – Theory	12
	WELD 336 – Shop	21
		240



# ON-THE-JOB AND IN-SCHOOL TRAINING CONTENT FOR THE WELDER TRADE

This chart outlines on-the-job examples for apprentices to achieve relevant work experience to prepare for the topics of technical training. Topics of technical training are provided with the associated learning outcomes.

Level One	7 weeks	210 hours
<b>Print Reading and Fabrication</b>		<b>10 hours</b>
<ul style="list-style-type: none"> <li>• interpret basic shop drawings</li> <li>• interpret basic welding symbols</li> </ul>		
<b>Mentors can assist the apprentice to prepare for this section of technical training by:</b>		
<ul style="list-style-type: none"> <li>• <i>teaching the apprentice how to measure welds</i></li> <li>• <i>mentoring the apprentice through a set of blueprints describing lines and symbols and explaining how to find needed information</i></li> <li>• <i>providing simple drawings for work to be performed</i></li> <li>• <i>pairing the apprentice with a journeyperson to interpret a drawing through the fabrication process, particularly the sequencing of operations</i></li> <li>• <i>allowing the apprentice to assist in the development of templates</i></li> </ul>		
<b>Industrial Mathematics</b>		<b>21 hours</b>
<ul style="list-style-type: none"> <li>• perform arithmetic calculations using whole numbers, fractions and decimals</li> <li>• calculate areas, volumes, and weights</li> <li>• calculate material requirements</li> </ul>		
<b>Mentors can assist the apprentice to prepare for this section of technical training by:</b>		
<ul style="list-style-type: none"> <li>• <i>ensuring the apprentice can read a tape measure in both metric and imperial</i></li> <li>• <i>having the apprentice convert from imperial dimensions to metric dimensions, and back</i></li> <li>• <i>having the apprentice repetitively add imperial measurements, particularly fractions</i></li> <li>• <i>teaching the apprentice to convert decimal measurements to fractions, and back</i></li> <li>• <i>teaching the apprentice to calculate areas, volumes and weights</i></li> <li>• <i>having the apprentice complete actual work-related problems and perform small material quantity estimating</i></li> </ul>		
<b>Metallurgy and Material Designations</b>		<b>10 hours</b>
<ul style="list-style-type: none"> <li>• interpret steel classification information</li> <li>• identify structural shapes, pipe and plate</li> </ul>		
<b>Mentors can assist the apprentice to prepare for this section of technical training by:</b>		
<ul style="list-style-type: none"> <li>• <i>having the mentoring journeyperson describe the effect of different carbon contents in metals</i></li> <li>• <i>explaining the application of steel classification systems</i></li> <li>• <i>having various wall charts showing structural shapes and sizes</i></li> <li>• <i>requiring the apprentice to learn to identify all metal materials in the shop or yard</i></li> </ul>		

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**Trade Safety****12 hours**

- describe fire-fighting equipment and procedures
- describe personal protective equipment and safety practices
- demonstrate safe shop work practices for housekeeping, equipment and tool use
- describe WHMIS
- interpret occupational health and safety regulations
- describe rigging and material handling procedures and equipment

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *providing comprehensive orientation for new employees*
- *clearly establishing housekeeping rules*
- *ensuring proper safety equipment is available*
- *providing training and review of the applicable sections of the OH&S Regulations*
- *having a functioning tool crib that details maintenance and use of tools and equipment*
- *ensuring the apprentice demonstrates proper fire safety through proper storage and disposal of flammable materials*
- *demonstrating the use and care of shop firefighting equipment*
- *having a common area for WHMIS materials and demonstrating the application of labels and the interpretation of MSD sheets*
- *providing the proper manuals for fabrication equipment and having the apprentice read them*
- *providing instructions and demonstrating the safe use of this equipment*
- *giving the apprentice simple tasks to perform to learn the use of the equipment*
- *having the apprentice assist in the maintenance of equipment*
- *describing care and use of lifting equipment and demonstrating knot tying techniques*
- *allowing the apprentice to work alongside someone skilled in proper rigging practices, then monitoring the abilities until trust is gained*

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**Shielded Metal Arc Welding – Theory****13 hours**

- describe the components and accessories of SMAW welding station
- describe operation of constant current power supply
- describe setup procedures
- describe maintenance and troubleshooting procedures
- describe SMAW safety concerns

**Shielded Metal Arc Welding – Shop****33 hours**

- setup a SMAW welding station
- demonstrate safe SMAW work procedures
- weld 14 gauge, horizontal fillet using E6010/11
- weld 14 gauge, lap joint, vertical down
- weld one and three pass horizontal fillet on 1/4 in. MS using E7018
- weld vertical up single and three pass fillet on 1/4 in. MS using E7018

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *describing the different electrodes and their intended uses*
- *having the mentoring journey person demonstrate technique, then monitor progress of the apprentice*
- *allowing the opportunity for the apprentice to train on the different machines that are available*
- *letting the apprentice perform welds on practice materials prior to the actual work required*
- *allowing the apprentice to perform hands-on welding in various situations and positions*

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## Oxy-Fuel Processes – Theory

12 hours

- describe oxy-fuel equipment and accessories
- describe setup, use and shut down procedures
- describe OFW, braze welding, soldering, brazing and OFC
- describe OFW and OFC safety concerns

## Oxy-Fuel Processes – Shop

18 hours

- demonstrate safe setup, use and shut down procedures
- weld gauge metal and flat
- perform braze welding and soldering
- cut plate to fit structural shape contour
- cut plate to bevel
- pierce and cut holes in plate

### Mentors can assist the apprentice to prepare for this section of technical training by:

- *demonstrating different OAW techniques while explaining the equipment and its' intended uses*
- *monitoring until the apprentice is comfortable in the set-up and take-down of this equipment*
- *describing the different gases, fluxes and fillers used*
- *ensuring the apprentice can recognize the types of gas by label*
- *explaining the difference between brazing, braze welding and soldering*
- *ensuring the apprentice fully understands the safety associated with brazing (zinc oxide)*
- *providing scrap cast iron for practice*
- *allowing the apprentice time to complete selected OAW exercises under close supervision*
- *fully describing the different tips and their uses*
- *demonstrating different cutting techniques while explaining the equipment and its' intended uses*
- *allowing the apprentice to flame-cut various thicknesses of different metals and scrap plate – observe the progress and offer hints*
- *giving the apprentice time to practice piercing, cutting circles, bevels and straight cuts*
- *explaining the importance of tip cleaners, demonstrate their use and ensure they are available*
- *downloading the Welder Journeyman Practical Examination candidate information from the apprenticeship website: [www.saskapprenticeship.ca](http://www.saskapprenticeship.ca)*
- *supervising the apprentice to attempt the oxyacetylene cutting test in this document*

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## Wire Feed Welding Processes – Theory

13 hours

- describe the components and accessories of a GMAW welding station
- describe operation of a constant voltage power supply
- describe setup procedures
- describe maintenance and troubleshooting procedures
- identify GMAW safety concerns
- describe the function of all major components of a GMAW, MCAW and FCAW power source

## Wire Feed Welding Processes – Shop

54 hours

- setup a GMAW weld station
- set up weld joints
- weld 14 gauge T-joint downhand
- weld 14 gauge lap joint horizontal pulse
- weld 14 gauge butt joint downhand
- weld 3/8 in. V-groove butt joint in flat position
- weld 3/8 in. V-groove butt joint in vertical position
- weld single and three pass horizontal fillet on 3/8 in. T-joint using MCAW
- weld aluminum horizontal T joint

- weld single and three pass 3/8 in. horizontal fillet on flux core

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *describing the different setup requirements as compared to a GMAW setup*
  - *describing the equipment specific to these processes and the process to change out all applicable parts*
  - *having the mentoring journey person demonstrate technique, then monitor progress of the apprentice*
  - *allowing the opportunity for the apprentice to train on the different machines that are available*
  - *letting the apprentice perform welds on practice materials prior to the actual work required*
  - *allowing the apprentice to perform hands-on welding in various situations and positions*
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**Thermal Cutting**

**14 hours**

- use oxy-fuel cutting to cut a nut from a bolt and cut a sleeve from a shaft
- use air carbon arc cutting to remove a weld, prepare grooves and back gouge
- use plasma arc cutting and gouging process

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *demonstrating gouging techniques*
  - *allowing the apprentice time to practice techniques*
  - *giving hands-on exercises - use the journey person certification exam as practice*
  - *giving opportunities to cut in various environments and positions*
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## Level Two

7 weeks

210 hours

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### Quality Assurance

12 hours

- identify applicable codes and standards
- describe mill test result, heat numbers and material traceability
- describe weld procedure data sheets, electrode data sheets and procedure qualification records
- interpret welder qualification information

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *identifying agencies that set codes and standards*
  - *identifying the codes that govern the welding in Canada for structural steel, boilers and pressure vessels, piping systems, etc.*
  - *showing examples of mill test results, heat numbers and describing how these assist and the importance of material traceability*
  - *describing welding procedure qualification*
  - *describing welder performance qualification*
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### Print Reading and Fabrication

10 hours

- interpret intermediate welding symbols
- interpret intermediate shop drawings
- use notching and miter functions of iron worker
- use press brake
- describe weld positioners

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *reviewing numerous blueprint and specification pages for past and present jobs*
  - *directing the apprentice to find information from a set of blueprints and monitor for difficulties*
  - *ensuring the apprentice understands weld symbols*
  - *providing the proper manuals for fabrication equipment and having the apprentice read them*
  - *supervising hands-on time in the use of press brake and ironworker*
- 

### Metallurgy and Material Designation

11 hours

- describe the physical, chemical and mechanical properties of selected metals
- identify steels by classification system
- identify use of different metals
- describe shop tests used to identify metals

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *explaining the physical and mechanical properties of metals and providing examples of where and why each is used*
- *providing textbooks and exercises to ensure the physical properties of metals are understood*
- *having resource materials on the topic of metallurgy available for the apprentice to review*
- *explaining how alloys affect properties of metals*
- *detailing rod selection for different alloying elements*
- *teaching the apprentice the procedures to identify materials - magnets, grinder spark test, etc.*

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**Wire Feed Welding Processes****23 hours**

- weld 3/8 in. MS horizontal, T-joint, 3 pass, using MCAW
- weld 1/4 in. MS, vertical, T-joint, 3 pass, using FCAW
- describe the welding gases and the CSA and AWS welding wire classification systems
- describe submerged arc welding

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *describing the different setup requirements as compared to a GMAW setup*
  - *describing the equipment specific to these processes and the process to change out all applicable parts*
  - *having the mentoring journey person demonstrate technique, then monitor progress of the apprentice*
  - *allowing the opportunity for the apprentice to train on the different machines that are available*
  - *letting the apprentice perform welds on practice materials prior to the actual work required*
  - *allowing the apprentice to perform hands-on welding in various situations and positions.*
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**Shielded Metal Arc Welding - Theory****18 hours**

- select power sources
- interpret power source technical data
- describe the effect of adjusting all weld parameters
- select electrodes

**Shielded Metal Arc Welding – Shop****92 hours**

- weld 3/8 in. MS, flat V-groove, butt joints – E6010 root, E7018 fill and cap
- weld 3/8 in. MS, Vertical V-groove butt joints - E6010 root, E7018 fill and cap
- weld 3/8 in. MS, Horizontal, V-groove butt joint - E6010

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *continuing to allow the apprentice to complete welds in all positions using a variety of electrodes*
  - *explaining how differing the machine settings will vary operating characteristics*
  - *giving the apprentice work on out-of-position welds*
  - *allowing the apprentice to train on a variety of SMAW machines as available in the shop to see how machines operate differently*
  - *allowing lots of repetitive hands-on welding - use the journey person certification exam as practice*
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**Gas Tungsten Arc Welding – Theory****9 hours**

- describe features of a GTAW power source
- select shielding gas, tungsten, current type, polarity, and amperage
- identify safety concerns in GTAW

**Gas Tungsten Arc Welding - Shop****21 hours**

- weld gauge stainless steel lap joint horizontal fillet
- weld gauge stainless steel corner joint horizontal fillet
- weld gauge aluminum lap joint horizontal fillet
- weld gauge aluminum corner joint horizontal fillet

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *explaining and demonstrating different GTAW processes and procedures*
- *describing the different gases and consumables*
- *allowing the apprentice to perform welds on practice materials prior to the actual work required*
- *allowing the apprentice time to practice techniques*

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## Welding Mathematics 2

14 hours

- apply manipulations to basic formulas to match modifications to basic shapes and objects
- perform equivalent Imperial and Metric calculations and conversions involving weight-volume, weight-length, and vice-versa
- perform advanced welding related problems involving ratios, proportions and percent
- perform advanced lineal and non-lineal problems involving irregular and odd shapes and objects

### **Mentors can assist the apprentice to prepare for this section of technical training by:**

- *ensuring the apprentice can read a tape measure in both metric and imperial*
  - *having the apprentice convert from imperial dimensions to metric dimensions, and back*
  - *having the apprentice repetitively add imperial measurements, particularly fractions*
  - *teaching the apprentice to convert decimal measurements to fractions, and back*
  - *teaching the apprentice to calculate areas, volumes and weights*
  - *having the apprentice complete actual work-related problems and perform small material quantity estimating*
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## Level Three

8 weeks

240 hours

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### Print Reading and Fabrication

17 hours

- interpret advanced welding symbols
- interpret basic piping drawings
- determine material and weld requirements from shop drawings
- use rolls to form material
- fabricate project

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *having the apprentice estimate jobs from blueprints*
  - *providing the proper manuals for fabrication equipment and having the apprentice read them*
  - *providing instructions and demonstrating the safe use of this equipment*
  - *giving the apprentice simple tasks to perform to learn the use of the equipment*
  - *having the apprentice assist in the maintenance of equipment*
  - *having the apprentice determine the sequence of operations for projects*
  - *continuing to have the apprentice fabricate parts requiring interpretation of detailed blueprints and specifications*
  - *monitoring the apprentice for the proper level of ability - should be able to complete projects with a minimum of supervision*
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### Metallurgy

10 hours

- describe tempering, normalizing and annealing
- determine the mechanical properties of metals
- describe pre-heat, interpass and post-heat considerations

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *having weld procedures in place*
  - *having resource materials available relating to welding metallurgy for the apprentice to review*
  - *having the apprentice weld steel that has a high carbon content*
  - *describing the procedures to and having the apprentice perform tempering, normalizing and annealing*
  - *explain and demonstrate how to pre and post-treat materials*
- 

### Special Welding and Cutting Processes

18 hours

- perform cutting procedures on plate - 30 degree bevel, contour cut and hole
- use air carbon arc cutting to remove backing plate
- perform specialized welding processes - SAW, SW, PAW, TW and RW

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *allowing the apprentice to work with less supervision at this point*
  - *assign the apprentice duties to perform using the various cutting processes*
  - *providing resource material for those processes not available and allowing the apprentice to ask questions*
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### SMAW Plate/Pipe Process – Theory

25 hours

- describe weld faults
- describe joint preparation for plate
- describe joint preparation for pipe



**SMAW Plate Process – Shop** **95 hours**

- weld 3/8 in. MS, vertical V-groove butt joints – E6010 root, E7018 fill and cap
- weld 3/8 in. MS, horizontal, V-groove butt joint – E6010
- perform 4GF test using 7018

**SMAW Pipe Process – Shop** **20 hours**

- weld 6 inch schedule 80 pipe in the 2G – 5G position, E6010/7018

**Mentors can assist the apprentice to prepare for these sections of technical training by:**

- *having piping available for practice welding*
- *allowing the apprentice opportunities to weld on non- pressure piping*
- *explaining testing procedures for pipe welding*
- *allowing practice time to perform this process repetitively - use the journey person certification exam as practice*

**Wire Feed Welding Processes – Theory** **12 hours**

- describe the function of all major components of a GMAW, FCAW and MCAW power source
- identify the applications of each process
- identify all weld parameters

**Wire Feed Welding Processes – Shop** **21 hours**

- weld 3/8 in. MS, flat V-groove butt joint using GMAW joint
- weld 3/8 in. MS vertical V-groove butt joint using FCAW

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *describing the equipment specific to these processes and the process to change out all applicable parts*
- *having the mentoring journey person demonstrate technique, then monitor progress of the apprentice*
- *allowing the opportunity for the apprentice to train on the different machines that are available*
- *letting the apprentice perform welds on practice materials prior to the actual work required*
- *allowing the apprentice to perform hands-on welding in various situations and positions*

**Gas Tungsten Arc Welding (GTAW)** **12 hours**

- weld 3/8 in. MS flat open root butt joints in the horizontal position using the GTAW process

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *ensuring the apprentice can convert metric to imperial for volume, capacity and mass as they pertain to water*
- *assisting the apprentice to calculate rolling and jumper offsets*
- *having the apprentice demonstrate the calculation of pipe sizes and flow rates*

**Welding Mathematics 3** **10 hours**

- advanced welding-related calculations involving layouts, rollouts, fitting and loading/lift problems
- calculation management involving compound combinations of welding related materials
- calculation management involving a small project involving diagrams or partial blueprint

**Mentors can assist the apprentice to prepare for this section of technical training by:**

- *having the apprentice convert from imperial dimensions to metric dimensions, and back*
- *having the apprentice repetitively add imperial measurements, particularly fractions*
- *teaching the apprentice to convert decimal measurements to fractions, and back*
- *teaching the apprentice to calculate areas, volumes and weights*
- *having the apprentice complete actual work-related problems and perform small material quantity estimating from diagrams*



**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**

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**District Offices**

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Moose Jaw (306) 694-3735

North Battleford (306) 446-7409

Prince Albert (306) 953-2632

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