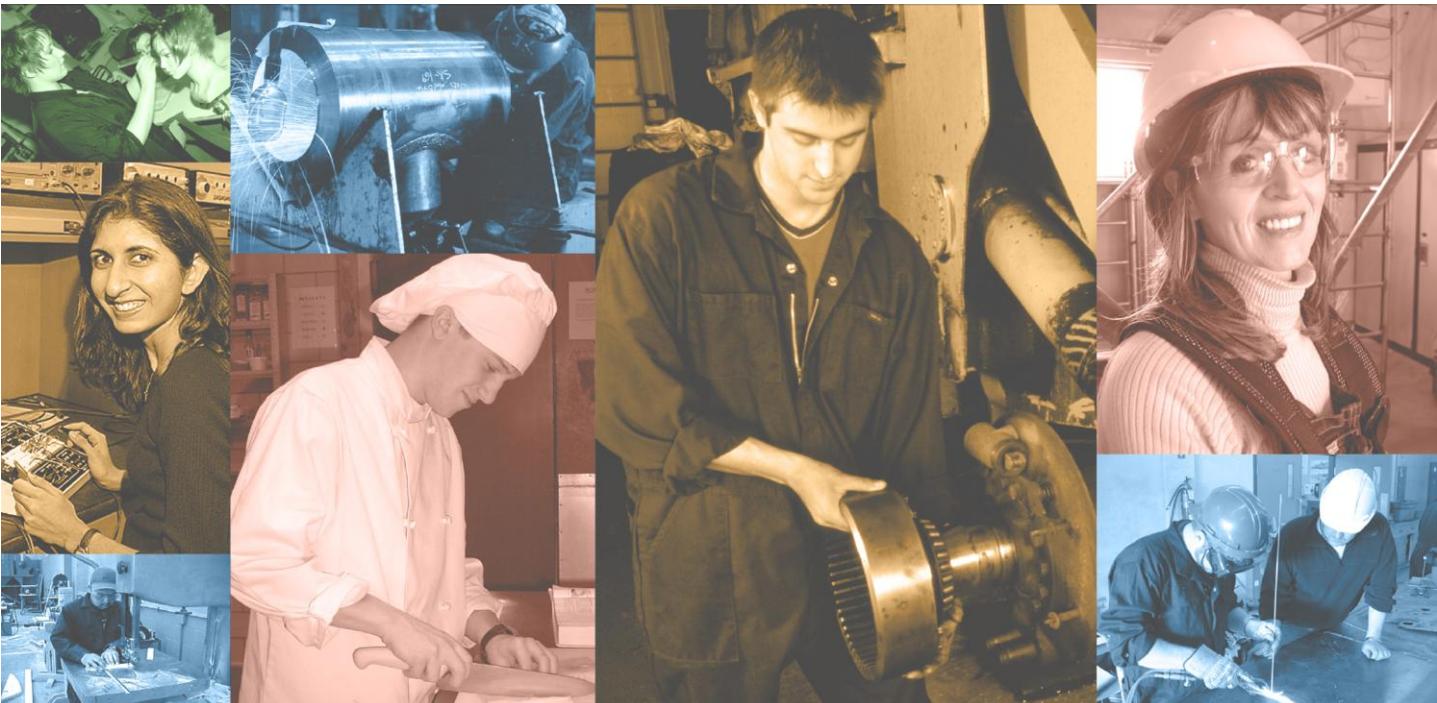


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# Plan of Training

## Metal Fabricator (Fitter)



**Government of Newfoundland and Labrador  
Department of Advanced Education and Skills  
Apprenticeship and Trades Certification Division**

**May 2006**

## Plan of Training – Metal Fabricator (Fitter)

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### Preface

This Apprenticeship Standard is based on the 2003 edition of the National Occupational Analysis for the Metal Fabricator (Fitter) trade.

This document describes the curriculum content for the Metal Fabricator (Fitter) apprenticeship training program and outlines each of the technical training units necessary for the completion of apprenticeship.

### Acknowledgements

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this Apprenticeship Curriculum Standard. Without their dedication to quality apprenticeship training, this document could not have been produced.

We offer you a sincere thank you.

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## A. Program Structure

For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.

The order of course delivery within each block can be determined by the educational agency, as long as pre-requisite conditions are satisfied.

Upon completion of an entry level program, individuals may be required to complete other certifications (employer or job site specific) in order to gain employment.

<b>Block I</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
TS1510	Occupational Health and Safety	6	None
TS1520	WHMIS	6	None
TS1530	Standard First Aid	14	None
WD1165	Hand, Measuring and Layout Tools	15	None
WD1170	Hand and Power Cutting Tools	15	TS1510; WD1165
WD1175	Drilling and Threading Tools	15	WD1170
WD1180	Grinding and Finishing	12	WD1170
WD1185	Bending and Rolling	4	SF1460
WD1270	Shielded Metal Arc Welding (SMAW) Butt Joint – Flat and Horizontal Positions (F-4 Class Electrodes) – Mild Steel	30	WD1620

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<b>Block I</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
WD1340	Gas Metal Arc Welding (GMAW) Fillet Weld – Flat and Horizontal Positions Mild Steel	15	WD1630
WD1600	Oxy-Fuel Cutting, Welding, Heating and Gouging	45	TS1530
WD1610	SMAW (Sheet Metal Arc Welding) 1 – Set-up, Strike and Maintain an Arc	30	WD1600
WD1620	SMAW 2 – Fillet Weld All Positions	60	WD1610
WD1630	GMAW (Gas Metal Arc Welding) 1 – Set-up and Maintain an Arc	15	WD1610
WD1660	Blueprint Reading 1 (Basic)	30	WD1610
WD1670	Blueprint Reading 2 (Welding Symbols)	30	WD1660
WD1680	Metallurgy, Expansion and Contraction Control	30	WD1610
WD1700	Stationary Powered Shearing	6	SF1420
WD1710	Iron Worker Operation	12	TS1510; WD1165
WD1720	Jigs and Fixture Fabrication	15	WD1730
WD1730	Fabrication Fundamentals	15	SF-1420
WD2430	Material Handling, Rigging and Scaffolding	35	TS1510
WD2440	Blueprint Reading 4 (Shop Drawings)	15	WD1670
SF-1400	Press Brake Operation	45	SF1460
SF1410	Roll Forming Equipment and Operation	45	WD1185
SF1420	Basic Layout Operations	20	WD1660

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<b>Block I</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
SF1430	Basic Parallel Line Development	30	SF1420
SF1440	Basic Radial Layout	30	SF1430
SF1450	Basic Triangulation Layout	30	SF1440
SF1460	Basic Plate Development	120	SF1450
SF1470	Basic Assembly and Fitting	40	SF1420
AP1101	Introduction to Apprenticeship	15	None
*AM1100	Math Essentials	30	None
AM1230	Metal Fabrication Math Fundamentals	30	AM1100
CM2160	Communication Essentials	45	None
SD1760	Workplace Essentials	45	None
MC1060	Computer Essentials	15	None
		<b>Total Hours</b>	<b>1010</b>

**\*A student who can meet the mathematics requirement through an ACUPLACER® test may be exempted from AM1100 - Math Essentials. Please check with your training institution.**

### Required Work Experience

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<b>Block II</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
WD1640	GTAW (Gas Tungsten Arc Welding) 1 – Set-up	15	WD1630
WD1650	Plasma Arc Cutting and Gouging	10	WD1610
WD1690	Quality Control	30	WD1610
WD1740	FCAW (Flux Cored Arc Welding) 1 – Set-up and Deposit a Weld	15	WD1630
WD1750	FCAW 2 – Weld Plate (Flat and Horizontal)	15	WD1740
WD1760	Air-Arc Cutting and Gouging	10	WD1270
WD1770	Submerged Arc Welding Set-up	4	WD1270
WD2410	Stud and Spot Resistance Welding	4	WD1620
WD2420	Blueprint Reading 3 (Advanced/CAD)	15	WD1670
SF1490	Structural Components and Detailing Practices	25	SF1420
SF1500	Pressure Vessel & Pipe Drawing Interpretation	10	WD2440
SF1510	Advanced Parallel Line Development	40	SF1430
SF1520	Oxy-Fuel Optical Tracer	6	WD1600
SF1530	CNC Cutting Machine	6	SF1520
SF1540	Finishing and Shipping	6	SF1470
SF1550	On-Site Installation	6	SF1540

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<b>Block II</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
SF1560	Job Planning	6	WD2440
<b>Total Hours</b>		223	

### Required Work Experience

<b>Block III</b>			
<b>Course No.</b>	<b>Course Name</b>	<b>Hours</b>	<b>Pre-Requisite(s)</b>
SF1700	Truss and Girder Fabrication	20	SF1490
SF1710	Advanced Radial Layout	40	SF1440
SF1720	Advanced Triangulation Layout	30	SF1450
SF1730	Advanced Assembly and Fitting	60	SF1470
SF1740	Advanced Plate Development	80	SF1460
<b>Total Hours</b>		230	

<b>Total Course Credit Hours</b>	1463
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## BLOCK I

### TS1510 Occupational Health and Safety

#### **Learning Outcomes:**

- Demonstrate knowledge of interpreting the Occupational Health and Safety Act, laws and regulations.
- Demonstrate knowledge of understanding the designated responsibilities within the laws and regulations such as the right to refuse dangerous work; and the importance of reporting accidents.
- Demonstrate knowledge of how to prevent accidents and illnesses.
- Demonstrate knowledge of how to improve health and safety conditions in the workplace.

**Duration:** 6 Hours

**Pre-Requisite(s):** None

#### **Objectives and Content:**

1. Interpret the Occupational Health and Safety Act laws and regulations.
  - i. explain the scope of the act
    - application of the act
    - Federal/Provincial jurisdictions
    - Canada Labour Code
    - rules and regulations
    - private home application
    - conformity of the Crown by the Act
2. Explain responsibilities under the Act and Regulations.
  - i. duties of employer, owner, contractors, sub-contractors, employees, and suppliers

3. Explain the purpose of joint health and safety committees.
  - i. formation of committee
  - ii. functions of committee
  - iii. legislated rights
  - iv. health and safety representation
  - v. reporting endangerment to health
  - vi. appropriate remedial action
  - vii. investigation of endangerment
  - viii. committee recommendation
  - ix. employer's responsibility in taking remedial action
4. Examine right to refuse dangerous work.
  - i. reasonable grounds for refusal
  - ii. reporting endangerment to health
  - iii. appropriate remedial action
  - iv. investigation of endangerment
  - v. committee recommendation
  - vi. employer's responsibility to take appropriate remedial action
  - vii. action taken when employee does not have reasonable grounds for refusing dangerous work
  - viii. employee's rights
  - ix. assigning another employee to perform duties
  - x. temporary reassignment of employee to perform other duties
  - xi. collective agreement influences
  - xii. wages and benefits
5. State examples of work situations where one might refuse work.
6. Describe discriminatory action.
  - i. definition
  - ii. filing a complaint procedure
  - iii. allocated period of time a complaint can be filed with the Commission
  - iv. duties of an arbitrator under the Labour Relations Act
  - v. order in writing inclusion
  - vi. report to commission Allocated period of time to request Arbitrator to deal with the matter of the request
  - vii. notice of application
  - viii. failure to comply with the terms of an order
  - ix. order filed in the court

7. Explain duties of commission officers.
  - i. powers and duties of officers
  - ii. procedure for examinations and inspections
  - iii. orders given by officers orally or in writing
  - iv. specifications of an order given by an officer to owner of the place of employment, employer, contractor, sub-contractor, employee, or supplier
  - v. service of an order
  - vi. prohibition of persons towards an officer in the exercise of his/her power or duties
  - vii. rescinding of an order
  - viii. posting a copy of the order
  - ix. illegal removal of an order
8. Interpret appeals of others.
  - i. allocated period of time for appeal of an order
  - ii. person who may appeal order
  - iii. action taken by Commission when person involved does not comply with the order
  - iv. enforcement of the order
  - v. notice of application
  - vi. rules of court
9. Explain the process for reporting of accidents.
  - i. application of act
  - ii. report procedure
  - iii. reporting notification of injury
  - iv. reporting accidental explosion or exposure
  - v. posting of act and regulations

**Practical Requirements:**

1. Conduct an interview with someone in your occupation on two or more aspects of the act and report results.
2. Conduct a safety inspection of shop area.

**TS1520      Workplace Hazardous Materials Information System (WHMIS)**

**Learning Outcomes:**

- Demonstrate knowledge of interpreting and applying the Workplace Hazardous Materials Information System (WHMIS) Regulation under the Occupational Health and Safety Act.

**Duration:**      6 Hours

**Pre-Requisite(s):**      None

**Objectives and Content:**

1. Define WHMIS safety.
  - i. rational and key elements
  - ii. history and development of WHMIS
  - iii. WHMIS legislation
  - iv. WHMIS implementation program
  - v. definitions of legal and technical terms
2. Examine hazard identification and ingredient disclosure.
  - i. prohibited, restricted and controlled products
  - ii. classification and the application of WHMIS information requirements
  - iii. responsibilities for classification
    - the supplier
    - the employer
    - the worker - Classification: rules and criteria
    - information on classification
    - classes, divisions and subdivision in WHMIS
    - general rules for classification
    - class A - compressed gases
    - class B - flammable and combustible materials
    - class C - oxidizing material
    - class D - poisonous and infectious material
    - class E - corrosive material
    - class F - dangerously reactive material
  - iv. products excluded from the application of WHMIS legislation

- consumer products
- explosives
- cosmetics, drugs, foods and devices
- pest control products
- radioactive prescribed substances
- wood or products made of wood
- manufactured articles
- tobacco or products of tobacco
- hazardous wastes
- products handled or transported pursuant to the Transportation of Dangerous Goods (TDG) Act

- v. comparison of classification systems - WHMIS and TDG
- vi. general comparison of classification categories
- vii. detailed comparison of classified criteria

3. Explain labeling and other forms of warning.

- i. definition of a WHMIS label
  - supplier label
  - workplace label
  - other means of identification
- ii. responsibility for labels
  - supplier responsibility
  - employer responsibility
  - worker responsibility
- iii. introduce label content, design and location
  - supplier labels
  - workplace labels
  - other means of identification

4. Introduce material safety data sheets (MSDS).

- i. definition of a material safety data sheet
- ii. purpose of the data sheet
- iii. responsibility for the production and availability of data sheets
  - supplier responsibility
  - employer responsibility
  - workers responsibility

**Practical Requirements:**

1. Locate WHMIS label and interpret the information displayed.
2. Locate a MSDS sheet for a product used in the workplace and determine what personal protective equipment and other precautions are required when handling this product.

**TS1530      Standard First Aid**

**Learning Outcomes:**

- Demonstrate knowledge of recognizing situations requiring emergency action.
- Demonstrate knowledge of making appropriate decisions concerning first aid.

**Duration:**            14 Hours

**Pre-Requisite(s):**    None

**Practical Requirements:**

1.      Complete a **St. John Ambulance or Canadian Red Cross Standard First Aid Certificate** course.

## WD1165 Hand, Measuring and Layout Tools

### **Learning Outcomes:**

- Demonstrate knowledge of proper use of hand, measuring and layout tools.

**Duration:** 15 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

1. Identify the types of hand tools and describe their applications, use, care and storage.
  - i. pliers
  - ii. chisels and punches
  - iii. wrenches
    - offset
    - sockets
    - adjustable
    - open end
    - combination
    - box end
    - allen
    - pipe
    - speed
  - iv. vices
    - pipe
    - soft jaw
    - swivel
  - v. straight edges
  - vi. screwdrivers
  - vii. files
  - viii. bolt cutters
  - ix. hammers and mallets

- ball peen
- cross peen
- sledge

- x. torque wrenches
- xi. reamers
- xii. chain hoists
- xiii. jacks
- xiv. tubing cutting tools
- xv. punches
  - center
  - prick
  - pin
- xvi. line up bars (drift pins)
- xvii. clamps

2. Describe the imperial and metric measuring systems and their use in the trade.

3. Identify measuring and layout tools and instruments and describe their parts, applications and procedures for use.

- i. squares
- ii. tape
- iii. compass
- iv. protractors
- v. levels
  - builders
  - laser
  - magnetic
  - water
  - spirit (torpedo)
- vi. gauges
  - hi-lo
  - feeler
  - welding
  - plate thickness
  - wire

- vii. micrometer
- viii. plum bob
- ix. scribes
- x. straight edge
- xi. calipers
- xii. chalk line
  - trammel points
  - dividers

**Practical Requirements:**

1. Layout lines on flat bar.
2. Layout drill gauge.

## WD1170 Hand and Power Cutting Tools

### **Learning Outcomes:**

- Demonstrate knowledge of cutting tools, their applications, maintenance and procedures for use.

**Duration:** 15 Hours

**Pre-Requisite(s):** TS1510; WD1165

### **Objectives and Content:**

1. Describe hand shears, their applications, maintenance and procedures for use.
  - i. cutting techniques
    - sheet metal in a straight line
  - ii. circles
  - iii. angular shapes
2. Describe power shears and nibblers, their applications, maintenance and procedures for use.
  - i. cutting techniques
    - metal in a straight line
  - ii. circles
  - iii. angular shapes
3. Describe squaring shears, their applications, maintenance and procedures for use.
  - i. parts of the shear
  - ii. type of blade
4. Describe hand hacksaws, their applications, maintenance and procedures for use.
  - i. parts of the saw
  - ii. type of blade
5. Describe band and reciprocating saws, their applications, maintenance and procedures for use.

- i. parts of the saw
- ii. type of blade

6. Describe chop saws, their applications, maintenance and procedures for use.

- i. parts of the saw
- ii. types of blades and discs

**Practical Requirements:**

1. Use tools to cut outlines laid out on flat bar and cut out drill gauge.

## WD1175 Drilling and Threading Tools

### **Learning Outcomes:**

- Demonstrate knowledge of drilling, threading and fastening tools, their use and maintenance.

**Duration:** 15 Hours

**Pre-Requisite(s):** WD1170

### **Objectives and Content:**

1. Identify the types of drills and describe their applications, use and maintenance.
  - i. parts
  - ii. sharpening
2. Describe the use and maintenance of hand power drills, drill presses, and magnetic-based drills.
3. Describe taps and dies, their applications, use and maintenance.
  - i. external
  - ii. internal
4. Identify the types of clamps, and describe their applications, use and maintenance.

### **Practical Requirements:**

1. Layout and fabricate drilling and threading exercise as per assigned project.
2. Layout and fabricate circle cutting attachment.

## WD1180 Grinding and Finishing

### **Learning Outcomes:**

- Demonstrate knowledge of grinding and finishing tools and equipment.

**Duration:** 12 Hours

**Pre-Requisites:** WD1170

### **Objectives and Content:**

1. Identify types of portable grinders and describe their applications, maintenance and use.
  - i. wheels
    - abrasive
    - grit
  - ii. speed
  - iii. attachments
  - iv. accessories
2. Identify types of portable sanders and describe their applications, maintenance and use.
  - i. discs
    - abrasive
    - grit
  - ii. speed
  - iii. attachments
  - iv. accessories
3. Identify types of stationary grinders and describe their applications, maintenance and use.
  - i. wheels
    - abrasive
    - grit
  - ii. speed

- iii. attachments
- iv. accessories
  - tool rest adjustment
  - wheel dressers

**Practical Requirements:**

1. Install grinding wheels on stationary grinder.
2. Grind metals with stationary grinders.
3. Demonstrate use of wheel dresser.
4. Grind metals with a portable grinder.

## WD1185 Bending and Rolling

### **Learning Outcomes:**

- Demonstrate knowledge of bending and rolling equipment.

**Duration:** 4 Hours

**Pre-Requisite(s):** SF1460

### **Objectives and Content:**

1. Define terminology associated with bending and rolling requirements.
  - i. tonnage
  - ii. spacing
  - iii. clearance
  - iv. calculations
2. Identify the types of equipment used to bend and roll metal, and describe their applications, maintenance and procedures for use.

### **Practical Requirements:**

None.

**WD-1270 Shielded Metal Arc Welding (SMAW) Butt Joint – Flat and Horizontal Positions (F-4 Class Electrodes) – Mild Steel**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to weld butt joints on mild steel in the flat and horizontal positions with F-4 class electrodes using the SMAW process.
- Demonstrate knowledge of the procedures used to test welds.

**Duration:** 30 Hours

**Prerequisite(s):** WD1620

**Objectives and Content:**

1. Describe the procedures used to weld butt joints on mild steel in the flat position.
  - i. material preparation
  - ii. joint preparation
  - iii. inspection and testing
2. Describe the procedures used to weld butt joints on mild steel in the horizontal position.
  - i. material preparation
  - ii. joint preparation
  - iii. inspection and testing
3. Describe the procedures used to test welds.

**Practical Requirements:**

1. Weld butt joints in the flat and horizontal position with F-4 electrodes using the SMAW process.
2. Conduct a visual inspection of the edge preparation joint fit-up and completed weld assembly.
3. Conduct a bend test.

**WD-1340 Gas Metal Arc Welding (GMAW) Fillet Weld – Flat and Horizontal Positions Mild Steel**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to fillet weld mild steel in the flat and horizontal position using the GMAW process.
- Demonstrate knowledge of the procedures used to test welds.

**Duration:** 15 Hours

**Prerequisite(s):** WD1630

**Objectives and Content:**

1. Describe the process and consumables used to fillet weld on mild steel in the flat and horizontal position.
  - i. shielding gas selection
  - ii. filler materials
  - iii. troubleshooting
  - iv. work and travel angles
  - v. gun manipulation
  - vi. joints
2. Describe the procedures used to test welds.

**Practical Requirements:**

1. Fillet weld in the flat and horizontal position using the GMAW process.
2. Conduct a visual inspection of welds.
3. Conduct a fillet weld break test.

## WD1600 Oxy-Fuel Cutting, Welding, Heating and Gouging

### **Learning Outcomes:**

- Demonstrate knowledge of oxy-fuel equipment.

**Duration:** 45 Hours

**Pre-Requisite(s):** TS1530

### **Objectives and Content:**

1. Describe the procedures used to set-up and shut down oxy-fuel equipment.
  - i. protective equipment
  - ii. cleaning
  - iii. equipment and accessories
    - cylinders (storage and handling)
    - regulators
    - lighter
    - radiograph (semi-automatic track cutter)
    - torches
    - flashback arrestors
    - check valve
    - hose
    - manifold
  - iv. assembling
  - v. tip selection
    - cutting
    - welding
    - heating
    - gouging
  - vi. thread identification
  - vii. pressure adjustment
  - viii. quality of cut
  - ix. gas selection
  - x. types of flames

- xi. testing
- xii. disassembling

2. Identify oxy-fuel cutting, heating and gouging applications and procedures.

- i. sheet metal
- ii. plate
- iii. structural shapes
- iv. pipe

**Practical Requirements:**

- 1. Fusion Welding
  - i. closed corner
  - ii. open corner
  - iii. horizontal lap joint
  - iv. square butt joint
- 2. Bronze Welding
  - i. tinning
  - ii. horizontal lap joint
  - iii. square butt joint
- 3. Silver Brazing
  - i. copper/steel tee joint
  - ii. copper tee tubing
- 4. Cutting
  - i. straight cutting
  - ii. bevel cutting
- 5. Gouging
  - i. gouge groove in flat plate

**WD1610 SMAW (Shielded Metal Arc Welding) 1 Set-up, Strike and Maintain an Arc**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to set-up and maintain an arc.
- Demonstrate knowledge of the procedures used to deposit a weld bead.

**Duration:** 30 Hours

**Pre-Requisite(s):** WD1600

**Objectives and Content:**

1. Define the terminology associated with arc welding.
  - i. mild steel and low alloy steel electrodes
  - ii. AC (Alternating Current)
  - iii. DC (Direct Current) (polarity)
  - iv. Arc Blow
  - v. duty cycle
  - vi. rated amperage
2. Describe the SMAW process.
  - i. general precautions
  - ii. equipment and accessories
    - personal protective equipment
    - ground clamps
    - terminal lugs
    - electrode holders
    - cable connectors
    - cables
  - iii. electrodes
  - iv. codes and standards

3. Describe the characteristics and applications of different power sources.
  - i. AC transformers
  - ii. AC/DC rectifiers
  - iii. DC generators
  - iv. engine drive (gasoline, diesel)
  - v. inverters
4. Describe the set-up and maintenance of welding equipment used in the SMAW process.
5. Describe the procedures used to strike and maintain an electric arc.
6. Describe the procedures and techniques used to deposit a weld bead.
  - i. stringer
  - ii. weave
  - iii. arc length
  - iv. travel speed
  - v. work and travel angles
  - vi. visual inspection

### **Practical Requirements.**

1. Set-up welding equipment check the various external components.
2. Tack weld with (6011) 4311 and (7018) 4918 electrodes.
3. Deposit stringer beads with 4311 and 4918 electrodes.
4. Deposit weave beads with 4311 and 4918 electrodes.
5. Perform padding with 4311 and 4918 electrodes.

## WD1620 SMAW 2 – Fillet Weld All Positions

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to fillet weld mild steel in all positions using the SMAW process.
- Demonstrate knowledge of the procedures used to perform visual inspection of welds.

**Duration:** 60 Hours

**Pre-Requisite(s):** WD1610

### **Objectives and Content:**

1. Identify types of joints and their characteristics.
  - i. tee
  - ii. lap
  - iii. corner
2. Identify types of fillet welds and describe their applications.
  - i. tack
  - ii. composite
  - iii. single-pass
  - iv. multi-pass
  - v. plug
  - vi. slot
3. Describe the procedures used to fillet weld on mild steel in all positions.
  - i. identify position
    - limitations
  - ii. identify material
  - iii. determine thickness of material
  - iv. determine fillet size
  - v. select electrode

- vi. select current

4. Describe the procedures used to test welds.
  - i. destructive
  - ii. non-destructive (visual inspection)
5. Describe weld faults and their causes.

**Practical Requirements:**

1. Perform welds on tee lap and corner joint, all positions.

WD1630 GMAW (Gas Metal Arc Welding) 1–Set-up and Maintain an Arc

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to set-up GMAW equipment, strike and maintain an arc.
- Demonstrate knowledge of the procedures used to disassemble and reassemble GMAW welding systems.
- Demonstrate knowledge of the procedures used to perform a visual inspection of a weld.

**Duration:** 15 Hours

**Pre-Requisite(s):** WD1610

**Objectives and Content:**

1. Define terminology associated with the GMAW process.
2. Describe the GMAW process.
  - i. general precautions
  - ii. equipment and accessories
    - shielding gas and regulators
    - electrode wire
    - gun
    - feeder
    - power source
    - nozzle
    - cable connections
    - cables
    - pulsed arc machines
  - iii. metal transfers
  - iv. polarity
  - v. arc voltage
  - vi. slope and adjustment

- vii. inductance
- viii. travel speed
- ix. wire feed speed
- x. penetration
- xi. travel and work angles
- xii. manipulation
- xiii. guide tubes
- xiv. contact tips
- xv. liners

3. Describe the assembly and disassembly of welding equipment used in the GMAW process.
4. Describe troubleshooting and maintenance procedures for GMAW equipment.
5. Describe the procedures used to establish and maintain an arc.
  - i. starting and stopping the weld
    - finishing end of the joint
  - ii. filler metal
  - iii. adjustment
  - iv. shielding gases (pre and post weld)
  - v. drive rolls
  - vi. gun
  - vii. stick-out
  - viii. speed
6. Describe the procedures and techniques used to deposit a weld bead.
  - i. stringer
  - ii. weave
  - iii. stick-out
  - iv. travel speed
  - v. work and travel angles
  - vi. visual inspection
7. Describe the various gases and gas mixtures and describe their applications.

8. Describe weld faults and their causes.
9. Describe the procedures used to test welds.
  - i. destructive
  - ii. non-destructive (visual inspection)

**Practical Requirements:**

1. Set-up GMAW equipment.
2. Change electrode wire guide.
3. Adjust and check flow meter.
4. Deposit fillet welds on mild steel, various thickness.

## WD1660 Blueprint Reading 1 (Basic)

### **Learning Outcomes:**

- Demonstrate a basic knowledge of blueprints and their purpose.

**Duration:** 30 Hours

**Pre-Requisite(s):** WD1610

### **Objectives and Content:**

1. Identify the various types of lines and their purpose.
2. Identify the various types of lines used on blueprints and describe their applications.
  - i. centre
  - ii. hidden
  - iii. dimension
  - iv. extension
  - v. object
  - vi. break
  - vii. long
  - viii. short
3. Identify views and describe their purpose.
  - i. front
  - ii. right side
  - iii. left side
  - iv. top (plan)
  - v. bottom
  - vi. back
  - vii. section

viii. detailed

4. Identify notes and specifications and describe their purpose.
  - i. parts of objects
  - ii. title block
  - iii. revisions
  - iv. drawing numbers
5. Identify sectioning practices and describe their purpose.
  - i. enlarged
  - ii. isometric
  - iii. auxiliary
  - iv. rotation
  - v. developed view
  - vi. detail
6. Identify and interpret common abbreviations and symbols.
  - i. supplementary symbols
  - ii. outdated and preferred symbols
  - iii. references
  - iv. location of symbols on drawings

**Practical Requirement(s):**

1. Identify the basic lines.
2. Identify various elements (i.e.) views notes and specifications, sections, common symbols and abbreviations.

## WD1670 Blueprint Reading 2 (Welding Symbols)

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to interpret welding abbreviations and symbols.

**Duration:** 30 Hours

**Pre-Requisite(s):** WD1660

### **Objectives and Content:**

1. Identify common welding symbols and abbreviations and describe their applications.
  - i. back gouging
  - ii. melt through
  - iii. finishing
  - iv. processes
2. Identify and interpret the symbols for fillet welds.
  - i. pitch
  - ii. dimension
  - iii. shape
  - iv. finishing
3. Identify and interpret the symbols for groove welds.
  - i. preparation
    - depth
    - angle
  - ii. root spacing
4. Identify and interpret the symbols for melt-through welds.
  - i. root spacing
  - ii. preparation angle
  - iii. backing

- iv. fusible inserts
- 5. Identify and interpret the symbols for plug welds.
  - i. dimensions
  - ii. bevel angle
  - iii. filler thickness
  - iv. number
  - v. pitch
  - vi. shape
- 6. Identify and interpret weld finishing symbols.
  - i. grinding
  - ii. machining
  - iii. chipping
  - iv. hammering
  - v. rolling
  - vi. unspecified
- 7. Identify and interpret pipe welding symbols.

**Practical Requirements:**

- 1. Locate and interpret abbreviations and symbols relevant to the trade
  - i. fillet welds
  - ii. groove welds
  - iii. melt through
  - iv. weld finishing
  - v. plug welds

## WD1680 Metallurgy, Expansion and Contraction Control

### **Learning Outcomes:**

- Demonstrate knowledge of the practices and principles to control expansion, contraction and distortion.

**Duration:** 30 Hours

**Pre-Requisite(s):** WD1610

### **Objectives and Content:**

1. Define terminology associated with metallurgy.
2. Describe the types and characteristics of metals.
  - i. ferrous
  - ii. low carbon
  - iii. medium carbon
  - iv. high carbon
  - v. alloy steel
  - vi. non-ferrous
3. Describe mechanical and physical properties of metals.
  - i. tensile strength
  - ii. yield strength
  - iii. elasticity
  - iv. ductility
  - v. hardness
  - vi. compressive strength
  - vii. fatigue strength
  - viii. impact strength
  - ix. toughness
  - x. density
  - xi. melting point
  - xii. thermal conductivity

- xiii. thermal expansion
- xiv. electrical conductivity and resistance
- xv. corrosion resistance
- xvi. brittleness
- xvii. malleability
- xviii. plasticity
- xix. reaction to heat
  - specific heat
  - heat of fusion

4. Describe the effects on properties of metals when:
  - i. forming
  - ii. shearing
  - iii. punching
  - iv. drilling
  - v. cutting
  - vi. welding
5. Describe the effects of stresses and shrinkage on materials.
  - i. hard
  - ii. brittle
  - iii. tough
  - iv. ductile
6. Describe common methods to determine the type of material and/or weldability.
  - i. spark
  - ii. flame
  - iii. visual
  - iv. chip
  - v. weight
  - vi. magnet
7. Identify pre-heat and post-heat processes and describe their purpose and applications.

- i. temperature
8. Describe various classification systems used for ferrous metals.
  - i. numbering systems
    - SAE (Society Automotive Engineers)
    - AISI (American Iron and Steel Institute)
    - ASTM (American Society of Testing and Materials)
    - CSA (Canadian Standards Association)
  - ii. colour coding of materials
9. Describe common problems in welding medium and high carbon steel.
10. Describe expansion and contraction of metals.
  - i. heating compared with cooling
11. Describe stresses resulting from.
  - i. welding
  - ii. flame cutting
  - iii. shearing
  - iv. unsatisfactory preparation for welding
  - v. forming
  - vi. riveting
12. Describe control of shrinkage in weldments.
  - i. welding sequence
    - back step
    - staggered intermittent
    - chain intermittent
  - ii. weld size and number of passes
  - iii. balancing of shrinkage and other forces
  - iv. pre-heat and post-heat requirements
13. Describe stress relief.
  - i. purpose
  - ii. methods

- heating
- peening
- aging

iii. requirements

14. Describe controlled shrinkage for:

- i. straightening of bent or distorted members
- ii. alignment of sub-assemblies
- iii. pre-bending
- iv. removal of corroded or seized parts

**Practical Requirements:**

1. Identify metals using the spark test.
2. Shape, grind and heat treat chisels.
3. Observe tensile, ductility, hardness, tests.
4. Demonstrate expansion and contraction.
5. Pre-set heated metal.
6. Use pre-setting to straighten bent members.
7. Perform pre-bending.

## WD1700 Stationary Powered Shearing

### **Learning Outcomes:**

- Demonstrate knowledge of powered shearing equipment and its applications.

**Duration:** 6 Hours

**Pre-Requisite(s):** SF1420

### **Objectives and Content:**

1. Identify types of powered shearing equipment and describe their characteristics and applications.
2. Describe the operation of shearing equipment.
  - i. capacity
  - ii. rake angle
  - iii. blade clearance
  - iv. back gauge calibration
  - v. lateral guide squaring
  - vi. operating procedures
  - vii. preventative maintenance

### **Practical Requirements:**

1. Determine capacity of shears.
2. Set-up and operate guillotine plate shears.

## WD1710 Iron Worker Operation

### **Learning Outcomes:**

- Demonstrate knowledge of procedures used to operate iron worker equipment for punching and shearing of structural shapes, plate and sheet sections.
- Demonstrate knowledge of procedures used to perform preventative maintenance on iron workers.

**Duration:** 12 Hours

**Pre-Requisite(s):** TS1510; WD1165

### **Objectives and Content:**

1. Describe the purpose of the iron worker and its accessories.
  - i. punching
  - ii. shearing
  - iii. notching
  - iv. coping
  - v. bending
2. Describe coping and notching.
  - i. blade clearance
  - ii. capacity
3. Describe shearing.
  - i. blades
  - ii. blade clearance
  - iii. capacity
4. Describe angular and square cuts of angle stock.
  - i. capacity
  - ii. back gauge clearance

5. Describe punching.
  - i. die clearance
  - ii. round
  - iii. oblong
  - iv. square
6. Describe bending.
  - i. die selection
  - ii. capacity
7. Describe preventative maintenance procedures.

**Practical Requirements:**

1. Demonstrate notching.
2. Demonstrate punching.
3. Demonstrate shearing.

## WD1720 Jigs and Fixture Fabrication

### **Learning Outcomes:**

- Demonstrate knowledge of jig and fixture fabrication and applications.

**Duration:** 15 Hours

**Pre-Requisite(s):** WD1730

### **Objectives and Content:**

1. Identify common types of jigs and fixtures and describe their purpose and applications.
2. Describe common methods used to fabricate jigs and fixtures.
  - i. design considerations
  - ii. fabrication practices

### **Practical Requirements:**

1. Fabricate jigs and fixtures.
  - i. set-up multi-punch operation
  - ii. fabricate jig to allow multi-drilling
  - iii. set-up jig to allow for shearing
  - iv. fabricate jig to accommodate truss assembly for welding
  - v. fabricate jig to accommodate ladder assembly

## WD1730 Fabrication Fundamentals

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare joints on structural shapes to industry standards.
- Demonstrate knowledge of the procedures used to fabricate using various structural shapes.

**Duration:** 15 Hours

**Pre-Requisite(s):** SF1420

### Objectives and Content:

1. Identify the various types of structural steel shapes and describe the procedures used to determine their dimensions.
  - i. S-beam (standard)
  - ii. WF-beam (wide flanged beam)
  - iii. angle iron
  - iv. channel
  - v. I-beam
  - vi. pipe and tubing
2. Identify the methods used to prepare joints on structural steel shapes to industry standards.
3. Describe the procedures used to work accurately from shop drawings or sketches.
  - i. read shop drawings
  - ii. verify dimensions
  - iii. cut parts as per shop drawings
4. Describe the procedures used to fabricate using various structural shapes.

**Practical Requirements:**

None.

## WD2430 Material Handling, Rigging and Scaffolding

### **Learning Outcomes:**

- Demonstrate knowledge of rigging, hoisting, lifting equipment, scaffolding, accessories and practices.

**Duration:** 35 Hours

**Pre-Requisite(s):** TS1510

### **Objectives and Content:**

1. Identify Provincial regulations applicable to material handling, rigging and scaffolding.
2. Describe the procedures for manual lifting.
3. Describe responsibilities and liabilities in the use of equipment for rigging, lifting and hoisting.
4. Describe the variables to consider when hoisting.
  - i. weight of objects
  - ii. object of configuration
  - iii. materials
  - iv. materials for blocking
5. Describe the methods of hoisting, their applications and procedures for use.
6. Describe the various types of wire ropes, chains, cables, cable clamps and their accessories.
  - i. characteristics
  - ii. applications
  - iii. precautions
  - iv. procedures for use
  - v. inspection

7. Identify and describe the various types of lifting clamps.
  - i. characteristics
  - ii. applications
  - iii. precautions
  - iv. inspection
  - v. procedures for use
8. Identify types of come alongs, rope and chain falls, and describe their applications and procedures for use.
9. Identify types of jacks and describe their applications and procedures for use.
  - i. hydraulic
  - ii. screw
  - iii. ratchet
10. Describe stacking and blocking.
  - i. structural shapes
  - ii. plate and sheet
  - iii. weldments and components
11. Describe the methods of securing chains to provide for manipulation of structural shapes.
12. Identify types of slings and describe their applications and procedures for use.
  - i. wire rope slings
  - ii. nylon slings
13. Describe use of hooks and shackles.
14. Describe rope and its use.
  - i. sizes
  - ii. care and inspection
  - iii. knots
    - bowline

- square or reef
- round turn and two half hitches
- scaffold hitch
- whipped ends and eyes

15. Describe use of chokers, slings and tag lines.
16. Describe spooling of line on drums.
  - i. over wind
  - ii. under wind
  - iii. left and right hand lay lines
17. Describe practices for use of tackle.
  - i. safety factors
  - ii. reeving practices
18. Identify mechanical types of hoisting methods and describe their applications.
  - i. overhead crane
  - ii. jib crane
  - iii. boom crane
  - iv. mobile crane
  - v. fork lifts
19. Describe standard hand signals.
20. Identify the different types of scaffolds, and describe their applications and procedures for use.
  - i. tube and clamp
  - ii. manufactured platforms and scaffolding
  - iii. rolling scaffolding
  - iv. suspended scaffolding

21. Describe safety requirements for erecting and working on scaffolding.
  - i. kick plates
  - ii. braces
  - iii. ties
  - iv. planking
  - v. permits
  - vi. tagging
  - vii. fall arrest
  - viii. railings
  
22. Describe special problems of rolling and suspended scaffolding and guidelines for their use.
  
23. Identify types of ladders and describe their applications and use.
  
24. Identify power line hazards when using lifting equipment.

**Practical Requirements:**

1. Make up spreader bar.
  
2. Tie knots using fiber rope.
  - i. reef knot
  - ii. bowline knot
  - iii. round turn and hitch
  - iv. scaffold hitch
  - v. demonstrate hand signals

## WD2440 Blueprint Reading 4 (Shop Drawings)

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to identify structural components from shop drawings.
- Demonstrate knowledge of the procedures used to draw templates for structural parts.

**Duration:** 15 Hours

**Pre-Requisite(s):** WD1670

### **Objectives and Content:**

1. Identify and interpret abbreviations used on shop drawings.
2. Identify and interpret various structural components found on shop drawings.
  - i. column
  - ii. beam
  - iii. truss
  - iv. purlin
  - v. joists
3. Identify and interpret shop drawings.
  - i. beams
  - ii. columns
  - iii. stairs
  - iv. brace
4. Identify and interpret information used to cut beams to desired dimensions from shop drawings.
  - i. notch
  - ii. cut
  - iii. cope

5. Describe the procedures used to draw templates for structural parts.

**Practical Requirements:**

1. Interpret instructions and symbols found on working drawings.
2. Draw templates for structural parts.

SF1400      Press Brake Operation

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to bend sheet and plate using a press brake.
- Demonstrate knowledge of the procedures used to layout materials in preparation for bending.
- Demonstrate knowledge of the procedures used to perform operational adjustments and corrective maintenance.

**Duration:**      45 Hours

**Pre-Requisite(s):**      SF1460

**Objectives and Content:**

1. Identify types of press brakes and describe their applications.
  - i. hydraulic
  - ii. mechanical
  - iii. Computerized Numerical Control (CNC)
2. Describe the set-up of press brake machinery.
  - i. attachments
  - ii. adjustments
  - iii. machine capabilities
    - sheet
    - plate
    - ferrous and non-ferrous
3. Describe the procedures used to layout materials for bending on a press brake.
  - i. allowances
    - future operations
    - bending
  - ii. dies and jigs
  - iii. bending charts
  - iv. bending sequence

4. Describe operational maintenance of press brake equipment.

**Practical Requirements:**

1. Set-up press brake.
2. Layout materials in preparation for bending.
3. Bend sheet and plate using a press brake, as per blueprint.
4. Perform operational adjustments and corrective maintenance.

**SF1410 Roll Forming Equipment and Operation**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to roll ferrous and non-ferrous plate, sheet and structural shapes to specified dimensions.
- Demonstrate knowledge of attachments used with roll forming equipment.
- Demonstrate knowledge of the procedures used to perform maintenance to roll forming equipment.

**Duration:** 45 Hours

**Pre-Requisite(s):** WD1185

**Objectives and Content:**

1. Describe the procedures used to set-up roll forming equipment.
2. Describe operation of equipment for:
  - i. roll configuration
  - ii. pre-bend
  - iii. capacity
  - iv. template
    - over roll
    - under roll
3. Describe the procedures used to roll ferrous and non-ferrous plate, sheet and structural shapes to specified dimensions.
  - i. equipment selection
  - ii. effects of rolling on material
4. Identify types of attachments and describe their applications, installation and adjustment.
  - i. cone rolling
  - ii. flat bar rolling
  - iii. angle rolling

5. Describe maintenance of roll forming equipment.

**Practical Requirements:**

1. Set-up plate rolling equipment.
2. Roll mild steel plate as per blueprint.

## SF1420 Basic Layout Operations

### **Learning Outcomes:**

- Demonstrate knowledge of basic layout operations.
- Demonstrate knowledge of the procedures used to perform a simple sketch.

**Duration:** 20 Hours

**Pre-Requisite(s):** WD1660

### **Objectives and Content:**

1. Describe methods used to carry out basic layout operations.
2. Describe geometric operations used in performing layout.
  - i. bisecting lines and circles
  - ii. erecting perpendiculars
  - iii. dividing lines and circles
  - iv. trisecting angles
  - v. drawing a tangent from a given point
  - vi. constructing a pentagon
  - vii. constructing a hexagon
  - viii. constructing an octagon
  - ix. drawing an ellipse
  - x. drawing a spiral/helix
3. Describe the procedures to perform a simple sketch.

### **Practical Requirements:**

1. Perform layout operations.

SF1430 Basic Parallel Line Development

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to perform basic parallel line development.

**Duration:** 30 Hours

**Pre-Requisite(s):** SF1420

**Objectives and Content:**

1. Describe terminology associated with parallel line development.
2. Describe the purpose of parallel line development.
3. Describe cylinders with various mitre cuts.
  - i. use of views
  - ii. methods of development
  - iii. elements
  - iv. pattern of development
4. Describe two, three, four and five piece elbows.
  - i. elbow rule
  - ii. types of patterns
  - iii. necessary view
  - iv. pattern development
5. Describe layout to provide for bending of flat surfaces at various angles.
6. Describe development of pipe or tubing tee.
  - i. equal and unequal diameters
  - ii. unequal diameter with branch placed off centre
  - iii. method of establishing mitre lines (line of cut)
  - iv. pattern development

**Practical Requirements:**

1. Perform basic parallel line development as per job sheet.

## SF1440 Basic Radial Layout

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to perform basic radial line development.
- Demonstrate knowledge of the procedures used to use radial line layout in combination with other layout methods.

**Duration:** 30 Hours

**Pre-Requisite(s):** SF1430

### **Objectives and Content:**

1. Define terminology associated with radial line development.
2. Describe the purpose of radial line development.
3. Describe development of conical sections.
  - i. plane through cone  $90^\circ$  to axis of circle
  - ii. plane through both sides inclined to the axis of an ellipse
  - iii. plane through apex of a cone vertically to the base triangle
  - iv. plane through a cone parallel to the apex in a hyperbola
  - v. plane through a cone parallel to its sides in a parabola
4. Describe the process to draw a truncated cone.
  - i. concentric
  - ii. eccentric
5. Describe development of a round cylinder intersecting a cone at  $90^\circ$ .
  - i. intersecting radial line to parallel line

### **Practical Requirements:**

1. Perform basic radial line development as per job sheet.

## SF1450 Basic Triangulation Layout

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures to use triangulation to develop patterns.
- Demonstrate knowledge of the procedures to use triangulation layout in combination with other layout methods.

**Duration:** 30 Hours

**Pre-Requisite(s):** SF1440

### **Objectives and Content:**

1. Define terminology associated with triangulation.
2. Describe the purpose of triangulation.
3. Describe true length lines.
  - i. use of plan and elevation to determine true lengths
  - ii. numbering and lettering
4. Describe development of transitional concentric and eccentric shapes.
  - i. square to square
  - ii. square to rectangular
  - iii. square to round

### **Practical Requirements:**

1. Perform basic triangulation development as per job sheet.

**SF1460      Basic Plate Development**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to lay out basic cylinders, cones, hoppers and chutes.
- Demonstrate knowledge of the procedures to use plate development in combination with other layout methods.

**Duration:**            120 Hours

**Pre-Requisite(s):**   SF1450

**Objectives and Content:**

1.      Describe the purpose of plate development.
2.      Identify types of cylinders and describe their applications.
  - i.      small shop fabricated
  - ii.     large field assembled
3.      Interpret drawings and identify material type and size of cylinder.
4.      Describe cylinder development.
  - i.      interpret the drawing
    - inside diameter
    - outside diameter
    - mean diameter
  - ii.     check materials
  - iii.    stretch-out of plate material
  - iv.     preparation of plate for layout
    - squaring up
    - marking-out in preparation for beveling
    - reason for roll up or roll down
    - mark out for assembly holes
5.      Describe cones and development of conical shapes.
  - i.      interpret the drawing

- ii. check materials
- iii. method of development
  - one piece cone
  - two half sections
- iv. layout methods
  - plate thickness allowance
  - calculation of true lengths
  - marking out radial lines
  - prepare plate edges for welding or bolting
  - mark up plates for bending
  - prepare bending templates
  - use template to check accuracy of contours

6. Identify hoppers and describe their applications.

- i. small shop fabricated
- ii. simple square
- iii. simple rectangular

7. Interpret drawings and identify material type and size of hopper.

8. Describe layout for plate development of hoppers and chutes.

- i. thickness of plate
- ii. bending allowance
- iii. calculation of true lengths
- iv. bevels and angles
- v. establish work and bend lines
- vi. make bending templates
- vii. marking of material
- viii. bolt hold pattern

**Practical Requirements:**

1. Lay out and fabricate basic shapes as per job sheet.
2. Lay out and fabricate basic hoppers.

**SF1470 Basic Assembly and Fitting**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to fit and assemble basic shop and field units.
- Demonstrate knowledge of common accessories and related equipment.

**Duration:** 40 Hours

**Pre-Requisite(s):** SF1420

**Objectives and Content:**

1. Define terminology associated with assembly and fitting.
2. Identify common accessories used to assemble and fit components and describe their applications.
  - i. dogs
  - ii. wedges
  - iii. clips
  - iv. angles
  - v. tie-down plates
  - vi. spider jigs
3. Describe the procedures used to fit-up and assemble:
  - i. small units
  - ii. large units
  - iii. large units to be disassembled for field erection
4. Describe the procedures to layout and fit complex beams and columns.
  - i. interpret drawings
  - ii. check bill of materials and mill certificate
  - iii. determine layout
  - iv. check gauges
  - v. block outs
  - vi. copes
  - vii. clearances

- viii. mark up
- ix. back check of work

**Practical Requirements:**

- 1. Fabricate beams and columns as per blueprint instructions.

**AP1101      Introduction to Apprenticeship**

**Learning Outcomes:**

- Demonstrate knowledge of how to become a registered apprentice.
- Demonstrate knowledge of the steps to complete an apprenticeship program.
- Demonstrate knowledge of various stakeholders in the apprenticeship process.
- Demonstrate knowledge of the Red Seal Program.

**Duration:**      15 Hours

**Pre-Requisite(s):**      None

**Objectives and Content:**

1. Define the following terms:
  - i. apprenticeship
  - ii. apprentice vs. registered apprentice
  - iii. Journeyperson vs. Certified Journeyperson
  - iv. Certificate of Apprenticeship
  - v. Certificate of Qualification
  - vi. Recognition of Prior Learning
  - vii. dual certification
2. Explain the apprenticeship system in Newfoundland and Labrador and the roles and responsibilities of those involved.
  - i. registered apprentice
  - ii. training institution
  - iii. employer
  - iv. Journeyperson
  - v. Department of Advanced Education and Skills
    - Industrial Training Section
    - Standards and Curriculum Section
  - vi. Provincial Trade Advisory Committees
  - vii. Provincial Apprenticeship and Certification Board

3. Identify the Conditions Governing Apprenticeship.
4. Describe the training and educational requirements.
  - i. pre-employment (entry level) training
  - ii. block release
  - iii. on-the-job
5. Explain the steps in the registered apprenticeship process.
  - i. criteria for eligibility
    - entrance requirements as per Conditions of Apprenticeship
    - employment
  - ii. registration process
    - application requirements
  - iii. Memorandum of Understanding
    - probation period
    - cancellation
  - iv. Record of Occupational Progress (Logbook)
    - signing off skills
    - recording hours
    - updating PDO on progress
  - v. class calls
    - schedule
    - EI Eligibility
    - Direct Entry
    - advanced level
  - vi. Block Exams
  - vii. progression
    - schedule
    - wage rates
  - viii. cancellation of apprenticeship
  - ix. Practical Examinations
  - x. Provincial and Interprovincial examinations
  - xi. certification
    - Certification of Apprenticeship
    - Certification of Qualification
    - Provincial certification
    - Interprovincial Red Seal endorsement

6. Explain the Interprovincial Standards Red Seal Program.
  - i. designated Red Seal trade
  - ii. the National Occupational Analysis (NOA)
  - iii. Interprovincial (IP) Red Seal Endorsement Examination
  - iv. relationship of NOA to IP Examination
  - v. qualification recognition and mobility
7. Identify the current financial incentives available to apprentices.
8. Explain the NL apprenticeship and trades certification division's out-of- province apprenticeship policy.

**Practical Requirements:**

1. Use the Provincial Apprenticeship and Trades Certification web site at [www.gov.nl.ca/app](http://www.gov.nl.ca/app) to:
  - i. locate, download, and complete the Application for Apprenticeship and Memorandum of Understanding (MOU)
  - ii. locate, download, and complete the Out of Province registration forms
    - Application for Apprenticeship (out of province)
    - Letter of Understanding (LOU)
    - Acceptance of Conditions Letter
  - iii. locate, download, and complete the Work Experience Credits form
  - iv. identify the locations of all Industrial Training offices
  - v. locate and review the following learning resources relevant to the trade:
    - Study Guide
    - Exam Preparation Guide
    - Plan of Training
2. Use a logbook for this trade to:
  - i. identify the hours for the trade (in-school and on-the-job)
  - ii. identify the number of blocks
  - iii. identify the courses in each block
  - iv. identify the workplace skills to be completed and verified

3. Use the Red Seal Web site, <http://www.red-seal.ca> to retrieve the National Occupational Analyses (NOA) for this trade.
  - i. identify the following components of the NOA:
    - Trends
    - Scope
    - Key Competencies
    - Blocks
    - Tasks
    - Subtasks
    - Pie Charts
    - Table of Specifications

## AM1100 Math Essentials

Note: It is recommended that AM1100 be delivered in the first semester of the Entry Level training program.

### **Learning Outcomes:**

- Demonstrate knowledge of the numeracy skills required to begin the 2<sup>nd</sup> level math course.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of mathematical principles in trade problem solving situations.
- Demonstrate the ability to solve simple mathematical word problems.

**Duration:** 30 Hours

**Pre-Requisite(s):** None

### **Objectives and Content:**

*Wherever possible, the instructor should use trade specific examples to reinforce the course objectives*

1. Use multiplication tables from memory.
2. Perform whole number operations.
  - i. read, write, count, round off, add, subtract, multiply and divide whole numbers
3. Apply the order of operations in math problems.
4. Perform fraction and mixed number operations.
  - i. read, write, add, subtract, multiply and divide fractions

5. Perform decimal operations.
  - i. read, write, round off, add, subtract, multiply and divide decimals
6. Perform percent/decimal/fraction conversion and comparison.
  - i. convert between fractions, decimals and percents
7. Perform percentage operations.
  - i. read and write percentages
  - ii. calculate base, rates and percentages
8. Perform ratio and proportion operations.
  - i. use a ratio comparing two quantities with the same units
  - ii. use a proportion comparing two ratios
9. Use the imperial measurement system in math problems.
  - i. identify units of measurement for:
    - length
    - mass
    - area
    - volume
    - capacity
10. Use the metric measurement system in math problems.
  - i. identify units of measurement for:
    - length
    - mass
    - area
    - volume
    - capacity

### **Practical Requirements:**

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

## AM1230 Metal Fabrication Math Fundamentals

### Learning Outcomes:

- Demonstrate knowledge of mathematical concepts in the performance of trade practices.
- Demonstrate knowledge of mathematics as a critical element of the trade environment.
- Demonstrate knowledge of solving mathematical word problems.
- Demonstrate knowledge of mathematical principles for the purposes of problem solving, job and materials estimation, measurement, calculation, system conversion, diagram interpretation and scale conversions, formulae calculations, and geometric applications.

**Duration:** 30 Hours

**Pre-Requisite(s):** AM1100

### Objectives and Content:

*The instructor is required to use trade specific examples to reinforce the course objectives.*

1. Employ percent/decimal/fraction conversion and comparison in trade specific situations.
2. Apply ratios and proportions to trade specific problems.
3. Use the Imperial Measurement system in trade specific applications.
4. Use the Metric Measurement system in trade specific applications.
5. Complete Imperial/Metric conversions in trade specific situations.
  - i. convert between imperial and metric measurements
  - ii. convert to another unit within the same measurement system

6. Manipulate formulas using cross multiplication, dividing throughout, elimination, and substitution to solve trade specific problems, such as:
  - i. right angle triangles
  - ii. area
  - iii. volume
  - iv. perimeter
7. Perform calculations involving geometry that are relevant to the trade, such as:
  - i. angle calculations
  - ii. circle calculations
8. Use practical math skills to complete administrative trade tasks.
  - i. material estimation
  - ii. material costing
  - iii. time & labour estimates
  - iv. taxes & surcharges
  - v. markup & projecting revenue

**Practical Requirements:**

1. To emphasize or further develop specific knowledge objectives, students will be asked to complete practical demonstrations which confirm proper application of mathematical theory to job skills.

Note:

This course has been designated as NON-TRANSFERABLE to other trades programs, and NOT ELIGIBLE FOR PRIOR LEARNING ASSESSMENT. Students completing training in this trade program are required to complete this math course.

## CM2160 Communication Essentials

### Learning Outcomes:

- Demonstrate knowledge of the importance of well-developed writing skills in the workplace and in career development.
- Demonstrate knowledge of the purpose of various types of workplace correspondence.
- Demonstrate knowledge of the principles of effective workplace writing.
- Demonstrate knowledge of standard formats for letters and memos.
- Demonstrate knowledge of principles related to writing effective letters and memos.
- Demonstrate the ability to prepare and deliver an oral presentation.
- Demonstrate knowledge of the importance of effective interpersonal skills in the workplace.

**Duration:** 45 Hours

**Pre-Requisite(s):** None

### Objectives and Content:

*Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.*

1. Identify the principles for writing clear, concise, complete sentences and paragraphs which adhere to the conventions of grammar, punctuation, and mechanics.
2. Identify the principles of effective workplace writing.
  - i. describe the value of well-developed writing skills to career success
  - ii. discuss the importance of tone, and language or word choice in workplace communication, regardless of the circumstances
  - iii. demonstrate an awareness of cultural differences when preparing workplace correspondence
  - iv. describe the writing process as it applies to workplace communication
    - planning
    - writing

- editing/revising
- v. identify the parts of a business letter and memo, and when each should be used in the workplace
- vi. identify the standard formats for business letters and memos
- vii. identify guidelines for writing sample letters and memos which convey:
  - acknowledgment
  - routine request
  - routine response
  - complaint
  - refusal
  - persuasive request
  - letters of appeal

3. Identify types of informal workplace documents.

- i. identify types & purposes of reports
  - incident
  - process
  - progress
- ii. identify common trade specific forms
- iii. describe primary and secondary methods used to gather information
- iv. discuss the importance of accuracy and completeness in reports and forms

4. Identify the elements of presentations used in the workplace.

- i. identify presentation types
  - impromptu
  - informative
  - demonstration
  - persuasive
- ii. identify the components of an effective presentation
  - eye contact
  - body language
  - vocal qualities
  - audience analysis
  - multimedia tools
  - keeping on topic

5. Demonstrate an understanding of interpersonal communications in the workplace.
  - i. identify listening techniques
  - ii. demonstrate an understanding of group dynamics
  - iii. describe the importance of contributing information and expertise in the workplace
  - iv. describe the importance of respectful and open communication in the workplace
  - v. identify methods to accept and provide feedback in a constructive and considerate manner
  - vi. explain the role of conflict in a group to reach solutions
6. Identify acceptable workplace uses of communication technologies.
  - i. cell / Smart Phone etiquette
  - ii. voice mail
  - iii. e-mail
  - iv. teleconferencing / videoconferencing for meetings and interviews
  - v. social networking
  - vi. other emerging technologies

**Practical Requirements:**

1. Write well-developed, coherent, unified paragraphs.
2. Write sample letters and memos.
3. Write one short informal report.
4. Complete a selection of at least 3 trade-related forms.
5. Deliver an effective oral presentation.

**SD1760      Workplace Essentials**

**Note:** It is recommended that SD1760 be delivered in the second half of the Entry Level training program.

**Learning Outcomes:**

- Demonstrate knowledge of workplace essentials in the areas of meetings, unions, workers compensation, workers' rights, and human rights.
- Demonstrate knowledge of good customer service practices.
- Demonstrate knowledge of effective job search techniques.

**Duration:**            45 Hours

**Pre-Requisite(s):**    None

**Objectives and Content:**

*Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.*

1. Identify common practices related to workplace meetings.
  - i. identify and discuss meeting format and preparation required for a meeting
  - ii. explain the purpose of an agenda
  - iii. explain the expected roles, responsibilities, and etiquette of meeting participants
2. Define unions and identify their role in the workplace.
  - i. identify the purpose of unions
  - ii. identify a common union structure
  - iii. identify the function of unions in this trade

3. Demonstrate an understanding of the Worker's Compensation process.
  - i. describe the aims, objectives, regulations and benefits of the Workplace Health, Safety and Compensation Commission
  - ii. explain the role of the Workers Advisor
  - iii. explain the internal review process
4. Demonstrate an understanding of workers' rights.
  - i. define labour standards
  - ii. identify regulations, including:
    - hours of work & overtime
    - termination of employment
    - minimum wages & allowable deductions
    - statutory holidays, vacation time, and vacation pay
5. Demonstrate an understanding of Human Rights issues.
  - i. examine the Human Rights Code and explain the role of the Human Rights Commission
  - ii. define harassment in various forms and identify strategies for prevention
    - direct
    - systemic
    - adverse effect
  - iii. identify gender and stereotyping issues in the workplace
  - iv. define basic concepts and terms related to workplace diversity including age, race, culture, religion, socio-economic status, and sexual orientation
6. Demonstrate an understanding of quality customer service.
  - i. explain why quality service is important
  - ii. identify barriers to quality customer service
  - iii. identify customer needs & common methods for meeting them
  - iv. identify and discuss the characteristics & importance of a positive attitude
  - v. identify the importance of demonstrating good communication skills including body language, listening, questioning, and when using electronic communication devices
  - vi. identify techniques for interacting with challenging customers to address complaints and resolve conflict

7. Demonstrate an understanding of effective job search techniques.
  - i. identify and explain employment trends, opportunities, and sources of employment
  - ii. identify and discuss essential skills for the trades as outlined by Human Resources and Skills Development Canada
  - iii. review job ads and identify the importance of fitting qualifications to job requirements
  - iv. identify the characteristics of effective resumes, the types of resumes, and principles of resume formatting
  - v. identify the characteristics of an effective cover letter
  - vi. identify the components of a portfolio, and discuss the value of establishing and maintaining a personal portfolio
  - vii. identify the common characteristics of the job interview process:
    - pre-interview preparation
    - interview conduct
    - post-interview follow up

**Practical Requirements:**

1. Create a resume.
2. Create a cover letter.
3. Participate in a mock job interview.

## MC1060 Computer Essentials

### Learning Outcomes:

- Demonstrate knowledge of computer systems and their operation.
- Demonstrate knowledge of popular software packages and their applications.
- Demonstrate knowledge of security issues related to computers.

**Duration:** 15 Hours

**Pre-Requisite(s):** None

### Objectives and Content:

*Wherever possible, the instructor is expected to use trade specific examples to reinforce the course objectives.*

1. Identify the major external components of a microcomputer system.
  - i. input devices
  - ii. output devices
  - iii. central control unit
2. Use operating system software.
  - i. start and quit a program
  - ii. use the help function
  - iii. use the find function
  - iv. maximize and minimize a window
  - v. use the task bar
  - vi. adjust desktop settings such as screen savers, screen resolution, and backgrounds
  - vii. shut down a computer
3. Perform file management commands.
  - i. create folders
  - ii. copy files and folders
  - iii. move files and folders
  - iv. rename files and folders
  - v. delete files and folders

4. Use word processing software to create documents.
  - i. enter text
  - ii. indent and tab text
  - iii. change text attributes (bold, underline, font, etc.)
  - iv. change layout format (margins, alignment, line spacing)
  - v. spell check and proofread
  - vi. edit text
  - vii. save document
  - viii. print document
  - ix. close document
  - x. retrieve documents
5. Use spreadsheet software to create spreadsheets.
  - i. enter data in cells
  - ii. create formulas to add, subtract, multiply and divide
  - iii. save spreadsheet
  - iv. print spreadsheet
  - v. close spreadsheet
  - vi. retrieve spreadsheet
6. Access the Internet.
  - i. access websites using the world wide web(www)
  - ii. identify examples of web browsers
  - iii. use search engines with common searching techniques
  - iv. describe security issues
7. Use electronic mail.
  - i. describe e-mail etiquette
    - grammar and punctuation
    - privacy and legal issues when sharing and forwarding e-mail
    - work appropriate content
    - awareness of employer policies
  - ii. manage e-mail using the inbox, sent, and deleted folders
  - iii. send an e-mail message with attachment(s)
  - iv. print e-mail

**Practical Requirements:**

None.

## BLOCK II

### WD1640 GTAW (Gas Tungsten Arc Welding) 1 - Set-up

#### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to set-up equipment, strike and maintain an arc.
- Demonstrate knowledge of the procedures used to perform visual inspection of welds.

**Duration:** 15 Hours

**Pre-Requisites:** WD1630

#### **Objectives and Content:**

1. Define terminology associated with the GTAW process.
2. Describe the GTAW process.
  - i. general precautions
  - ii. equipment and accessories
    - power sources
    - torches
    - flow meters
  - iii. electrodes
  - iv. current requirement
  - v. shielding gases
  - vi. travel and work angles
  - vii. filler rods
  - viii. joint types and their preparation
  - ix. edge preparations
  - x. weld types
3. Describe the procedures to assemble and disassemble GTAW welding equipment.

4. Describe the procedures used to establish and maintain an arc.
  - i. conventional and pulse arc welding
5. Describe the procedures used to test welds.
  - i. destructive
  - ii. non-destructive (visual inspection)

**Practical Requirements:**

1. Set-up GTAW equipment, strike and maintain arc.
2. Change electrode, collet and collet body.
3. Adjust and check flow meter.
4. Run beads on cold rolled steel plate.
5. Shut down equipment.

## WD1650 Plasma Arc Cutting and Gouging

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to set-up and operate plasma arc equipment.
- Demonstrate knowledge of the procedures used to cut and gouge ferrous and non-ferrous metal.

**Duration:** 10 Hours

**Pre-Requisite(s):** WD1610

### **Objectives and Content:**

1. Define terminology associated with the plasma arc process.
2. Describe the plasma arc process.
  - i. general precautions
  - ii. equipment and accessories
    - types of torches
    - electrodes and tips
  - iii. types of arcs
  - iv. gases
  - v. power source
  - vi. procedures to set-up equipment and check its operation
3. Describe the procedures used to assemble and disassemble plasma arc equipment.
4. Describe the procedures used to maintain and troubleshoot plasma arc equipment.
5. Describe the procedures used to cut various thicknesses of ferrous and non-ferrous metals.
  - i. structural shapes
  - ii. plate
  - iii. pipe

iv. sheet metal

6. Describe the process used to set-up and operate equipment for gouging ferrous and non-ferrous metals.

**Practical Requirements:**

1. Set-up equipment, check its operation for non-transfer arc and check torch.
2. Cut steel of various thicknesses.
3. Cut stainless steel of various thicknesses.
4. Cut aluminium.
5. Gouge mild steel.

## WD1690 Quality Control

### **Learning Outcomes:**

- Demonstrate knowledge of quality control.
- Demonstrate knowledge of non-destructive tests.

**Duration:** 30 Hours

**Pre-Requisite(s):** WD1610

### **Objectives and Content:**

1. Explain the purpose and scope of quality control.
2. Describe the methods used to identify and verify materials.
  - i. standards and specifications
  - ii. mill certificates
3. Describe standards and specifications applicable in the trade.
  - i. templates and/or gauges
  - ii. drawing (compliance with)
4. Describe the procedures used to ascertain compliance with design and code specifications.
5. Describe the methods of inspection and testing of structural materials and welds and their associated procedures.
  - i. non-destructive
    - visual
    - radiography
    - magnetic particle
    - ultrasonic
    - dye penetrant test
    - leak test
    - pneumatic test (air and soap, inert gas)

- hydrostatic test (water pressure)
- ii. paint thickness

**Practical Requirements:**

1. Perform visual inspection of welds.
2. Inspect and test structural material and weld.
  - i. inspect items and note irregularities (visual inspection)
  - ii. bend specimen and determine ductility and soundness
  - iii. perform etch test
  - iv. visual inspect radiographic film for irregularities
  - v. use magnetic particle test
  - vi. perform dye penetrant test
  - vii. perform leak test on small vessels
    - air and soap (pneumatic)
    - water pressure (hydrostatic)
3. Identify inspection and test methods for paint thickness.

## WD1740 FCAW (Flux-Cored Arc Welding) 1- Set-up and Deposit a Weld

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to set-up and adjust FCAW equipment.

**Duration:** 15 Hours

**Pre-Requisite(s):** WD1630

### **Objectives and Content:**

1. Define terminology associated with the FCAW process.
2. Describe the FCAW process.
  - i. general precautions
  - ii. equipment and accessories
    - shielding gas and regulators
    - electrode wire
      - flux cored
      - metal cored
    - gun
    - feeder
    - power source
    - nozzle
    - cable connections
    - cables
  - iii. metal transfers
  - iv. polarity
  - v. arc voltage
  - vi. slope and adjustment
  - vii. inductance
  - viii. travel speed
  - ix. wire feed speed

- x. penetration
- xi. travel and work angles
- xii. manipulation
- xiii. guide tubes
- xiv. contact tips
- xv. liners

3. Describe the assembly and disassembly of welding equipment used in the FCAW process.
4. Describe troubleshooting and maintenance procedures for FCAW equipment.
5. Describe the procedures used to deposit a satisfactory weld.
  - i. starting and stopping the weld
  - ii. filler metal
  - iii. adjustment
  - iv. shielded gases (pre and post weld)
  - v. drive rolls
  - vi. gun
  - vii. stick-out
  - viii. speed

**Practical Requirements:**

1. Set-up FCAW equipment and adjust flow meter, if necessary.
2. Identify electrode wire and equipment components.

WD1750 FCAW 2- Weld Plate (Flat and Horizontal)

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to deposit a weld in flat and horizontal positions using flux cored wire.
- Demonstrate knowledge of the procedures used to identify various gases and gas mixtures.
- Demonstrate knowledge of the procedures used to shut down FCAW equipment.

**Duration:** 15 Hours

**Pre-Requisite(s):** WD1740

**Objectives and Content:**

1. Describe the procedures and techniques used to deposit a weld bead.
  - i. stringer
  - ii. weave
  - iii. stick-out
  - iv. travel speed
  - v. work and travel angles
  - vi. visual inspection
2. Describe the procedures used to weld a butt joint in flat and horizontal positions using flux cored wire.
  - i. quality of welds
  - ii. faults
  - iii. travel angles
  - iv. manipulation
3. Describe the various gases and gas mixtures and describe their applications.
4. Describe weld faults and their causes.
5. Describe the procedures used to test welds.
  - i. destructive

- ii. non-destructive (visual inspection)

**Practical Requirements:**

1. Perform a butt weld in the flat and horizontal positions using the flux core process.
2. Conduct visual inspection of welds.
3. Perform a side bend test.

## WD1760 Air-Arc Cutting and Gouging

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to remove a weld from a joint using the AAC process
- Demonstrate knowledge of the procedures used to cut metal using the AAC process

**Duration:** 10 Hours

**Pre-Requisite(s):** WD1270

### **Objectives and Content:**

1. Identify the equipment and accessories used in the AAC process.
  - i. power source
  - ii) torch
  - iii) ground clamp
  - iv) air supply
  - v) pressure regulator
  - vi) electrodes
  - vii) cables
2. Describe the AAC process and its applications.
  - i. cut
  - ii. remove faulty welds
  - iii. joint preparation
  - iv. back gouge

### **Practical Requirements:**

1. Remove a weld from a joint using the AAC process.
2. Cut Metal using the AAC process.

## WD1770 Submerged Arc Welding Set-up

### **Learning Outcomes:**

- Demonstrate knowledge of the SAW process.

**Duration:** 4 Hours

**Pre-Requisite(s):** WD1270

### **Objectives and Content:**

1. Describe the procedures used to weld carbon steel plate of various thicknesses using the SAW process.
  - i. deposition rates
  - ii. travel speeds
  - iii. depth of penetration
  - iv. welding position
  - v. fluxes
  - vi. starting methods
  - vii. faults encountered

### **Practical Requirements:**

None.

## WD2410 Stud and Spot Resistance Welding

### **Learning Outcomes:**

- Demonstrate knowledge of stud welding and resistance spot welding.

**Duration:** 4 Hours

**Pre-Requisite(s):** WD1620

### **Objectives and Content:**

1. Define terminology associated with the stud weld and resistance spot weld process.
2. Describe the stud weld process.
  - i. general precautions
  - ii. principles of operation
    - equipment
    - weld quality
    - variables
      - stud size
      - current
      - time
3. Describe the procedures used to stud weld.
4. Describe the resistance spot weld process.
  - i. general precautions
  - ii. principles of operation
    - equipment
    - weld quality
    - types of joints
    - variables
      - current
      - time

- material (type and thickness)

5. Describe the procedures used to perform resistance spot weld.

**Practical Requirements:**

None.

## WD2420 Blueprint Reading 3 (Advanced/CAD)

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to interpret dual dimensions.
- Demonstrate knowledge of the procedures used to interpret international symbols.
- Demonstrate knowledge of the procedures used to interpret test and inspection symbols.
- Demonstrate knowledge to describe computer-aided drafting (CAD).

**Duration:** 15 Hours

**Pre-Requisite(s):** WD1670

### **Objectives and Content:**

1. Describe dual dimensions and their use in the trade.
  - i. variation
  - ii. flexibility
  - iii. accuracy
  - iv. disadvantages
2. Identify and interpret international symbols.
3. Identify and interpret test and inspection symbols.
  - i. visual inspection
  - ii. ultrasonic
  - iii. X-rays
  - iv. dye penetrates
  - v. dimensioning
  - vi. eddy current
  - vii. magnetic particle
  - viii. acoustic emissions
  - ix. leak test

4. Describe computer-aided drafting (CAD) and its use in the trade.

**Practical Requirements:**

1. Interpret dual dimensioning.
2. Locate and interpret test and inspection symbols.
3. Locate and interpret international symbols.

**SF1490      Structural Components and Detailing Practices**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to interpret basic prints and working drawings pertaining to structural members.
- Demonstrate knowledge of the procedures used to identify basic structural components and detailing practices.

**Duration:**      25 Hours

**Pre-Requisite(s):**      SF1420

**Objectives and Content:**

1. Identify structural members and describe their applications.
2. Describe the fabrication of beams and columns.
  - i. cuts, copes, block out, cut and chip
  - ii. stiffeners, gussets and filler plates
  - iii. minimum edge distances – standard gauges
  - iv. marking of parts numbers and piece marks
3. Interpret drawings and layout.
  - i. stairs and handrails
  - ii. templates
  - iii. platforms
  - iv. structural symbols
4. Identify and interpret symbols.
  - i. structural shapes
  - ii. type of material
  - iii. processes
    - machining
  - iv. rivet and bolt
  - v. revision
  - vi. erection mark

- vii. orientation mark

5. Identify abbreviations commonly encountered.

**Practical Requirements:**

1. Develop templates as per job sheets.

**SF1500      Pressure Vessel and Pipe Drawing Interpretation**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to interpret pressure vessel and pipe drawings.
- Demonstrate knowledge of the procedures used to identify specifications and symbols used in piping and pressure vessel drawings.

**Duration:**            10 Hours

**Pre-Requisite(s):**   SF2440

**Objectives and Content:**

1. Identify terminology and components used in pressure vessels and pipe drawings.
2. Interpret pressure vessels and pipe drawings.
  - i. codes
  - ii. specifications
  - iii. symbols
  - iv. testing & inspection

**Practical Requirements:**

None.

**SF1510      Advanced Parallel Line Development**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to perform advanced parallel line development.

**Duration:**            40 Hours

**Pre-Requisite(s):**   SF1430

**Objectives and Content:**

1.      Describe development of a lateral.
  - i.      use of projection line
  - ii.     use of profiles
  - iii.    location and shape of mitres
2.      Describe development of an off-set pipe.
  - i.      location and shape of a mitre
  - ii.     methods of construction
  - iii.    use of elbow patterns
3.      Describe development of an off-centre lateral.
  - i.      methods of construction
  - ii.     pattern development

**Practical Requirements:**

1.      Perform advanced parallel line development as per job sheet.

SF1520      Oxy-Fuel Optical Tracer

**Learning Outcomes:**

- Demonstrate knowledge of optical tracer equipment ,its set-up and adjustment.
- Demonstrate knowledge of the procedures used to operate the cutting machine in the strip and trace mode.

**Duration:**      6 Hours

**Pre-Requisite(s):**      WD1600

**Objectives and Content:**

1. Identify types of optical tracers and describe their applications.
  - i. size
  - ii. capacity
  - iii. number of cutting heads
  - iv. cantilevers
  - v. bridges
2. Describe the procedures used to operate the optical tracer.
  - i. gas controls
  - ii. pressure settings
  - iii. ignition
  - iv. pre-heat settings
  - v. high pre-heat settings
  - vi. cutting oxygen settings
  - vii. torch height
  - viii. torch height setting and control
  - ix. master height control
  - x. tracing head
    - kerf offset adjustment
    - determining kerf compensation
    - direction of kerf adjustment
  - xi. tracing and stripping mode
    - piercing

- lead in
- lead out

xii. material utilisation

- plate alignment
- placement of the pattern
- nesting of part
- material and part identification

3. Identify pattern materials and describe their preparation.

4. Describe cutting charts and their uses.

- i. cutting tip selection
  - pressure settings
  - cutting speed settings
  - kerf dimensions

5. Describe factors affecting set-up of equipment.

- i. tip size and conditions
- ii. quality of the cuts
- iii. pre-heat adjustment
- iv. cutting pressure adjustment
- v. cutting speed
- vi. torch height
- vii. motion stability of the machine

6. Describe routine operational maintenance of the optical tracer.

- i. rail cleaning
- ii. gear box oil level check
- iii. tracing check

**Practical Requirements:**

1. Use optical tracer to cut components as per instructions on job sheet.

**SF1530      CNC Cutting Machine**

**Learning Outcomes:**

- Demonstrate knowledge of CNC controls and commands.
- Demonstrate knowledge of CNC cutting machine operation.

**Duration:**            6 Hours

**Pre-Requisite(s):**   SF1520

**Objectives and Content:**

1.      Describe the use of CNC shape cutting machines and describe their applications in industry.
2.      Describe shape selection.
  - i.      50 standard shape library
  - ii.     standard shape operation
  - iii.    shape number
  - iv.     part number
  - v.      program name defined by user
  - vi.     prompting operation and menu
3.      Describe the conditions affecting the quality of the cut.
  - i.      tip and size conditions
  - ii.     pre-heat adjustment
  - iii.    piercing time setting
  - iv.     cutting pressure adjustment
  - v.      cutting speed
  - vi.     torch height
  - vii.    plasma height sensing unit
  - viii.   motion stability of the machine
4.      Describe main menu operation.
  - i.      load program
    - standard shape library
    - panel device

- floppy disk
- ii. run program
- iii. store program
  - panel device
  - floppy disk
- iv. delete program
- v. utilities
  - display system data
  - display/edit/nest
  - directory support
  - set-up and configuration
  - diagnostic support
  - set-up/load/store
  -

5. Describe cutting machine maintenance.

- i. rail cleaning
- ii. gear box oil level check
- iii. tracing deck

**Practical Requirements:**

None.

**SF1540      Finishing and Shipping**

**Learning Outcomes:**

- Demonstrate knowledge of finishing and shipping products.

**Duration:**      6 Hours

**Pre-Requisite(s):**      SF1470

**Objectives and Content:**

1. Identify the types of finishes and describe their applications.
  - i. paint and primer
  - ii. galvanized
2. Identify the types of surface preparation methods for finishing products.
  - i. abrasive blasting
  - ii. chemical cleaning
  - iii. mechanical cleaning
  - iv. polishing
3. Describe the procedures to finish products.
  - i. ferrous
  - ii. non-ferrous
4. Describe procedures to prepare materials for shipping.
  - i. identifies piece marks to be shipped
  - ii. determines weight
  - iii. coordinates sequence of loading
  - iv. determines dunnage and false work requirements

**Practical Requirements:**

None.

SF1550      On-Site Installation

**Learning Outcomes:**

- Demonstrate knowledge of on-site installation.
- Demonstrate knowledge of codes and regulations.
- Demonstrate knowledge of site hazards.

**Duration:**      6 Hours

**Pre-Requisite(s):**      SF1540

**Objectives and Content:**

1.      Describe the procedures for site installation.
  - i.      interpret codes and site drawings
  - ii.      coordinate with other tradespeople
  - iii.      receipt of materials
  - iv.      establish lay down area and dunnage
  - v.      determine equipment
  - vi.      determine consumables
  - vii.      confirm field dimensions
  - viii.      install components

**Practical Requirements:**

None.

SF1560      Job Planning

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to estimate materials and timeline.
- Demonstrate knowledge of the procedures used to complete a project.

**Duration:**      6 Hours

**Pre-Requisite(s):**      WD2440

**Objectives and Content:**

1.      Describe the components of job planning.
  - i.      document receipt of materials
  - ii.      coordinate lay down area
  - iii.      identify structural components and pieces
  - iv.      identify sub-assemblies
  - v.      schedule equipment and manpower
  - vi.      estimate materials and consumables

**Practical Requirements:**

None.

## BLOCK III

### SF1700 Truss and Girder Fabrication

#### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to interpret truss and girder prints and drawings.
- Demonstrate knowledge of the procedures used to identify characteristics of trusses and girders.
- Demonstrate knowledge of layout and fabrication.

**Duration:** 20 Hours

**Pre-Requisite(s):** SF1490

#### **Objectives and Content:**

1. Identify types of trusses and girders, and describe their characteristics, components and materials to fabricate.
2. Interpret prints and drawings to produce trusses and girders.
3. Describe procedures used to layout components of trusses and girders.
4. Describe the procedures used to fabricate trusses and girders.

#### **Practical Requirements:**

1. Fabricate simple trusses and girders.

SF1710      Advanced Radial Layout

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to perform advanced radial line development
- Demonstrate knowledge of the procedures to use radial line layout in combination with other layout methods.

**Duration:**      40 Hours

**Pre-Requisite(s):**      SF1440

**Objectives and Content:**

1.      Describe development of a round cylinder intersecting a cone at  $45^\circ$ .
2.      Describe development of a  $90^\circ$  equally tapering elbow.
3.      Describe development of an oblique cone.

**Practical Requirements:**

1.      Perform advanced radial line development as per job sheet.

**SF1720      Advanced Triangulation Layout**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures to use triangulation to develop patterns for transitional and/or twisted shapes.
- Demonstrate knowledge of the procedures to use triangulation layout in combination with other layout methods.

**Duration:**            30 Hours

**Pre-Requisite(s):**   SF1450

**Objectives and Content:**

1.      Describe development of transitional concentric and eccentric shapes.
  - i.      square to square rotated half turn
  - ii.     square to rectangular rotated half turn
  - iii.    inclined square to square
  - iv.     rectangular to round pitch at top
  - v.      oblong to round

**Practical Requirements:**

1.      Perform advanced triangulation development as per job sheet.

**SF1730      Advanced Assembly and Fitting**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to fit and assemble girders and trusses
- Demonstrate knowledge of the installation and testing of large structures

**Duration:**      60 Hours

**Pre-Requisite(s):**      SF1470

**Objectives and Content:**

1.      Describe the procedures used to layout welded girders.
  - i.      interpret drawings
  - ii.      check bill of materials
  - iii.      web plates
  - iv.      flange plates
  - v.      cambers
  - vi.      templates
  - vii.      gauges
  - viii.      web stiffeners
2.      Describe the procedures used to layout bolted girders.
  - i.      interpret drawings
  - ii.      check bill of materials
  - iii.      web plates
  - iv.      flange plates
  - v.      cambers
  - vi.      templates
  - vii.      gauges
  - viii.      web stiffeners
3.      Describe the procedures used to fit girders.
  - i.      interpret drawings
  - ii.      prefabricated sub-assemblies
  - iii.      fit up of girders

- iv. shop splicing
- v. fit detail on the girder
  - stiffeners
  - end plates
  - gussets
  - clips
- vi. shop welding
- vii. riveting
- viii. bolting
- ix. cambered girders

4. Describe components and processes specific to bolted bridge trusses.

- i. top-bottom chord units
- ii. end posts
- iii. web members
- iv. floor system
- v. brace members
- vi. bearing shoes
- vii. expansion joints
- viii. fitting the trusses
- ix. reaming and bolting

5. Describe interpretation of drawings, layout and fitting practices for large structures.

- i. tanks
- ii. field fabricated cones
- iii. cranes
- iv. truss conveyors

6. Describe installation and testing procedures.

- i. interpretation of drawing
  - establish reference points
  - elevation
- ii. use of transit and builders level
  - use of equipment
  - set-up on tripod
  - level the instrument
  - use of plumb bomb
  - accuracy requirements

7. Interpret applicable codes.

**Practical Requirements:**

1. Fabricate girders as per blueprints

SF1740      Advanced Plate Development

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to lay out advanced cylinders, cones, hoppers and chutes.
- Demonstrate knowledge of the procedures to use plate development in combination with other layout methods.

**Duration:**      80 Hours

**Pre-Requisite(s):**      SF1460

**Objectives and Content:**

1.      Describe cones and the development of conical shapes.
  - i.      large cone with multiple sections
2.      Identify hoppers and describe their applications.
  - i.      large field assembled
  - ii.      hoppers having offset opening
  - iii.      hoppers with flanges
3.      Interpret drawings and identify material type and size of hopper.
4.      Describe outlet ends of hoppers and chutes and their accessories.
  - i.      plane and flanged end (bolted)
  - ii.      geared or power driven gate end
  - iii.      sliding end
  - iv.      support members
5.      Describe special hopper and chute requirements.
  - i.      channel and angle stiffeners
  - ii.      flat bar stiffeners
  - iii.      lap joints
  - iv.      butt joints
  - v.      accessories

**Practical Requirements:**

1. Layout and fabricate conical shapes as per job sheet.
2. Layout and fabricate hoppers as per job sheet.

## **B. Conditions Governing Apprenticeship Training**

### **1.0 General**

The following general conditions apply to all apprenticeship training programs approved by the Provincial Apprenticeship and Certification Board (PACB) in accordance with the *Apprenticeship Training and Certification Act* (1999). If an occupation requires additional conditions, these will be noted in the specific Plan of Training for the occupation. In no case should there be a conflict between these conditions and the additional requirements specified in a certain Plan of Training. All references to Memorandum of Understanding will also apply to Letter of Understanding (LOU) agreements.

### **2.0 Entrance Requirements**

#### **2.1 Entry into the occupation as an apprentice requires:**

Indenturing into the occupation by an employer who agrees to provide the appropriate training and work experiences as outlined in the Plan of Training.

2.2 Notwithstanding the above, each candidate must have successfully completed a high school program or equivalent, and in addition may be required to have completed certain academic subjects as specified in a particular Plan of Training. Mature students, at the discretion of the Director of Apprenticeship and Trades Certification, may be registered. A mature student is defined as one who has reached the age of 19 and who can demonstrate the ability and the interest to complete the requirements for certification.

2.3 At the discretion of the Director of Apprenticeship and Trades Certification, credit toward the apprenticeship program may be awarded to an apprentice for previous work experience and/or training as validated through prior learning assessment.

2.4 An Application for Apprenticeship form must be duly completed along with a Memorandum of Understanding as applicable to be indentured into an Apprenticeship. The Memorandum of Understanding must contain signatures of

an authorized employer representative, the apprentice and an official representing the Provincial Apprenticeship and Certification Board to be valid.

- 2.5 A new Memorandum of Understanding must be completed for each change in an employer during the apprenticeship term.

### **3.0 Probationary Period**

The probationary period for each Memorandum of Understanding will be six months or 900 employment credit hours. Within that period the memorandum may be terminated by either party upon giving the other party and the PACB one week notice in writing.

### **4.0 Termination of a Memorandum of Understanding**

After the probationary period referred to in Section 3.0, the Memorandum of Understanding may be terminated by the PACB by mutual consent of the parties involved, or cancelled by the PACB for proper and sufficient cause in the opinion of the PACB, such as that stated in Section 14.

### **5.0 Apprenticeship Progression Schedule, Wage Rates and Advanced Training Criteria**

## Progression Schedule

Metal Fabricator (Fitter) – 5400 Hours			
APPRENTICESHIP LEVEL AND WAGES			
Year	Wage Rate At This Level	Requirements for progression to next level of apprenticeship	When requirements are met, the apprentice will progress to...
1 <sup>st</sup>	60 %	<ul style="list-style-type: none"> <li>▪ Completion of Block 1 training</li> <li>▪ Pass Block 1 exam</li> <li>▪ Minimum 1800 hours of combined relevant work experience and training</li> </ul>	2 <sup>nd</sup> Year
2 <sup>nd</sup>	75%	<ul style="list-style-type: none"> <li>▪ Completion of Block 2 training</li> <li>▪ Pass Block 2 exam</li> <li>▪ Minimum 3600 hours of combined relevant work experience and training</li> </ul>	3 <sup>rd</sup> Year
3 <sup>rd</sup>	90%	<ul style="list-style-type: none"> <li>▪ Completion of Block 3 training</li> <li>▪ Minimum 5400 hours of combined relevant work experience and training</li> <li>▪ Sign-off of all workplace skills in apprentice logbook</li> <li>▪ Pass certification exam</li> </ul>	Journeyperson Certification
<p><b>Wage Rates</b></p> <ul style="list-style-type: none"> <li>▪ Rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice.</li> <li>▪ Rates must not be less than the wage rate established by the Labour Standards Act (1990), as now in force or as hereafter amended, or by other order, as amended from time to time replacing the first mentioned order.</li> <li>▪ Rates must not be less than the wage rate established by any collective agreement which may be in force at the apprentice's workplace.</li> <li>▪ Employers are free to pay wage rates above the minimums specified.</li> </ul> <p><b>Block Exams</b></p> <ul style="list-style-type: none"> <li>▪ This program may <b>not</b> currently contain Block Exams, in which case this requirement will be waived until such time as Block Exams are available.</li> </ul>			

## Plan of Training – Metal Fabricator (Fitter)

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Metal Fabricator (Fitter) – 5400 Hours		
CLASS CALLS		
Call Level	Requirements for Class Call	Hours awarded for In-School Training
Direct Entry Apprentice: PLA & / or Block 1	<ul style="list-style-type: none"><li>▪ Minimum of 1000 hours of relevant work experience</li><li>▪ Prior Learning Assessment (PLA) at designated college (if applicable)</li></ul>	To be determined by the number of courses completed after each class call
Block 2	<ul style="list-style-type: none"><li>▪ Minimum of 3000 hours of relevant work experience and training</li></ul>	233
Block 3	<ul style="list-style-type: none"><li>▪ Minimum of 5200 hours of relevant work experience and training</li></ul>	230

**Direct Entry Apprentice**

- Must complete Block 1 courses through PLA and / or in-school training.
- Block 1 training is to be completed via class calls; up to 16 weeks of training per calendar year.
- Must attend in-school training until Block 1 is complete before attending Blocks 2 or higher

**Class Calls at Minimum Hours**

- Class calls may not always occur at the minimum hours indicated. Some variation is permitted to allow for the availability of training resources and apprentices.

## **6.0 Tools**

Apprentices shall be required to obtain their own hand tools applicable for the designated occupation of registration or tools as specified by the PACB.

## **7.0 Periodic Examinations and Evaluation**

- 7.1 Every apprentice shall submit to such occupational tests and examinations as the PACB shall direct. If after such occupational tests and examinations the apprentice is found to be making unsatisfactory progress, his/her apprenticeship level and rate of wage shall not be advanced as provided in Section 5 until his/her progress is satisfactory to the Director of Apprenticeship and Trades Certification and his/her date of completion shall be deferred accordingly. Persistent failure to pass required tests shall be a cause for revocation of his/her Memorandum of Understanding.
- 7.2 Upon receipt of reports of accelerated progress of the apprentice, the PACB may shorten the term of apprenticeship and advance the date of completion accordingly.
- 7.3 For each and every course, a formal assessment is required for which 70% is the pass mark. A mark of 70% must be attained in both the theory examination and the practical project assignment, where applicable as documented on an official transcript.
- 7.4 Course credits may be granted through the use of a PACB approved matrix which identifies course equivalencies between designated trades and between current and historical Plans of Training for the same trade.

## **8.0 Granting of Certificates of Apprenticeship**

Upon the successful completion of apprenticeship, the PACB shall issue a Certificate of Apprenticeship.

## **9.0 Hours of Work**

Any hours employed in the performance of duties related to the designated occupation will be credited towards the completion of the term of apprenticeship. Appropriate documentation of these hours must be provided.

## **10.0 Copies of the Registration for Apprenticeship**

The Director of Apprenticeship and Trades Certification shall provide copies of the Registration for Apprenticeship form to all signatories to the document.

## **11.0 Ratio of Apprentices to Journeypersons**

Under normal practice, the ratio of apprentices to journeypersons shall not exceed two apprentices to every one journeyperson employed. Other ratio arrangements would be determined and approved by the PACB.

## **12.0 Relationship to a Collective Bargaining Agreement**

Where applicable in Section 5 of these conditions, Collective Agreements take precedence.

## **13.0 Amendments to a Plan of Apprenticeship Training**

A Plan of Training may be amended at any time by the PACB.

## **14.0 Employment, Re-Employment and Training Requirements**

- 14.1 The Plan of Training requires apprentices to regularly attend their place of employment.
- 14.2 The Plan of Training requires apprentices to attend training for that occupation as prescribed by the PACB.
- 14.3 Failure to comply with Sections 14.1 and/or 14.2 will result in cancellation of the Memorandum of Understanding. Apprentices may have their MOUs reinstated by the PACB but would be subject to a commitment to complete the entire

program as outlined in the General Conditions of Apprenticeship. Permanent cancellation in the said occupation is the result of non-compliance.

- 14.4 Cancellation of the Memorandum of Understanding to challenge journeyperson examinations, if unsuccessful, would require an apprentice to serve a time penalty of two (2) years before reinstatement as an apprentice or qualifying to receive a class call to training as a registered Trade Qualifier. Cancellation must be mutually agreed upon by the employer and the apprentice.
- 14.5 An employer shall ensure that each apprentice is under the direct supervision of an approved journeyperson supervisor who is located at the same worksite as the apprentice, and that the apprentice is able to communicate with the journeyperson with respect to the task, activity or function that is being supervised.
- 14.6 Under the Plan of Training the employer is required to keep each apprentice employed as long as work is available, and if the apprentice is laid off due to lack of work, to give first opportunity to be hired before another is hired.
- 14.7 The employer will permit each apprentice to attend training programs as prescribed by the PACB.
- 14.8 Apprentices who cannot acquire all the workplace skills at their place of employment will have to be evaluated in a simulated work environment at a PACB authorized training institution and have sign-off done by instructors to meet the requirements for certification.

## **15.0 Appeals to Decisions Based on Conditions Governing Apprenticeship Training**

Persons wishing to appeal any decisions based on the above conditions must do so in writing to the Minister of Advanced Education and Skills within 30 days of the decision.

## C. Requirements for Red Seal Endorsement

1. Evidence the required work experiences outlined in this Plan of Training have been obtained. This evidence must be in a format clearly outlining the experiences and must be signed by an appropriate person or persons attesting that these experiences have been obtained to the level required.
2. Successful completion of all required courses in the program.
3. A combination of training from an approved training program and suitable work experience totaling 5400 hours.

**Or**

A total of 7200 hours of suitable work experience.

4. Completion of a National Red Seal examination, to be set at a place and time determined by the Apprenticeship and Trades Certification Division.

## **D. Roles and Responsibilities of Stakeholders in the Apprenticeship Process**

The apprenticeship process involves a number of stakeholders playing significant roles in the training of apprentices. This section outlines these roles and the responsibilities resulting from them.

### **The Apprentice:**

- completes all required technical training courses as approved by the PACB.
- finds appropriate employment.
- completes all required work experiences in combination with the required hours.
- ensures work experiences are well documented.
- approaches apprenticeship training with an attitude and commitment that fosters the qualities necessary for a successful career as a qualified journeyperson.
- obtains the required hand tools as specified by the PACB for each period of training of the apprenticeship program.

## **The Employer:**

- provides high quality work experiences in an environment conducive to learning.
- remunerates apprentices as set out in the Plan of Training or Collective Agreements.
- provides feedback to training institutions, Apprenticeship and Trades Certification Division and apprentices in an effort to establish a process of continuous quality improvement.
- where appropriate, releases apprentices for the purpose of returning to a training institution to complete the necessary technical courses.
- ensures work experiences of the apprentice are documented.
- ensures a certified journeyperson is currently on staff in the same trade area as the apprentice and whose certification is recognized by the NL Department of Advanced Education and Skills.

## **The Training Institution:**

- provides a high quality learning environment.
- provides the necessary student support services that will enhance an apprentice's ability to be successful.
- participates with other stakeholders in the continual updating of programs.

## **The Apprenticeship and Trades Certification Division:**

- establishes and maintains program advisory committees under the direction of the PACB.
- promotes apprenticeship training as a viable career option to prospective apprentices and other appropriate persons involved, such as career guidance counsellors, teachers, parents, etc.
- establishes and maintains a protocol with training institutions, employers and other appropriate stakeholders to ensure the quality of apprenticeship training programs.
- ensures all apprentices are appropriately registered and records are maintained as required.
- schedules all necessary technical training periods for apprentices to complete requirements for certification.
- administers block, provincial and interprovincial examinations.

## **The Provincial Apprenticeship and Certification Board:**

- sets policies to ensure the provisions of the *Apprenticeship and Certification Act* (1999) are implemented.
- ensures advisory and examination committees are established and maintained.
- accredits institutions to deliver apprenticeship training programs.
- designates occupations for apprenticeship training and/or certification.