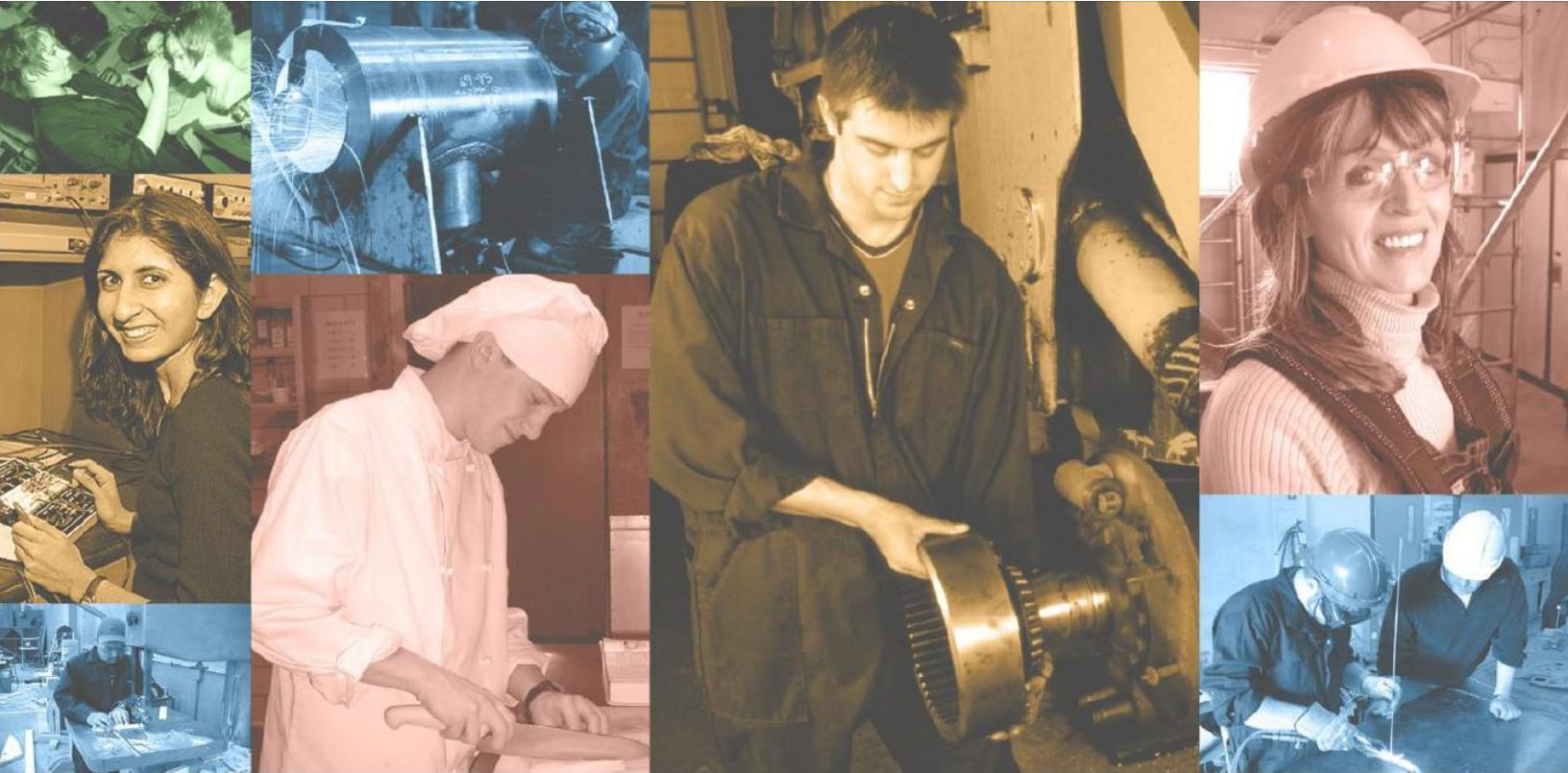

Newfoundland and Labrador Curriculum Standard Sheet Metal Worker



Government of Newfoundland and Labrador
Department of Immigration, Skills and Labour
Apprenticeship and Trades Certification Division

March 2018

PLAN OF TRAINING

Sheet Metal Worker

March 2018



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

Approved by:

A handwritten signature in blue ink, appearing to read "Dave L. J.", written over a horizontal line.

Chairperson, Provincial Apprenticeship and Certification Board

Date: March 09, 2018

Preface

This curriculum standard is aligned with the 2018 Red Seal Occupational Standard (RSOS) and National Harmonization sequencing and levels for the Sheet Metal Worker trade. It describes the curriculum content for the Sheet Metal Worker training program.

Acknowledgements

The Provincial Trade Advisory Committee (PTAC), industry representatives, instructors and apprenticeship staff provided valuable input to the development of this provincial plan of training. Without their dedication to quality apprenticeship training, this document could not have been produced.

We offer a sincere thank you.

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Document Status	Date Distributed	Mandatory Implementation Date	Comments
Approved	March 2018	September 2018	Updated to 2018 RSOS and National Harmonization
Approved	June 2020		Applied accessibility formatting.

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A. RSOS Comparison Chart

RSOS 2018 Tasks		2018 POT	
Task 1 - Performs safety-related functions			
1.01	Uses personal protective equipment (PPE) and safety equipment	In Context Throughout	
1.02	Maintains safe work environment		
1.03	Performs lock-out and tag-out procedures		
Tasks 2 - Uses and maintains tools and equipment			
2.01	Uses hand and portable power tools	SL1115	Tools and Equipment
2.02	Uses shop tools and equipment		
2.03	Uses gas metal arc welding (GMAW) equipment	SL1115	Tools and Equipment
		SL1440	Introduction to Gas Metal Arc Welding (GMAW)
		SL1453	Gas Metal Arc Welding (GMAW) and Shielded Metal Arc Welding (SMAW)
		SL1455	Gas Metal Arc Welding (GMAW) II
		SL1457	Gas Metal Arc Welding (GMAW) III
2.04	Uses resistance spot welding equipment	SL1440	Introduction to Gas Metal Arc Welding (GMAW)
2.05	Uses gas tungsten arc welding (GTAW) equipment	SL1452	Introduction to Gas Tungsten Arc Welding (GTAW)
		SL3151	Advanced Gas Tungsten Arc Welding (GTAW)
2.06	Uses shielded metal arc welding (SMAW) equipment	SL1453	Gas Metal Arc Welding (GMAW) and Shielded Metal Arc Welding (SMAW)
2.07	Uses oxy-fuel and plasma arc cutting equipment	SL1285	Plasma Arc Cutting
		SL1355	Oxy-Acetylene Welding and Cutting
2.08	Uses soldering and brazing equipment	SL1772	Soldering
2.09	Uses measuring and layout equipment	SL1152	Drafting, Pattern Development and Layout
2.10	Uses testing and inspection devices	SL1115	Tools and Equipment
2.11	Uses stationary and mobile work platforms	SL1115	Tools and Equipment
2.12	Uses hoisting, rigging and positioning equipment	SL1125	Hoisting, Lifting and Rigging
Task 3 - Organizes work			
3.01	Uses trade-related documentation	SL2101	Trade Related Documents
3.02	Interprets drawings	SL1162	Blueprint Reading
3.03	Organizes materials and equipment for project	SL4100	Job Planning

RSOS 2018 Tasks		2018 POT	
3.04	Performs basic design and field modifications	SL1152	Drafting, Pattern Development and Layout
Task 4 - Uses communication and mentoring techniques			
4.01	Uses communication techniques	CM2160	Communication Essentials
4.02	Uses mentoring techniques	SL1900	Mentoring
Task 5 - Performs pattern development			
5.01	Develops patterns using simple and straight line layout	SL1152	Drafting, Pattern Development and Layout
		SL1153	Pattern Development I
		SL1155	Pattern Development II
		SL1157	Pattern Development III
5.02	Develops patterns using parallel line method	SL1245	Layout and Fabrication - Parallel Lines
		SL1153	Pattern Development I
		SL1155	Pattern Development II
		SL1157	Pattern Development III
5.03	Develops patterns using radial line method	SL1255	Layout and Fabrication - Radial Lines
		SL1153	Pattern Development I
		SL1155	Pattern Development II
		SL1157	Pattern Development III
5.04	Develops patterns using triangulation method	SL1265	Layout and Fabrication - Triangulation
		SL1153	Pattern Development I
		SL1155	Pattern Development II
		SL1157	Pattern Development III
5.05	Uses computer technology for pattern development	SL1152	Drafting, Pattern Development and Layout
		SL1153	Pattern Development I
		SL1155	Pattern Development II
		SL1157	Pattern Development III
Task 6 - Fabricates sheet metal components for air and material handling systems			
6.01	Cuts ductwork, fittings and components	SL1131	Fabrication Fundamentals
		SL2205	Fabrication (Air and Material Handling Systems and Components)
		SL1123	Material Handling Systems
6.02	Forms ductwork, fittings and components	SL1131	Fabrication Fundamentals
		SL1180	Sheet Metal Fundamentals
		SL2205	Fabrication (Air and Material Handling Systems and Components)
		SL1123	Material Handling Systems
6.03	Insulates ductwork, fittings and components	SL1131	Fabrication Fundamentals
		SL1180	Sheet Metal Fundamentals
		SL2205	Fabrication (Air and Material Handling Systems and Components)
6.04	Assembles ductwork, fittings and components	SL1131	Fabrication Fundamentals
		SL1180	Sheet Metal Fundamentals
		SL2205	Fabrication (Air and Material

RSOS 2018 Tasks		2018 POT	
			Handling Systems and Components)
6.05	Fabricates dampers	SL1180	Sheet Metal Fundamentals
		SL2205	Fabrication (Air and Material Handling Systems and Components)
		SL1180	Sheet Metal Fundamentals
6.06	Fabricates hanger systems, supports and bases	SL1180	Sheet Metal Fundamentals
		SL2205	Fabrication (Air and Material Handling Systems and Components)
		SL1123	Material Handling Systems
Task 7 - Fabricates flashing, roofing, sheeting and cladding			
7.01	Cuts metal for flashing, roofing, sheeting and cladding	SL4240	Metal Roofing and Architectural Metal
7.02	Forms flashing, roofing, sheeting and cladding		
Task 8 - Fabricates Specialty Products			
8.01	Cuts material for specialty products	SL1443	Metallurgy
8.02	Forms specialty products	SL4280	Specialty Products
8.03	Assembles specialty products		
8.04	Finishes specialty products		
Task 9 - Prepares installation site			
9.01	Performs onsite measurements.	SL1304	Air Handling Systems I
9.02	Performs demolitions for renovations.	SL1304	Air Handling Systems I
9.03	Installs penetrations and sleeves	SL1304	Air Handling Systems I
9.04	Installs supports and bases.	SL1304	Air Handling Systems I
9.05	Installs hangers, cables, braces and brackets	SL2230	Chimneys, Breeching and Venting
Task 10 - Installs and connects chimneys, breeching and venting to exhaust appliances and mechanical equipment			
10.01	Installs chimney	SL2230	Chimneys, Breeching and Venting
10.02	Connects appliances or mechanical equipment to chimney and breeching		
10.03	Installs high efficiency appliances and mechanical equipment		
Task 11 - Installs Air Handling System Components			
11.01	Installs air handling equipment	SL1304	Air Handling Systems I
11.02	Installs sheet metal ducts and fittings.	SL1305	Air Handling Systems II
11.03	Installs dampers	SL1307	Air Handling Systems III
11.04	Installs fire and fire/smoke dampers		
11.05	Installs registers, grilles, diffusers and louvers	SL1743	Air Quality Management
11.06	Installs terminal boxes.		
11.07	Installs coils		
11.08	Installs system component accessories.		
11.09	Installs Plenums		

RSOS 2018 Tasks		2018 POT	
Task 12 Installs material handling system components			
12.01	Installs pneumatic and gravity material handling system components	SL1304	Air Handling Systems I
		SL1305	Air Handling Systems II
12.02	Installs mechanized material handling system components	SL1307	Air Handling Systems III
		SL1743	Air Quality Management
Task 13 - Applies thermal insulation, lagging, cladding and flashing			
13.01	Applies thermal insulation to components	SL1304	Air Handling Systems I
13.02	Applies lagging and cladding to components	SL1305	Air Handling Systems II
13.03	Applies flashing to components	SL1307	Air Handling Systems III
		SL1743	Air Quality Management
Task 14 - Performs leak testing, air balancing and commissioning			
14.01	Performs leak tests	SL-4230	Adjusting and Balancing (Air and Material Handling Systems)
14.02	Performs testing, adjusting and balancing (TAB)		
14.03	Participates in the commissioning of air and material handling systems		
Task 15 - Installs metal roofing and cladding/siding systems			
15.01	Lays out roof and walls	SL4240	Metal Roofing and Architectural Metal
15.02	Installs insulation, isolation material and building envelope components		
15.03	Installs roofing and cladding/siding system components		
15.04	Seals exposed joints		
15.05	Installs decking		
Task 16 - Installs exterior components			
16.01	Prepares surface	SL4240	Metal Roofing and Architectural Metal
16.02	Fastens exterior components		
Task 17 - Installs specialty products			
17.01	Installs stainless steel specialty products	SL1443	Metallurgy
17.02	Installs non-stainless steel products	SL4280	Specialty Products
17.03	Installs Marine Products		
Task 18 - Performs scheduled maintenance.			
18.01	Performs maintenance inspection	SL4260	Maintenance and Repair (Air and Material Handling Systems)
18.02	Services components.		
Task 19 - Repairs faulty systems and components.			
19.01	Diagnoses system faults	SL4260	Maintenance and Repair (Air and Material Handling Systems)
19.02	Repairs worn or faulty components		

B. 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 level 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.

Level 1				
Course No.	IPG No.	Course Name	Hours	Pre-Requisite(s)
SL1115	SMW-110 SMW-115 SMW-160 SMW-165	Tools and Equipment	30	None
SL1180	SMW-120	Sheet Metal Fundamentals	3	None
SL1125	SMW-205	Hoisting, Lifting and Rigging	12	SL1115
SL1131	SMW-155	Fabrication Fundamentals	30	SL1115
SL1443	SMW-120	Metallurgy	6	None
SL1152	SMW-125 SMW-145	Drafting, Pattern Development and Layout	24	None
SL1304	-	Air Handling Systems I	18	None
SL1162	SMW-210	Blueprint Reading	24	None
SL1245	SMW-215	Layout and Fabrication - Parallel Lines	60	SL1131, SL1162
SL1255	SMW-220 SMW-315	Layout and Fabrication - Radial Lines	45	SL1131, SL1162
SL1265	SMW-225	Layout and Fabrication - Triangulation	60	SL1131, SL1162
SL1355	SMW-430	Oxy-Acetylene Welding and Cutting	25	TS1115

Level 1				
Course No.	IPG No.	Course Name	Hours	Pre-Requisite(s)
SL1285	SMW-135	Plasma Arc Cutting	6	TS1115
SL1440	SMW-130	Introduction to Gas Metal Arc Welding (GMAW)	30	SL1355
SL1452	SMW-235	Introduction to Gas Tungsten Arc Welding (GTAW)	45	SL1355
SL1743	SMW-330	Air Quality Management	12	None
SL1772	SMW-140	Soldering	20	SL1355
AM1300	-	Sheet Metal Math Fundamentals	30	None
Total Hours			480	

Required Work Experience

Level 2				
Course No.	IPG No.	Course Name	Hours	Pre-Requisite(s)
SL2101	SMW-440	Trade Related Documents	3	Level 1
SL1453	SMW-230	Gas Metal Arc Welding (GMAW) and Shielded Metal Arc Welding (SMAW)	42	Level 1
SL1153	-	Pattern Development I	90	Level 1
SL2205	SMW-240 SWM-400	Fabrication (Air and Material Handling Systems and Components)	39	Level 1
SL2230	SMW-335	Chimneys, Breeching and Venting	15	Level 1
SL4240	-	Metal Roofing and Architectural Metal	30	Level 1
SL4100	-	Job Planning	15	Level 1
SL1305	-	Air Handling Systems II	6	Level 1
Total Hours			240	

Required Work Experience

Level 3				
Course No.	IPG No.	Course Name	Hours	Pre-Requisite(s)
SL1155	SMW-220 SMW-315	Pattern Development II	75	Level 2
SL1307	SMW-245 SMW-405	Air Handling Systems III	45	Level 2
SL3151	SMW-300	Advanced Gas Tungsten Arc Welding (GTAW)	75	Level 2
SL1455	-	Gas Metal Arc Welding (GMAW) II	15	Level 2
SL4260	SMW-410	Maintenance and Repair (Air and Handling Systems)	15	Level 2
SL4280	SMW-435	Specialty Products	15	Level 2
Total Hours			240	

Required Work Experience

Level 4				
Course No.	IPG No.	Course Name	Hours	Pre-Requisite(s)
SL4200	SMW-325	HVAC Systems	60	Level 3
SL1123	-	Material Handling Systems	45	Level 3
SL1157	-	Pattern Development III	70	Level 3
SL4230	SMW-415	Adjusting and Balancing (Air and Material Handling Systems)	15	Level 3
SL1457	-	Gas Metal Arc Welding (GMAW) III	30	Level 3
SL1900	-	Mentoring	20	Level 3
Total Hours			240	

Required Work Experience

Total Course Credit Hours	1200
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Level 1

SL1115 Tools and Equipment

Learning Outcomes:

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

Duration: 30 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to tools and equipment.
2. Identify types of hand tools and describe their applications and procedures for use.
3. Identify types of portable power tools and describe their applications and procedures for use.
4. Identify types of powder actuated tools and describe their applications.
5. Identify types of shop tools and equipment and describe their applications and procedures for use.
6. Identify types of Computer Numerical Control (CNC) equipment and describe their applications.
 - i. plasma cutting
 - ii. punches
 - iii. brakes
7. Identify types of measuring and layout tools and equipment and describe their applications and procedures for use.
8. Identify types of soldering/brazing equipment and describe their applications.
9. Describe the procedures used to inspect, maintain and store tools and equipment.

10. Define terminology associated with ladders and work platforms.
11. Identify hazards and describe safe work practices pertaining to ladders and work platforms.
 - i. fall protection and arrest
 - ii. power lines
 - iii. excess loads
12. Interpret codes and regulations pertaining to ladders and work platforms.
13. Identify types of ladders and work platforms, and describe their characteristics and applications.
 - i. ladders
 - ii. work platforms
 - stationary
 - portable
14. Describe the procedures used to erect and remove ladders and stationary work platforms.
15. Describe the procedures used to inspect, maintain, transport and store ladders and stationary work platforms.

Practical Requirements:

1. Produce work pieces to print specifications using the various types of power cutting equipment.
2. Use combination snips to cut to size a metal blank and circular disk.
3. Cut a circular opening in a metal blank using aviation snips.
4. Cut a piece of angle iron to size using a hack saw.
5. Cut a rectangular opening in a metal blank using a chisel.
6. Perform bending operations of ferrous and non-ferrous materials, using press brake, to specified tolerances/drawing specifications.
7. Use power shears to cut a sample piece to a given measurement and deburr.
8. Produce samples of seams and edges and check for accuracy.
9. Adjust and change punches and dies to create burr free holes.

10. Roll a work piece to a given specification.
11. Perform general maintenance according to manufacturer's specifications on hand and power tools.
12. Perform general maintenance according to manufacturer' specifications on equipment.
13. Prepare lap seams using various methods
 - i. sheet metal screws
 - ii. pop rivets
 - iii. spot welds

SL1180 Sheet Metal Fundamentals

Learning Outcomes:

- Demonstrate knowledge of metals and their characteristics and applications.

Duration: 3 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with sheet metals.
2. Describe identification systems for metals.
 - i. numbering
 - ii. colour coding
 - iii. gauging
3. Identify types of metals and describe their applications.
 - i. steel
 - ii. copper
 - iii. brass
 - iv. aluminum
 - v. cast iron
 - vi. stainless steel
4. Identify types of basic surface finishes and describe their applications.
 - i. mill
 - ii. brushed
 - iii. mirrored
 - iv. dull
5. Identify methods used to work with metals.
 - i. forming
 - ii. cutting/shearing

- iii. punching
 - iv. drilling
 - v. joining
6. Describe the procedures used to prevent or correct problems that occur when working metals.
7. Identify types of trade related documents and describe their applications.
- i. manufacturers' specifications
 - ii. drawings and specifications
 - iii. codes and standards
 - SMACNA
 - ASHRAE
 - National Building Code (NBC)
 - iv. work orders
 - change
 - job
 - material
8. Identify types of documentation and describe the procedures used to prepare them.
- i. work orders
 - ii. reports
 - hazard assessment
 - safety
 - Worker's Compensation
 - iii. maintenance/service records
 - iv. stock/inventory records
 - shop
 - job site
 - vehicle

Practical Requirements:

None

SL1125 Hoisting, Lifting and Rigging

Learning Outcomes:

- Demonstrate knowledge of hoisting, lifting and rigging equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of basic hoisting, lifting and rigging techniques.
- Demonstrate knowledge of the procedures used to perform hoisting and lifting operations.

Duration: 12 Hours

Pre-Requisite(s): SL1115

Objectives and Content:

1. Define terminology associated with hoisting, lifting and rigging.
2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.
3. Interpret codes and regulations pertaining to rigging, hoisting and lifting.
 - i. training and certification requirements
4. Identify types of rigging equipment and accessories and describe their applications, limitations and procedures for use.
 - i. ropes
 - ii. slings
 - iii. chains
 - iv. hooks
 - v. spreader bars
 - vi. shackles
5. Identify the factors to consider when selecting rigging equipment.
 - i. load characteristics
 - ii. environment

- iii. safety factor
6. Describe the considerations when rigging material/equipment for lifting.
 - i. load characteristics
 - ii. equipment and accessories
 - iii. environmental factors
 - iv. anchor points
 - v. sling angles
 7. Identify types of knots, hitches, splices and bends, and describe the procedures used to tie them.
 - i. bowline
 - ii. running bowline
 - iii. square/reef
 - iv. half-hitch
 8. Identify types of hoisting and lifting equipment and accessories, and describe their applications and procedures for use.
 - i. duct lift
 - ii. electric overhead travelling cranes
 - iii. come-alongs
 - iv. tirlors
 - v. chainfalls
 9. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.
 10. Explain sling angle when preparing for hoisting and lifting operations.
 11. Describe the procedures used for attaching rigging equipment to the load.
 12. Identify and interpret basic hand signals used for hoisting and lifting.
 13. Identify and describe procedures used to communicate during hoisting, lifting and rigging operations.
 - i. hand signals
 - ii. electronic communications
 - iii. audible/visual

14. Describe the procedures used to ensure the work area is safe for lifting.
 - i. supervision of lift
 - ii. securing work area
 - iii. communication

15. Describe the procedures used to perform a lift.
 - i. load determination
 - ii. communication methods
 - iii. pre-lift checks
 - iv. placement of load
 - v. post-lift inspection

16. Describe various types of scaffolding.

Practical Requirements:

1. Tie the following using fibre rope:
 - i. reef knot
 - ii. bowline
 - iii. round turn and hitch
 - iv. scaffold hitch

2. Demonstrate hand signals for crane operation.

SL1131 Fabrication Fundamentals

Learning Outcomes:

- Demonstrate knowledge of the procedures used to fabricate basic ductwork and fittings.

Duration: 30 Hours

Pre-Requisite(s): SL1115

Objectives and Content:

1. Define terminology associated with fabrication.
2. Interpret codes and regulations pertaining to the fabrication of sheet metal components.
3. Interpret information, pertaining to the fabrication of sheet metal components, found on drawings and specifications.
4. Identify tools and equipment used to fabricate basic sheet metal components, and describe their applications and procedures for use.
5. Identify types of fastening methods used to fabricate ductwork and fittings and describe their associated procedures.
 - i. mechanical
 - ii. adhesives
 - iii. welding
6. Identify types of seams for fabrication of ductwork and fittings and describe the procedures and connectors used to produce them.
 - i. longitudinal
 - Pittsburgh Lock
 - groove seam
 - acme lock
 - snap/button lock
 - ii. transverse
 - slip & drive
 - duct mate
 - TDC/TDF
 - companion flanges
7. Identify types of edges for fabrication of ductwork and fittings and describe the procedures used to produce them.

8. Identify types of duct reinforcement.

Practical Requirements:

1. Layout and fabricate a basic duct system.
 - i. metallic or non-metallic
 - ii. gauge
 - iii. joining apparatus
 - iv. sealing
2. Fabricate various seams and edges.
3. Fabricate and insulate basic duct run with basic fittings and various types of cleats.

SL1443 Metallurgy

Learning Outcomes:

- Demonstrate knowledge of metals and their properties.
- Demonstrate knowledge of metallurgic principles.

Duration: 6 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with metallurgy.
2. Describe the properties of metals.
 - i. composition
 - ii. physical
3. Describe the effects metal working has on metallurgic properties.
 - i. stress
 - ii. contraction
 - iii. expansion
 - iv. distortion
 - v. work hardening
 - vi. annealing
 - vii. galvanic action
4. Describe the passivation process.

Practical Requirements:

None.

SL1152 Drafting Pattern Development and Layout

Learning Outcomes:

- Demonstrate knowledge of basic drafting.
- Demonstrate knowledge of basic drafting tools and equipment and their procedures for use.
- Demonstrate basic knowledge of Computer Aided Drafting (CAD) and its use.
- Demonstrate knowledge of basic geometric shapes.

Duration: 24 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with drafting, pattern development and layout.
2. Identify basic drafting tools and equipment, and describe their applications and procedures for use.
3. Identify layout tools and describe their applications and procedures for use.
4. Identify basic geometric shapes and describe their characteristics.
5. Identify different views used when drafting and describe their applications.
 - i. elevation
 - ii. plan
 - iii. section
 - iv. auxiliary
6. Describe the procedures used to develop basic drawings and sketches.
 - i. pictorial
 - ii. orthographic
7. Identify types of computer technology used for pattern development and describe their applications.
8. Identify types of sheet metal patterns and describe the characteristics and applications.
 - i. square-to-round on centre
 - ii. right cone
 - iii. pipe tee

Practical Requirements:

1. Perform various geometric operations.
 - i. bisect a straight line or circle
 - ii. construct a perpendicular
 - iii. divide a line into a given number of equal parts
 - iv. construct parallel lines
 - v. construct tangents
 - vi. construct an ellipse
 - vii. construct a pentagon, octagon and hexagon

2. Layout and fabricate simple fittings.
 - i. elbows
 - ii. offsets
 - iii. duct sections

SL1304 Air Handling Systems I

Learning Outcomes:

- Demonstrate knowledge of installation procedures for air handling systems and their components.

Duration: 18 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with the installation of air handling systems and components.
2. Identify hazards and describe safe work practices pertaining to the installation of air handling systems and components.
3. Interpret information, pertaining to the installation of air handling systems, found on drawings and specifications.
4. Identify tools and equipment used for the installation of air handling systems, and describe their application, limitations and procedures for use.
5. Identify types of air handling systems, and describe their applications, principles and operation.
 - i. exhaust
 - ii. make-up air
 - iii. supply/return air (central)

6. Identify air handling system components and describe their applications.
 - i. sheet metal components
 - ductwork
 - fittings
 - hangers
 - ii. system components
 - dampers
 - fire dampers
 - registers/diffusers
 - grilles
 - louvers

7. Describe the procedures used to install air handling system components.

Practical Requirements:

None

SL1162 Blueprint Reading

Learning Outcomes:

- Demonstrate knowledge of the procedures used to interpret and extract information from drawings.
- Demonstrate knowledge of drawings and specifications and their applications.

Duration: 24 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with drawings.
2. Identify the types of drawings and describe their applications.
 - i. civil/site
 - ii. architectural
 - iii. mechanical
 - iv. structural
 - v. electrical
 - vi. shop drawings
 - vii. sketches
 - viii. as-built
3. Identify the views used on drawings.
 - i. elevation
 - ii. plan
 - iii. section
 - iv. detail
 - v. auxiliary
4. Identify the parts of a drawing and describe their purpose and applications.

lines

 - i. lines
 - ii. legend

- iii. symbols and abbreviations
 - duct
 - welding
 - electrical
 - plumbing
 - architectural
 - iv. title block
 - v. notes
 - vi. specifications
5. Identify and interpret common symbols and abbreviations found on drawings.
 6. Identify the types of scales and describe their applications and procedures for use.
 7. Describe metric and imperial systems of measurement.
 8. Interpret and extract information from drawings.

Practical Requirements:

1. Interpret blueprints.

SL1245 Layout and Fabrication-Parallel Lines

Learning Outcomes:

- Demonstrate knowledge of the procedures used to develop, wye-branches, two piece elbows and basic branches using the parallel line method of layout.
- Demonstrate knowledge of the procedures used to layout and fabricate flat on top and flat on bottom patterns.
- Demonstrate knowledge of the procedures used to layout and fabricate round tees.
- Demonstrate knowledge of the procedures used to layout and fabricate basic gutter mitres.
- Demonstrate knowledge of the procedures used to layout and fabricate round elbows.
- Demonstrate knowledge of the procedures used to layout and fabricate flashings.
- Demonstrate knowledge of the procedures used to layout and fabricate roof jacks.

Duration: 60 Hours

Pre-Requisite(s): SL1131, SL1162

Objectives and Content:

1. Define terminology associated with parallel line development.
 - i. flat-on-top
 - ii. flat-on-bottom
 - iii. pipe
 - iv. tee
 - v. mitre line
 - vi. centerline radius
 - vii. gore
 - viii. seam lines
 - ix. end gore
 - x. symmetry of lines
 - xi. true length of lines

2. Describe procedures to layout and fabricate round tees.
 - i. 90° tee with equal diameters
 - patterns for the tee
 - patterns for the hole
 - ii. 90° tee with unequal diameters
 - patterns for the tee
 - patterns for the hole
 - iii. centered tees at an angle
 - iv. off-center tees
 - v. off-center tees at an angle

3. Describe procedures used to layout and fabricate flat-on-top and flat-on-bottom patterns.
 - i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing
 - v. determine true length of lines
 - vi. determine types of seams, joints and edges
 - vii. calculate allowances
 - viii. determine stretch outs
 - ix. cut pattern
 - x. check pattern accuracy

4. Describe procedures used to layout and fabricate basic gutter mitres.

5. Describe the rule of elbow division.

6. Describe procedures used to layout and fabricate round and multi-piece elbows.

7. Describe procedures used to layout and fabricate roof jacks.

8. Describe procedures used to layout and fabricate wye branches.

Practical Requirements:

1. Layout and fabricate a basic roof jack as per specifications.
2. Layout and fabricate a basic two-piece elbow as per specifications.
3. Layout and fabricate a basic branch pattern as per specifications.
4. Layout and fabricate patterns as per specifications.
 - i. flat-on-top
 - ii. flat-on-bottom
 - iii. round tee
 - iv. basic gutter mitre
 - v. multi-piece elbow

SL1255 Layout and Fabrication-Radial Lines

Learning Outcomes:

- Demonstrate knowledge of the procedures used to layout and fabricate tapers on a pitch.
- Demonstrate knowledge of the procedures used to layout and fabricate scalene and oblique cones (eccentrics).

Duration: 45 Hours

Pre-Requisite(s): SL1131, SL1162

Objectives and Content:

1. Define terminology associated with radial line pattern development.
 - i. apex
 - ii. frustum of a cone
 - iii. truncated cones
 - iv. right cones
 - v. true length lines
 - vi. eccentrics
2. Identify and describe the types of fittings that require the radial line method of layout.
 - i. funnel
 - ii. tapers
 - iii. branches
3. Describe procedures to layout patterns and fabricate tapered fittings.
 - i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing
 - v. determine true length of lines
 - vi. determine types of seams, joints and edges
 - vii. calculate allowances

- viii. determine stretch outs
- ix. check pattern accuracy
- x. cut pattern

Practical Requirements:

1. Layout basic patterns and fabricate tapered fittings as per specifications.
 - i. basic frustum
 - ii. basic truncated cone
2. Layout pattern and fabricate fittings as per specifications.
 - i. tapers on a pitch
 - ii. scalene or oblique cones (eccentrics)

SL1265 Layout and Fabrication-Triangulation

Learning Outcomes:

- Demonstrate knowledge of the procedures used to layout and fabricate basic square-to-rounds using the triangulation method.
- Demonstrate knowledge of the procedures used to develop basic transitions using the triangulation method.

Duration: 60 Hours

Pre-Requisite(s): SL1131, SL1162

Objectives and Content:

1. Define terminology associated with triangulation.
 - i. true length of lines
 - ii. lines of symmetry
 - iii. square-to-rounds (e.g., change in shape)
 - iv. transitions (e.g., change in size)
2. Identify and describe the types of patterns and fittings that require the triangulation method.
 - i. square-to-rounds
 - ii. transitions
3. Describe two methods of finding true length of lines.
 - i. separate
 - ii. superimposed
4. Describe procedures to layout and fabricate patterns for basic transitions and square-to-rounds.
 - i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing

- v. determine true length of lines
 - vi. determine types of seams, joints, and edges
 - vii. calculate allowances
 - viii. determine stretch outs
 - ix. check pattern accuracy
 - x. cut pattern
5. Describe procedures used to layout patterns and fabricate basic cylindrical rolling offsets.
- i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing
 - v. determine true length of lines
 - vi. determine types of seams, joints, and edges
 - vii. calculate allowances
 - viii. determine stretch outs
 - ix. check pattern accuracy
 - x. cut pattern
6. Describe procedures used to layout patterns and fabricate square or rectangular basic drop cheek elbows and offsets.
- i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing
 - v. determine true length of lines
 - vi. determine types of seams, joints, and edges
 - vii. calculate allowances
 - viii. determine stretch outs
 - ix. check pattern accuracy
 - x. cut pattern
7. Describe procedures used to layout patterns and fabricate basic wye-branches and tapered elbows.
- i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing
 - v. determine true length of lines
 - vi. determine types of seams, joints, and edges
 - vii. calculate allowances

- viii. determine stretch outs
- ix. check pattern accuracy
- x. cut pattern

Practical Requirements:

1. Layout and fabricate basic transitions, square to rounds, basic wye branches, tapered elbows, and cylindrical rolling offsets as per specifications.
2. Layout and fabricate rectangular or square basic drop cheek elbows and offsets as per specifications.

SL1355 Oxy-Acetylene Welding and Cutting

Learning Outcomes:

- Demonstrate knowledge of the procedures to use oxy-fuel equipment to perform basic welding, cutting and brazing.

Duration: 25 Hours

Pre-Requisite(s): SL1115

Objectives and Content:

1. Identify and describe oxy-fuel equipment, its characteristics and applications.
2. Describe the safe operation of oxy-fuel equipment.
 - i. cleaning
 - ii. threads
 - iii. pressure
 - iv. fuel gas
 - v. oxygen
 - vi. set up procedures
 - vii. lighting procedures
 - viii. flame adjustment
 - ix. shut down procedures
3. Identify the metals that can be cut by oxy-fuel equipment.
4. Describe the types of flames, pressure and tip sizes and the application of each.
5. Describe the various types of torches and their applications.
6. Describe the principles of the oxy-fuel welding process.
 - i. flame adjustment
 - ii. filler metals
 - brazing rod
 - silver / phosphorus

Practical Requirements:

1. Set up and use cutting equipment.
2. Set up and use welding equipment.
3. Fusion weld in the flat position.
4. Braze weld in the horizontal position.
5. Shut down oxy-fuel equipment.

SL1285 Plasma Arc Cutting

Learning Outcomes:

- Demonstrate knowledge of plasma arc equipment and accessories.
- Demonstrate knowledge of the procedures used to cut with plasma arc equipment.

Duration: 6 Hours

Pre-Requisite(s): SL1115

Objectives and Content:

- 1, Define terminology associated with plasma arc cutting.
2. Identify hazards and describe safe work practices pertaining to the use of plasma arc cutting equipment.
 - i. personal
 - ii. shop/facility
 - iii. equipment
 - iv. ventilation
3. 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
4. Describe the procedures used to set-up, adjust and shut down plasma arc equipment.
5. Describe the procedures used to inspect and maintain plasma arc equipment.

6. Describe the procedures used to cut using plasma arc equipment.

Practical Requirements:

1. Perform plasma arc cutting operations.

SL1440 Introduction to Gas Metal Arc Welding (GMAW)

Learning Outcomes:

- Demonstrate knowledge of gas metal arc welding (GMAW) welding equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set-up, adjust, operate, inspect and maintain GMAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using GMAW welding equipment.

Duration: 30 Hours

Pre-Requisite(s): SL1355

Objectives and Content:

1. Describe the purpose, applications and advantages of GMAW.
2. Identify hazards and describe safe work practices pertaining to the use of GMAW equipment.
 - i. personal
 - ii. shop/facility
 - iii. equipment
 - iv. ventilation
3. Define terminology associated with GMAW welding.
 - 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
4. Identify codes, standards and symbols pertaining to GMAW welding.
- i. Canadian Standards Association (CSA)
 - ii. American Society of Mechanical Engineers (ASME)
 - iii. American Welding Society (AWS)
5. Identify GMAW welding equipment, consumables and accessories and describe their applications.
6. Describe the procedures used to assemble and disassemble GMAW welding equipment.
7. Describe the procedures used to establish and maintain an arc using GMAW welding equipment.
- 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
8. Identify the modes of transfer relating to GMAW welding and describe their characteristics and applications.
- i. short circuiting
 - ii. globular
 - iii. spray
 - iv. pulse
9. Describe the procedures and techniques used to deposit a weld bead using GMAW welding equipment.
- i. electrode extension
 - ii. travel speed
 - iii. work and travel angles
 - iv. flow rates
 - v. stringer
 - vi. weave
 - vii. stick-out

- viii. travel speed
 - ix. work and travel angles
 - x. visual inspection
10. Describe the procedures used to inspect, maintain and troubleshoot GMAW welding equipment

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.

SL1452 Introduction to Gas Tungsten Arc Welding (GTAW)

Learning Outcomes:

- Demonstrate knowledge of gas tungsten arc welding (GTAW) equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set-up, adjust, operate, inspect and maintain GTAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using GTAW equipment.

Duration: 45 Hours

Pre-Requisite(s): SL1355

Objectives and Content:

1. Describe the purpose, applications and advantages of GTAW.
2. Define terminology associated with GTAW welding.
 - i. equipment and accessories
 - power sources
 - air-cooled torches
 - water-cooled torches
 - flow meters
 - ii. tungsten electrodes
 - iii. current requirement
 - iv. shielding gases
 - v. travel and work angles
 - vi. filler rods
 - vii. collet
 - viii. collet body
 - ix. cup
 - x. high frequency

3. Identify hazards and describe safe work practices pertaining to the use of GTAW equipment.
 - i. personal
 - ii. shop/facility
 - iii. equipment
 - iv. ventilation
4. Interpret codes and regulations pertaining to the use of GTAW equipment for welding mild steel.
5. Identify GTAW welding equipment, consumables and accessories and describe their applications.
6. Describe the procedures used to assemble and disassemble GTAW welding equipment.
7. Describe the procedures used to establish and maintain an arc using GTAW welding equipment.
8. Describe the procedures and techniques used to deposit a weld bead using GTAW welding equipment.
 - i. with filler metal
 - ii. without filler metal
9. Describe the procedures used to inspect, maintain and troubleshoot GTAW welding equipment.

Practical Requirements:

1. Set-up GTAW equipment.
2. Run beads on mild steel plate.
3. Shut-down equipment.

SL1743 Air Quality Management

Learning Outcomes:

- Demonstrate knowledge of air quality management.

Duration: 12 Hours

Pre-Requisite(s): None

Objectives and Content:

1. Define terminology associated with air quality management.
2. Identify hazards and describe safe work practices pertaining to air quality management.
3. Interpret codes and regulations pertaining to air quality management.
4. Describe considerations and requirements associated with air quality management.
 - i. environmental conditions
 - ii. intake locations
 - iii. exhaust locations
5. Describe the importance of indoor air quality.
6. Identify methods of improving or correcting problems with air quality.
 - i. heating/cooling
 - ii. ventilation
 - iii. conditioning
 - filtration
 - sterilization
 - purification
 - humidification/dehumidification

7. Identify areas requiring special air quality ventilation.
 - i. clean/sterile rooms
 - ii. industrial/commercial settings
8. Identify the methods used to determine air quality relating to humidity and temperature.
9. Identify air quality problems and describe the procedures used to prevent or correct them.
 - i. contamination
 - ii. humidity
 - iii. temperature (hot/cold zones)
 - iv. air motion
10. Describe the impact improper system or component installation can have on air quality.

Practical Requirements:

None.

SL1772 Soldering

Learning Outcomes:

- Demonstrate knowledge of equipment used for soldering.
- Demonstrate knowledge of the procedures used to solder various materials.

Duration: 20 Hours

Pre-Requisite(s): SL1355

Objectives and Content:

1. Identify and describe the various types of soldering equipment, its characteristics and applications.
 - i. types of soldering irons (copper)
 - ii. types of soldering furnaces
2. Describe the safe operation of gas fired furnaces.
 - i. leaks
 - ii. ventilation
 - iii. cleaning
 - iv. lighting procedure
 - v. shut down procedure
3. Describe the proper method of forging and tinning an iron.
4. Describe the various fluxes used in soldering and their preparation.
 - i. corrosive and non-corrosive
 - ii. safe handling of acids
 - iii. ventilation
5. Describe the various types of solder and their advantages and disadvantages.
 - i. Composition
 - ii. grading (50/50, 60/40)
 - iii. bar solder
 - iv. wire solder

- v. flux core
 - vi. beads
6. Describe various soldering methods.
- i. flame color
 - ii. sweating a joint
 - iii. skimming
 - iv. pointing up
 - v. capillary action
 - vi. seam preparation
 - vii. flux removal
 - viii. test for leakage

Practical Requirements:

1. Forge and tin a soldering iron.
2. Light and shut down a propane furnace.
3. Solder container having both vertical and horizontal seams.
4. Test for leaks.

AM1300 Sheet Metal 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): No requirement for direct entry apprentices

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.

Level 2

SL2101 Trade Related Documents

Learning Outcomes:

- Demonstrate knowledge of trade related documents and their use.
- Demonstrate knowledge of procedures used to prepare documentation.

Duration: 3 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

1. Identify types of trade related documents and describe their applications.
 - i. manufacturers' specifications
 - ii. drawings and specifications
 - iii. codes and standards
 - SMACNA
 - ASHRAE
 - National Building Code (NBC)
 - iv. work orders
 - change
 - job
 - material

2. Identify types of documentation and describe the procedures used to prepare them.
 - i. work orders
 - ii. reports
 - hazard assessment
 - safety
 - Worker's Compensation
 - iii. maintenance/service records
 - iv. stock/inventory records
 - shop
 - job site
 - vehicle

Practical Requirements:

None.

SL1453 Gas Metal Arc Welding (GMAW) & Shielded Metal Arc Welding (SMAW)

Learning Outcomes:

- Demonstrate knowledge of the procedures used to weld stainless steel using the GMAW & SMAW process.
- Demonstrate knowledge of the procedures used to weld mild steel using the GMAW & SMAW process.

Duration: 42 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

1. Interpret codes and regulations pertaining to the use of GMAW & SMAW equipment for welding mild & stainless steel.
2. Identify GMAW & SMAW equipment, consumables and accessories used to weld mild & stainless steel, and describe their characteristics and applications.
3. Identify the modes of transfer relating to GMAW & SMAW welding and describe their characteristics and applications.
 - i. short circuiting
 - ii. globular
 - iii. spray
 - iv. pulse
4. Describe the procedures used to set-up, adjust and shut-down GMAW & SMAW equipment for welding mild & stainless steel.
5. Describe the procedures used to weld mild & stainless steel using the GMAW & SMAW process.
 - i. plug
 - ii. fillet (continuous)
 - iii. stitch
 - iv. tack
 - v. edge
 - vi. corner
6. Describe weld defects, their causes and the procedures to prevent and correct them.
 - i. porosity
 - ii. cracks

- iii. warping
- iv. undercut

Practical Requirements:

1. Set up GMAW & SMAW equipment.
2. Change the electrode wire guide.
3. Adjust and check the flow metre.
4. Deposit fillet welds on mild and stainless steel plates of various thicknesses using the GMAW & SMAW processes in various positions.

SL1153 Pattern Development I

Learning Outcomes:

- Demonstrate knowledge of the procedures used to layout and fabricate complex transitions.
- Demonstrate knowledge of the procedures used to layout and fabricate complex drop cheek elbows and rolling offsets.
- Demonstrate knowledge of the procedures used to layout and fabricate tapered elbows.
- Demonstrate knowledge of the procedures used to layout and fabricate round tees.

Duration: 90 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

- 1 Describe procedures used to layout patterns and fabricate complex transitions, drop cheek elbows, rolling offsets, tapered elbows, and round tees.
 - i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing
 - v. determine true length of lines
 - vi. determine types of seams, joints, and edges
 - vii. calculate allowances
 - viii. determine stretch outs
 - ix. check pattern accuracy
 - x. cut pattern

Practical Requirements:

1. Layout and fabricate as per specifications.
 - i. complex transition
 - ii. drop cheek elbow
 - iii. rolling offset
 - iv. tapered elbow
 - v. round tees

SL2205 Fabrication (Air and Material Handling Systems and Components)

Learning Outcomes:

- Demonstrate knowledge of sheet metal components for air handling systems and the procedures used to fabricate them.
- Demonstrate knowledge of sheet metal components for material handling systems and the procedures used to fabricate them.

Duration: 39 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

1. Define terminology associated with air and material handling systems.
2. Identify hazards and describe safe work practices when fabricating sheet metal components for air and material handling systems.
3. Interpret codes and regulations pertaining to the fabrication of sheet metal components for air and material handling systems.
 - i. SMACNA
 - ii. ASHRAE
 - iii. NBC
4. Interpret information, pertaining to the fabrication of sheet metal components for air and material handling systems, found on drawings and specifications.
5. Identify tools and equipment used to fabricate sheet metal components for air and material handling systems, and describe their applications, limitations and procedures for use.
6. Identify types of materials used to fabricate sheet metal components for air and material handling systems, and describe their characteristics and applications.

7. Identify and describe sheet metal components associated with air and material handling systems.
 - i. ductwork
 - ii. fittings
 - iii. dampers
 - iv. fire dampers
 - breakaway join
 - v. flexible connections
 - vi. hangers
 - vii. equipment supports/bases
 - viii. louvers
 - ix. attenuators (silencer)

8. Identify considerations and requirements when fabricating sheet metal components for air handling systems.
 - i. load bearing capacities
 - ii. system specifications
 - iii. environmental conditions

9. Identify considerations and requirements when fabricating sheet metal components for material handling systems.
 - i. load bearing capacities
 - ii. system specifications
 - iii. environmental conditions
 - iv. architectural conditions

10. Describe the procedures used to fabricate sheet metal components for air and material handling systems.
 - i. cut
 - ii. label
 - iii. form
 - iv. insulate
 - v. assemble

11. Identify tools and instruments used in testing and inspecting systems, and describe their applications and procedures for use.

Practical Requirements:

1. Fabricate and assemble a flexible connection.
2. Fabricate and install a single blade balancing damper.
3. Fabricate sleeve to accommodate installation of a fire damper in duct work.

SL2230 Chimneys, Breeching and Venting

Learning Outcomes:

- Demonstrate knowledge of installation procedures for chimneys, breeching and venting.

Duration: 15 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

1. Define terminology associated with chimneys, breeching and venting.
2. Identify hazards and describe safe work practices associated with chimneys, breeching and venting.
3. Interpret codes, standards and regulations pertaining to the installation of chimneys, breeching and venting.
 - i. jurisdictional requirements
4. Interpret information pertaining to the installation of chimneys, breeching and venting, found on drawings and specifications.
5. Identify tools and equipment relating to the installation of chimneys, breeching and venting, and describe their applications and procedures for use.
6. Identify types of chimneys, breeching and venting systems and their components and describe their applications.
 - i. chimney classifications
 - ii. vent classifications/combustion air
7. Describe the procedures used to remove and install chimneys, breeching and venting.
8. Describe the procedures used to connect chimneys, breeching and venting to the appliance.

9. Identify cladding and lagging materials used for chimneys, breeching and venting and describe their characteristics and applications.
10. Identify flashing requirements pertaining to chimneys, breeching and venting.
11. Describe the procedures used to install cladding and lagging on chimneys, breeching and venting.

Practical Requirements:

None.

SL4240 Metal Roofing and Architectural Metal

Learning Outcomes:

- Demonstrate knowledge of fabrication procedures for metal roofing, cladding and architectural metals.
- Demonstrate knowledge of installation procedures for metal roofing, cladding and architectural metals.

Duration: 30 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

1. Define terminology associated with metal roofing, cladding and architectural metals.
2. Identify hazards and describe safe work practices pertaining to the fabrication and installation of metal roofing, cladding and architectural metals.
3. Interpret codes and regulations pertaining to the installation of metal roofing, cladding and architectural metals.
4. Interpret information, pertaining to metal roofing and architectural metal, found on drawings and specifications.
5. Identify tools and equipment used to fabricate and install metal roofing, cladding and architectural metals, and describe their applications and procedures for use.
6. Identify types of materials used in fabricating metal roofing, cladding and architectural metals.
7. Identify types of components associated with metal roofing and cladding and architectural metals and describe their applications.
 - i. roof drainage
 - ii. flashing
 - iii. soffit and fascia

- iv. roof vents
8. Describe the procedures used to fabricate metal roofing, cladding and architectural metals and their associated components.
- i. layout
 - ii. determine seam
 - standing seam
 - batten seam
 - flat seam
 - commercial
 - iii. cut
 - iv. form
 - v. solder and braze seam
9. Identify considerations and requirements relating to installing metal roofing, cladding and architectural metals.
- i. building materials
 - ii. roof slope
 - iii. expansion and contraction
10. Identify types of fasteners for installing metal roofing, cladding and architectural metals and describe their applications.
11. Identify types of roof structures and construction features and describe their applications.
- i. hip
 - ii. gable
 - iii. pitched
 - iv. flat
 - v. saw tooth
 - vi. shed
 - vii. mansard
12. Describe the procedures used to layout metal roofing, cladding and architectural metals.
- i. check for square
 - ii. determine starting point
 - iii. establish reference lines

13. Identify materials to be installed to prepare surfaces for installation of metal roofing, cladding and architectural metals insulation.
 - i. waterproof membrane
 - ii. isolation material
 - iii. building envelope
14. Describe the procedures used to install materials to roofs or walls in preparation for installation of metal roofing, cladding and architectural metals.
15. Describe the procedures used to install metal roofing, cladding and architectural metals.
 - i. cut
 - ii. fit
 - iii. secure
 - iv. seal
16. Identify types of metal decking and describe their applications.
 - i. metal pan
 - ii. Q decking
17. Describe the procedures used to install decking.
18. Identify types of exterior components and describe their applications.
 - i. awnings
 - ii. signage
 - iii. cornice work

Practical Requirements:

None.

SL4100 Job Planning

Learning Outcomes:

- Demonstrate knowledge of the procedures used to plan and organize jobs.
- Demonstrate knowledge of the procedures used to take field measurements.
- Demonstrate knowledge of the procedures used to produce material take-off lists.

Duration: 15 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

1. Identify sources of information relevant to job planning.
 - i. documentation
 - ii. drawings
 - iii. specifications
 - iv. related professionals
 - v. clients
2. Describe the considerations for determining job requirements.
 - i. personnel
 - ii. tools and equipment
 - iii. materials
 - iv. permits
3. Describe the procedures used to plan job tasks.
 - i. scheduling
 - ii. estimating
4. Describe the procedures used to organize and maintain inventory.
5. Describe the procedures used to interpret and extract information from blueprints.

6. Identify the purpose of submittals and shop drawings and describe the procedures used to interpret them.
7. Identify the types of material take-off lists and describe their applications and the procedures used to produce them.
 - i. material estimation
 - ii. material installation
8. Describe the procedures used to prepare for installation of residential and /or commercial/industrial air & material handling systems and components.
 - i. duct sizing
 - ii. determine penetration locations
 - iii. perform site measurements
 - iv. demolition and removal of existing systems and components
 - v. on-site co-ordination
 - staging (storing material)
 - planning
 - distributing (material to installation area)
 - sectioning (pre-assembling on site)
 - erecting
 - vi. final inspection (completing)
9. Identify considerations and requirements for installing air & material handling system components.
 - i. isolators
 - ii. environmental conditions
 - iii. field design modifications

Practical Requirements:

None.

SL1305 Air Handling Systems II

Learning Outcomes:

- Demonstrate knowledge of installation procedures for air handling systems and their components.

Duration: 6 Hours

Pre-Requisite(s): Level 1

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to the installation of air handling systems and components.
2. Interpret information, pertaining to the installation of air handling systems, found on drawings and specifications.
3. Identify air handling system components and accessories and describe their applications.
 - fire dampers
 - smoke dampers
 - access doors
 - spark arrestors
4. Describe the procedures used to install air handling system components.

Practical Requirements:

None

Level 3

SL1155 Pattern Development II

Learning Outcomes:

- Demonstrate knowledge of the procedures used to layout and fabricate wye-branch using scalene cones.
- Demonstrate knowledge of the procedures used to layout and fabricate intersections.
- Demonstrate knowledge of the procedures used to layout and fabricate complex wye-branches and tapered elbows.
- Demonstrate knowledge of the procedures used to layout and fabricate complex square-to-rounds.
- Demonstrate knowledge of the procedures used to layout and fabricate flashings.

Duration: 75 Hours

Pre-Requisite(s): Level 2

Objectives and Content:

1. Describe procedures used to layout and fabricate tapered elbows, wye-branches, intersections, square to rounds, and flashings.
 - i. determine views
 - ii. locate views
 - symmetry of lines
 - iii. label lines and points
 - iv. prepare drawing
 - v. determine true length of lines
 - vi. determine types of seams, joints and edges
 - vii. calculate allowances
 - viii. determine stretch outs
 - ix. check pattern accuracy
 - x. cut pattern

Practical Requirements:

1. Layout and fabricate, as per specifications;
 - i. tapered elbow
 - ii. wye-branch using scalene cones
 - iii. complex wye-branch
 - iv. intersection
 - v. square-to-round
 - vi. flashing

SL1307 Air Handling Systems III

Learning Outcomes:

- Demonstrate knowledge of installation procedures for air handling systems and their components.
- Demonstrate knowledge of installation procedures for material handling systems and their components.
- Demonstrate knowledge of basic design and field modifications.

Duration: 45 Hours

Pre-Requisite(s): Level 2

Objectives and Content:

1. Define terminology associated with the installation of air handling systems and components.
2. Identify hazards and describe safe work practices pertaining to the installation of air handling systems and components.
3. Interpret information, pertaining to the installation of air handling systems, found on drawings and specifications.
4. Identify tools and equipment used for the installation of air handling systems, and describe their application, limitations and procedures for use.
5. Identify types of air handling systems, and describe their applications, principles and operation.
 - i. exhaust
 - ii. make-up air
 - iii. supply/return air (central)

6. Identify air handling system components and describe their applications.
 - i. sheet metal components
 - ductwork
 - fittings
 - hangers
 - braces
 - brackets
 - cladding/lagging
 - flashing
 - ii. system components
 - units
 - coils
 - heat and energy recovery ventilators
 - automatic controls and instruments
 - insulation
 - thermal
 - acoustical
 - iii. accessories
 - humidifiers
 - filters
 - mixing boxes

7. Identify the types of fasteners and describe their applications.
 - i. concrete
 - ii. metal
 - iii. wood

8. Describe the procedures used to prepare for installation of residential and commercial/industrial air handling systems and components.
 - i. determine equipment requirements
 - ii. determine penetration locations
 - iii. perform site measurements
 - iv. demolition and removal of existing systems and components
 - v. on-site co-ordination
 - staging (storing material)
 - planning
 - distributing (material to installation area)
 - sectioning (pre-assembling on site)
 - erecting
 - vi. final inspection (completing)

9. Identify considerations and requirements for installing air handling system components.
 - i. manufacturers' specifications
 - ii. isolators
 - iii. building materials

- iv. environmental conditions
 - v. field design modifications
10. Describe the procedures used to install air handling system components.

Practical Requirements:

1. Install duct run and various components to plan and specifications.

SL3151 Advanced Gas Tungsten Arc Welding

Learning Outcomes:

- Demonstrate knowledge of the procedures used to weld aluminum and stainless steel using the GTAW process.

Duration: 75 Hours

Pre-Requisite(s): Level 2

Objectives and Content:

1. Interpret codes and regulations pertaining to the use of GTAW equipment for welding aluminum and stainless steel
2. Identify types of GTAW equipment, consumables and accessories used to weld aluminum and stainless steel and describe their characteristics and applications.
3. Describe the procedures used to set-up, adjust and shut-down GTAW equipment for welding aluminum, and stainless steel.
4. Describe the procedures used to weld aluminum and stainless steel using the GTAW process.
 - i. plug
 - ii. fillet (continuous)
 - iii. stitch
 - iv. tack
 - v. edge
 - vi. corner
5. Describe weld defects, their causes and the procedures to prevent and correct them.
 - i. porosity
 - ii. cracks
 - iii. warping
 - iv. undercut

Practical Requirements:

1. Set-up and adjust GTAW welding equipment.
2. Weld corner, lap, tee and butt joints on aluminum and stainless steel.
3. Apply finishing methods to welds.

SL1455 Gas Metal Arc Welding (GMAW) II

Learning Outcomes:

- Demonstrate knowledge of the procedures used to weld aluminum using the GMAW process.
- Demonstrate knowledge of the procedures used to weld aluminum using the GMAW process.

Duration: 15 Hours

Pre-Requisite(s): Level 2

Objectives and Content:

1. Interpret codes and regulations pertaining to the use of GMAW equipment for welding aluminum.
2. Identify GMAW equipment, consumables and accessories used to weld aluminum, and describe their characteristics and applications.
3. Identify the modes of transfer relating to GMAW welding and describe their characteristics and applications.
 - i. short circuiting
 - ii. globular
 - iii. spray
 - iv. pulse
4. Describe the procedures used to set-up, adjust and shut-down GMAW equipment for welding aluminum.
5. Describe the procedures used to weld aluminum using the GMAW process.
 - i. plug
 - ii. fillet (continuous)
 - iii. stitch
 - iv. tack
 - v. edge
 - vi. corner
6. Describe weld defects, their causes and the procedures to prevent and correct them.
 - i. porosity
 - ii. cracks
 - iii. warping
 - iv. undercut

Practical Requirements:

None

SL4260 Maintenance and Repair (Air and Material Handling Systems)

Learning Outcomes:

- Demonstrate knowledge of maintenance and repair procedures for air handling systems.
- Demonstrate knowledge of maintenance and repair procedures for material handling systems.
- Demonstrate knowledge of testing devices and their applications.

Duration: 15 Hours

Pre-Requisite(s): Level 2

Objectives and Content:

1. Define terminology associated with the maintenance and repair of air and material handling systems.
2. Identify hazards and describe safe work practices pertaining to the maintenance and repair of air and material handling systems.
3. Interpret codes and regulations pertaining to the maintenance and repair of air and material handling systems.
 - i. SMACNA
 - ii. ASHRAE
 - iii. NBC
4. Identify tools and equipment used to maintain and repair air and material handling system components, and describe their applications, limitations and procedures for use.
 - i. testing devices
5. Identify considerations for the maintenance and repair of air and material handling system components.
 - i. sounds
 - ii. vibration
 - iii. odours
 - iv. heat build-up
 - v. visual
6. Describe the procedures used to diagnose system faults in air and material handling system components.

7. Describe the procedures used to service air and material handling system components.
 - i. scheduled
 - filters
 - lubrication
 - adjustments
 - ii. emergency
 - iii. lock out

8. Describe the procedures used to repair or replace worn, faulty or defective components of air or material handling systems.

Practical Requirements:

None.

SL4280 Specialty Products

Learning Outcomes:

- Demonstrate knowledge of specialty products and their applications.
- Demonstrate knowledge of fabrication procedures for specialty products.
- Demonstrate knowledge of installation procedures for specialty products and their related components.

Duration: 15 Hours

Pre-Requisite(s): Level 2

Objectives and Content:

1. Define terminology associated with the fabrication of specialty products.
 - i. metal
 - ii. non-metal
2. Identify hazards and safe work practices pertaining to the fabrication and installation of specialty products.
3. Interpret codes and regulations pertaining to the fabrication and installation of specialty products.
 - i. codes and regulations
 - ii. manufacturers' specifications
 - iii. environmental conditions
 - iv. sanitation
4. Interpret information, pertaining to the fabrication and installation of specialty products, found on drawings and specifications.
5. Identify tools and equipment used to fabricate and install specialty products, and describe their applications, limitations and procedures for use.
6. Identify types of specialty products and accessories and describe their applications.
 - i. kitchen
 - ii. medical
 - iii. food processing
 - iv. pharmaceutical laboratory
 - v. decorative
 - vi. marine

7. Identify types of materials used in fabricating specialty products and components and describe their applications.
 - i. ferrous
 - ii. non-ferrous
 - iii. plastics/PVC
 - iv. composites (i.e., awnings)

8. Describe the procedures used to fabricate specialty products and their associated components.
 - i. handling
 - ii. design
 - iii. cut
 - iv. form
 - v. assemble
 - vi. join
 - vii. finish

9. Identify types of fasteners and fastening methods used to install specialty products and describe their applications.

10. Describe the procedures used to install specialty products.

Practical Requirements:

None.

Level 4

SL1457 Gas Metal Arc Welding (GMAW) III

Learning Outcomes:

- Demonstrate knowledge of the procedures used to weld aluminum using the GMAW process.
- Demonstrate knowledge of the procedures used to weld aluminum using the GMAW process.

Duration: 30 Hours

Pre-Requisite(s): Level 3

Objectives and Content:

1. Interpret codes and regulations pertaining to the use of GMAW equipment for welding aluminum.
2. Identify GMAW equipment, consumables and accessories used to weld aluminum, and describe their characteristics and applications.
3. Identify the modes of transfer relating to GMAW welding and describe their characteristics and applications.
 - i. short circuiting
 - ii. globular
 - iii. spray
 - iv. pulse
4. Describe the procedures used to set-up, adjust and shut-down GMAW equipment for welding aluminum.
5. Describe the procedures used to weld aluminum using the GMAW process.
 - i. plug
 - ii. fillet (continuous)
 - iii. stitch
 - iv. tack
 - v. edge
 - vi. corner
6. Describe weld defects, their causes and the procedures to prevent and correct them.
 - i. porosity
 - ii. cracks

- iii. warping
- iv. undercut

Practical Requirements:

1. Set up GMAW equipment.
2. Change the electrode wire guide.
3. Adjust and check the flow metre.
4. Deposit fillet welds on aluminum plates of various thicknesses using the GMAW process in various positions.

SL1123 Material Handling Systems

Learning Outcomes:

- Demonstrate knowledge of installation procedures for material handling systems and their components.
- Demonstrate knowledge of basic design and field modifications.

Duration: 45 Hours

Pre-Requisite(s): Level 3

Objectives and Content:

1. Define terminology associated with the installation of material handling systems and components.
2. Identify hazards and describe safe work practices pertaining to the installation of material handling systems and components.
3. Interpret information, pertaining to the installation of material handling systems, found on drawings and specifications.
4. Identify tools and equipment used for the installation of material handling systems, and describe their application, limitations and procedures for use.
5. Identify material handling system components and describe their applications.
 - i. sheet metal components
 - ductwork
 - fittings
 - hangers
 - braces
 - brackets
 - cladding/lagging
 - flashing
 - ii. system components
 - fans
 - collection devices
 - cyclone
 - separating devices
 - automatic controls and instruments
 - thermal insulation
 - iii. accessories
 - access doors

- blast gates
6. Identify the types of fasteners and describe their applications.
 - i. concrete
 - ii. metal
 - iii. wood
 7. Describe the procedures used to prepare for installation of material handling system components.
 - i. determine equipment requirements
 - ii. verify duct sizing
 - iii. determine penetration locations
 - iv. perform site measurements
 - v. demolition and removal of existing systems and components
 - vi. on-site co-ordination
 - staging (storing material)
 - planning
 - distributing (material to installation area)
 - sectioning (pre-assembling on site)
 - erecting
 - vii. final inspection (completing)
 8. Identify considerations for installing material handling system components.
 - i. manufacturers' specifications
 - ii. isolators
 - iii. building materials
 - iv. environmental conditions
 - v. field design modifications
 9. Describe the procedures used to install material handling system components.

Practical Requirements:

1. Install duct run and various components to plan and specifications.

SL4200 HVAC Systems

Learning Outcomes:

- Demonstrate knowledge of HVAC systems and their associated design principles.

Duration: 60 Hours

Pre-Requisite(s): Level 3

Objectives and Content:

1. Describe the purpose and operation of an HVAC system.
2. Describe the basic properties of air.
 - i. psychrometric chart
3. Describe air patterns and their impact on the operation of a typical HVAC system.
 - i. air velocity (FPM)
 - ii. air volume (CFM)
 - iii. duct pressure
 - static pressure (SP)
 - velocity pressure (VP)
 - total pressure (TP)
 - iv. resistance
 - friction loss
 - dynamic loss
4. Describe ventilation.
 - i. purpose
 - ii. positive and negative building pressure
 - iii. sources of infiltration and exfiltration
 - iv. methods of measuring
5. Describe the basic principles of heating and cooling air.
6. Identify the types of fans.
 - i. axial
 - propeller
 - tube axial
 - vane axial
 - ii. centrifugal
 - straight blade

- forward curved blade (squirrel cage)
 - backward inclined
7. Describe the four basic duct systems and their design principles.
 - i. single zone
 - ii. variable air volume (VAV)
 - iii. multi-zone
 - iv. double-duct (dual)
 8. Describe the installation of HVAC equipment.
 - i. regulations (SMACNA)
 - ii. procedures
 - iii. practices
 - iv. principles
 9. Describe the types of package units.
 - i. gas-electric
 - ii. gas-gas
 - iii. electric-electric
 - iv. heat pump
 10. Describe procedures used to install package units.
 - i. roof top systems
 - ii. split systems
 - indoor
 - outdoor
 11. Describe air handling system components.
 - i. cladding/lagging
 - ii. flashing
 - iii. thermal and acoustical insulation

Practical Requirements:

None.

SL1157 Pattern Development III

Learning Outcomes:

- demonstrate knowledge of computer technology used for pattern development and layout
- demonstrate knowledge of basic pattern development and layout

Duration: 70 Hours

Pre-Requisite(s): Level 3

Objectives and Content:

1. Describe the procedures used to perform pattern development using computer technology.
2. Define terminology associated with pattern development and layout.
3. Identify layout tools and describe their applications and procedures for use.
4. Identify layout methods and describe their applications.

Practical Requirements:

1. Select, finalize and fabricate a component using computer technology as per specifications.

SL4230 Adjusting and Balancing (Air and Material Handling Systems)

Learning Outcomes:

- Demonstrate knowledge of adjusting and balancing procedures for air handling systems.
- Demonstrate knowledge of adjusting and balancing procedures for material handling systems.

Duration: 15 Hours

Pre-Requisite(s): Level 3

Objectives and Content:

1. Define terminology associated with adjusting and balancing air and material handling systems.
2. Identify hazards and describe safe work practices pertaining to adjusting and balancing air and material handling systems.
3. Interpret codes and regulations pertaining to adjusting and balancing air and material handling systems.
4. Interpret information, pertaining to adjusting and balancing air and material handling systems, found on drawings and specifications.
5. Identify requirements and limitations pertaining to adjusting and balancing air handling systems.
6. Identify tools and instruments used in adjusting and balancing systems, and describe their applications and procedures for use.
 - i. electrical devices
 - ii. air balancing devices
 - iii. charts
 - psychometric
 - fan

7. Describe the importance of balancing and adjusting to ensure optimal system performance.
8. Describe the procedures and techniques used to perform air balancing on air handling systems.
9. Describe the procedures and techniques used to perform balancing on material handling systems.
10. Describe the procedures used to adjust air handling system components to optimize performance.
11. Describe the procedures used to adjust material handling system components to optimize performance.
12. Identify problems pertaining to air handling systems and describe the procedures used to prevent and correct them.
 - i. positive pressure
 - ii. negative pressure
 - iii. improper installation
 - duct sizing
 - noise
13. Identify problems pertaining to material handling systems and describe the procedures used to prevent and correct them.

Practical Requirements:

None.

SL1900 Mentoring

Learning Outcomes:

- Demonstrate knowledge of strategies for learning skills in the workplace.
- Demonstrate knowledge of strategies for teaching workplace skills

Duration: 20 Hours

Pre-Requisite(s): Level 3

Objectives and Content:

1. Describe the importance of individual experience.
2. Describe the shared responsibilities for workplace learning.
3. Determine one's own learning preferences and explain how these relate to learning new skills.
4. Describe the importance of different types of skills in the workplace.
5. Identify different learning needs and describe the strategies to meet these needs.
 - i. learning disabilities
 - ii. learning preferences
 - iii. language proficiency
6. Identify strategies to assist in learning a skill.
 - i. developing coaching skills
 - ii. being mature and patient
 - iii. providing/accepting feedback
7. Identify different roles played by a workplace mentor.
8. Identify how to choose a good time to present a lesson.
9. Explain the importance of linking the lesson.
10. Identify the component of the skill (the context).
11. Describe considerations in setting up opportunities for skill practice.
12. Describe a skills assessment.
13. Identify methods of assessing progress.

14. Explain how to adjust a lesson to different situations.

Practical Requirements:

None

C. 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

Sheet Metal Worker - 7200 Hours			
Apprenticeship Level and Wages			
Level	Wage Rate	Requirements for Progression to Next Level	Next Level
1	60%	<ul style="list-style-type: none"> ▪ Completion of Level 1 NLCS training ▪ Pass Level 1 exam ▪ Minimum 1800 hours of combined relevant work experience and training 	2 nd Year
2	70%	<ul style="list-style-type: none"> ▪ Completion of Level 2 training ▪ Pass Level 2 exam* ▪ Minimum 3600 hours of combined relevant work experience and training 	3 rd Year
3	80%	<ul style="list-style-type: none"> ▪ Completion of Level 2 training ▪ Pass Level 2 exam* ▪ Minimum 5400 hours of combined relevant work experience and training 	4 th Year
4	90%	<ul style="list-style-type: none"> ▪ Completion of Level 4 training ▪ Pass Level 4 exam* ▪ Minimum 7200 hours of combined relevant work experience and training ▪ Sign-off of all workplace skills in apprentice logbook ▪ Pass certification exam 	Journeyperson Certification
<p>Wage Rates</p> <ul style="list-style-type: none"> ▪ Rates are percentages of the prevailing journeyperson's wage rate in the place of employment of the apprentice. ▪ 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. ▪ Rates must not be less than the wage rate established by any collective agreement which may be in force at the apprentice's workplace. ▪ Employers are free to pay wage rates above the minimums specified. <p>Level Exams</p> <ul style="list-style-type: none"> ▪ This program may not currently contain Level Exams, in which case this requirement will be waived until such time as Level Exams are available. 			

Sheet Metal Worker – 7200 Hours		
Class Calls (After Apprenticeship Registration)		
Call Level	Requirements for Class Call	Hours awarded for In-School Training
Direct Entry Level 1	<ul style="list-style-type: none"> ▪ Minimum of 1800 hours of relevant work experience ▪ Prior Learning Assessment (PLA) at designated college (if applicable) 	480
Level 2	<ul style="list-style-type: none"> ▪ Minimum of 3000 hours of relevant work experience and training 	240
Level 3	<ul style="list-style-type: none"> ▪ Minimum of 5000 hours of relevant work experience and training 	240
Level 4	<ul style="list-style-type: none"> ▪ Minimum of 7000 hours of relevant work experience and training 	240
<p>Class Calls at Minimum Hours</p> <ul style="list-style-type: none"> ▪ 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 journeyman supervisor who is located at the same worksite as the apprentice, and that the apprentice is able to communicate with the journeyman 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 Immigration, Skills and Labour within 30 days of the decision.

D. 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 7200 hours.

Or

A total of 10800 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.

E. 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 journeyman.
- 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 Immigration, Skills and Labour.

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 level, 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.