

# Apprenticeship and Industry Training

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## Sheet Metal Worker Curriculum Guide

011 (2022)



Apprenticeship  
and Industry  
Training

**ALBERTA ADVANCED EDUCATION**

Sheet Metal Worker: apprenticeship education program curriculum guide

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**Sheet Metal Worker  
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**CURRICULUM GUIDE**

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## Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding a sponsor. Sponsors guide apprentices, and support on-the-job learning through provision of mentorship. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journey person or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution (PSI) – usually a college or technical institute.

To receive their post-secondary credential, apprentices must learn theory and skills, and they must pass examinations. Criteria for the program—including the content and delivery of technical training—are developed and updated by the Registrar.

The graduate of the Sheet Metal Worker apprenticeship program is an individual who will be able to:

- supervise, train and mentor apprentices.
- use and maintain hand and power tools to the standards of competency and safety required in their profession.
- apply the correct principles of sheet metal pattern development using triangulation, parallel line, and radial line development.
- read and use blueprints and specifications to estimate, fabricate and install sheet metal items.
- fabricate and install, safely and efficiently, fume and dust exhaust systems, ventilation, heating and air-conditioning systems and equipment for restaurants, hospitals, dairies, breweries, etc.
- know, and be able to apply their knowledge of the advantages and limitations of various types of sheet metal used in the profession including non-metallic materials such as plastics.
- know, and be able to apply their knowledge of the installation, and service of gas piping systems, HVAC appliances and equipment in accordance with local, provincial and national standards for the industry.
- apply standards and regulations of propane and natural gas in order to provide the maximum of safety.
- co-ordinate sheet metal work with other professions on the job site.
- do all sheet metal related tasks expected of someone who carries this credential.

## Apprenticeship and Industry Training System

Alberta's apprenticeship programs are supported by industry stakeholders that ensures a highly skilled, internationally competitive workforce in the province. The Registrar establishes the educational standards and provides direction to the system supported by industry and the PSI's. The Ministry of Advanced Education provides the legislative framework and administrative support for the apprenticeship and industry training system.

**Special thanks are offered to the following industry members who contributed to the development of the standard:**

Mr. G. Provencher ..... Grande Prairie  
Mr. K. Broadbent ..... Lethbridge  
Mr. R. Deveau ..... Calgary  
Mr. M. Kaiser ..... Calgary  
Mr. C. Challand ..... Rimbey  
Mr. J. Morrow ..... Calgary  
Mr. E. Palmerchuk ..... Calmar

## Alberta Government

Alberta Advanced Education works with industry, sponsor and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and sponsors
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

## **Apprentice Safety**

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, sponsors, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

### **Occupational Health and Safety**

Persons engaged in, or supporting an individual in an experiential learning environment are often exposed to more worksite hazards than in other forms of traditional post-secondary education and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety-OHS (a division of Alberta Labour and Immigration) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at [www.alberta.ca/occupational-health-safety.aspx](http://www.alberta.ca/occupational-health-safety.aspx)

## **Technical Training**

Apprenticeship technical training is delivered by the PSI's throughout Alberta. The PSI's are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All PSI's place a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all professions.

The PSI's work with industry and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship education programs across the province. They develop curriculum from the curriculum guides established by the Registrar in consultation with the PSI's and industry and provide the technical training to apprentices.

The following PSI's deliver Sheet Metal Worker trade apprenticeship technical training:

Northern Alberta Institute of Technology  
Grande Prairie Regional College

Southern Alberta Institute of Technology

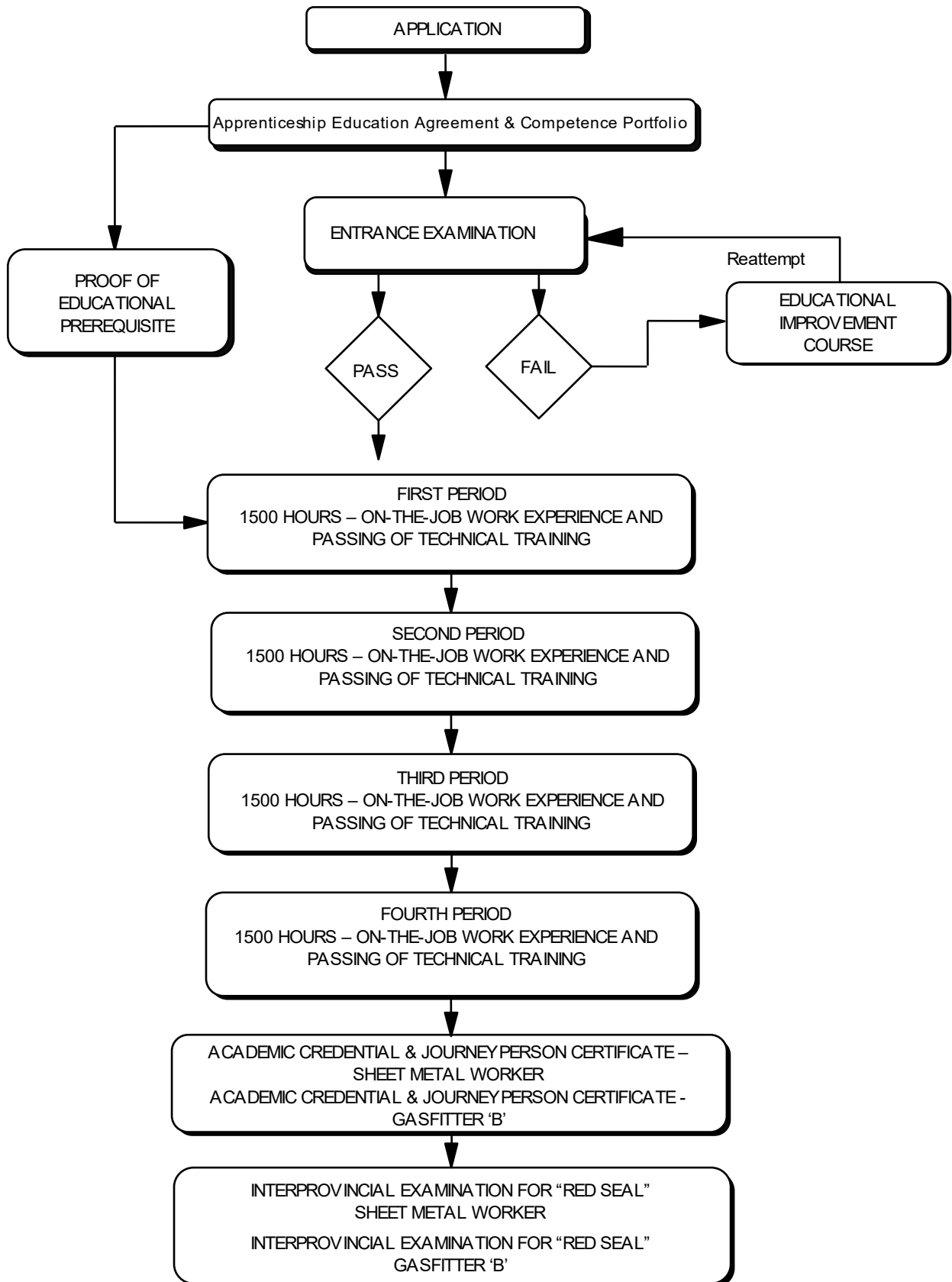
### **Procedures for Recommending Revisions to the Curriculum Guide**

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Registrar of Apprenticeship Education Programs  
c/o Apprenticeship Delivery and Industry Support Services  
Apprenticeship Delivery and Industry Support  
Advanced Education  
19th floor, Commerce Place  
10155 102 Street NW  
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used.

### Apprenticeship Route toward Academic Credential



## Sheet Metal Worker Training Profile

### FIRST PERIOD

(10 Weeks 30 Hours Per Week – Total of 300 Hours)

#### SECTION ONE

|  |   |   |   |  |   |   |
|--|---|---|---|--|---|---|
| <b>SAFETY, TOOLS AND EQUIPMENT</b><br><br><div style="text-align: right; font-weight: bold;">18%</div> | A | Safety Legislation, Regulations & Industry Policy in the Trades<br><div style="text-align: right;">4%</div> | B | Climbing, Lifting, Rigging, & Hoisting<br><div style="text-align: right;">4%</div>       | C | Hazardous Materials & Fire Protection<br><div style="text-align: right;">4%</div>             |
|  | D | Apprenticeship Training Program<br><div style="text-align: right;">4%</div>                                 | E | Sheet Metal Safety<br><div style="text-align: right;">4%</div>                           | F | Ladders, Scaffolds and Lifts<br><div style="text-align: right;">5%</div>                      |
|  | G | Welding Safety<br><div style="text-align: right;">7%</div>  | H | Hand and Power Tools<br><div style="text-align: right;">9%</div>                         | I | Bench Machines<br><div style="text-align: right;">5%</div>                                    |
|  | J | Floor, Portable and Power Shop Equipment<br><div style="text-align: right;">12%</div>                       | K | Materials, Valves, Welded Pipe and Fittings<br><div style="text-align: right;">15%</div> | L | Joints, Seams, Fasteners, Sealants and Insulation<br><div style="text-align: right;">7%</div> |
|  | M | Plastic Pipe and Tube<br><div style="text-align: right;">13%</div>  | N | Electrical Safety<br><div style="text-align: right;">7%</div>                            |   |   |

#### SECTION TWO

|  |   |   |   |   |   |  |
|--|---|---|---|---|---|--|
| <b>DUCT CONSTRUCTION USING SIMPLE AND CONICAL LINE PATTERN DEVELOPMENT</b><br><br><div style="text-align: right; font-weight: bold;">44%</div> | A | Geometry and Calculations<br><div style="text-align: right;">15%</div>  | B | Pattern Development<br><div style="text-align: right;">12%</div>  | C | Conical Layout and Projects<br><div style="text-align: right;">8%</div>          |
|  | D | Welding and Cutting Process<br><div style="text-align: right;">3%</div> | E | Soldering and Brazing<br><div style="text-align: right;">6%</div> | F | Rectangular Duct System Fabrication<br><div style="text-align: right;">56%</div> |

#### SECTION THREE

|  |   |  |   |   |   |   |
|--|---|--|---|---|---|---|
| <b>RESIDENTIAL HVAC DRAWINGS</b><br><br><div style="text-align: right; font-weight: bold;">17%</div> | A | Orthographic Projection<br><div style="text-align: right;">15%</div> | B | Pictorial Drawings<br><div style="text-align: right;">17%</div>                               | C | Drawing Components<br><div style="text-align: right;">16%</div> |
|  | D | HVAC Drawings<br><div style="text-align: right;">29%</div>           | E | Residential HVAC Components and Material Takeoff<br><div style="text-align: right;">23%</div> |   |   |

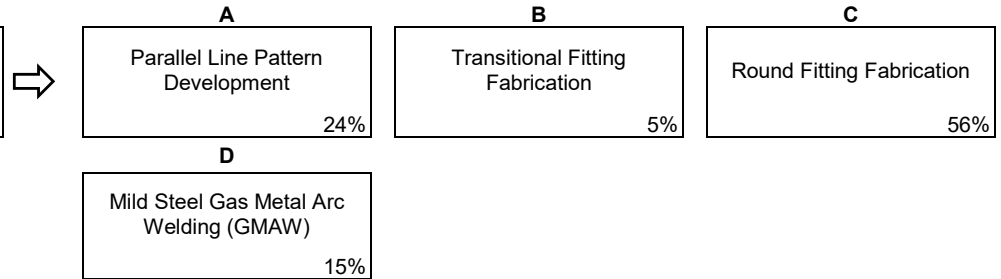
#### SECTION FOUR

|  |   |  |   |   |   |   |
|--|---|--|---|---|---|---|
| <b>RESIDENTIAL HVAC INSTALLATION</b><br><br><div style="text-align: right; font-weight: bold;">21%</div> | A | Residential Heating Systems and Equipment<br><div style="text-align: right;">19%</div> | B | Installation Codes<br><div style="text-align: right;">16%</div> | C | Principles of Indoor Air Quality<br><div style="text-align: right;">29%</div> |
|  | D | Indoor Air Quality Equipment<br><div style="text-align: right;">36%</div>              |   |   |   |   |

**SECOND PERIOD**  
(10 Weeks 30 Hours Per Week – Total of 300 Hours)

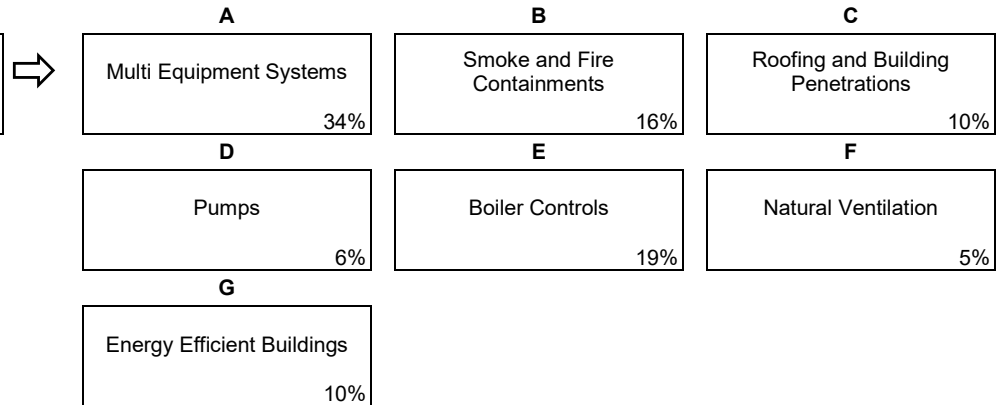
**SECTION ONE**

**FABRICATION USING  
PARALLEL LINE PATTERN  
DEVELOPMENT** 32%



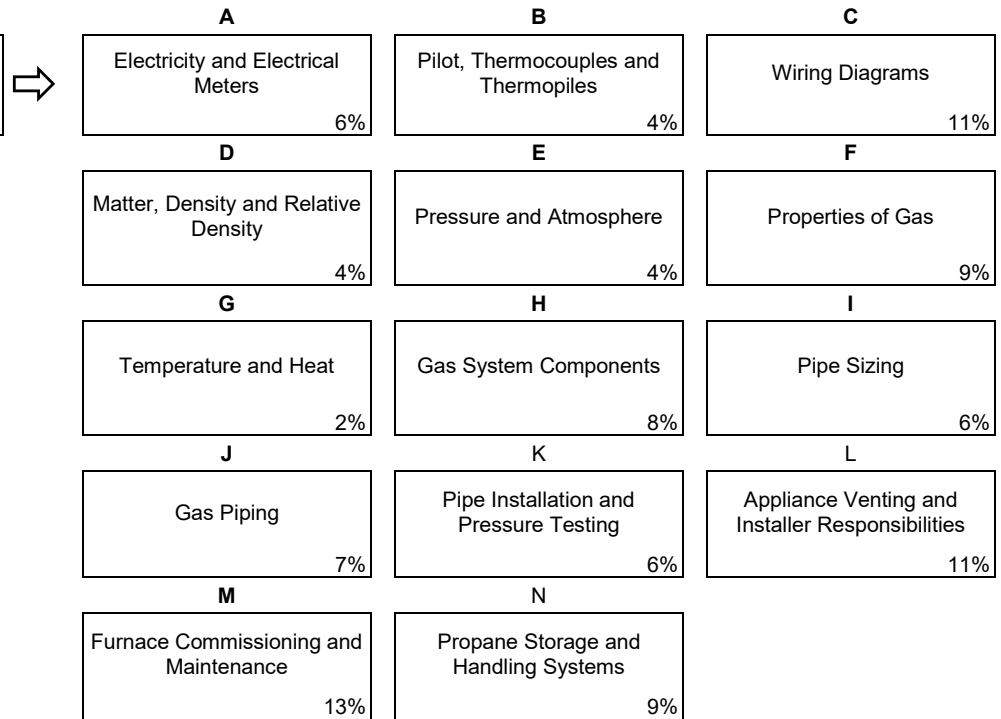
**SECTION TWO**

**LIGHT COMMERCIAL HVAC** 21%



**SECTION THREE**

**HVAC HEATING APPLIANCE  
INSTALLATION** 47%





**THIRD PERIOD**  
**(10 weeks 30 Hours per Week – Total of 300 Hours)**

**SECTION ONE**

**GTAW WELDING AND PLASMA CUTTING**  
 18%



**A**  
 Computerized Layouts and Plasma Cutting  
 28%

**B**  
 Gas Tungsten Arc Welding (GTAW)  
 28%

**C**  
 Aluminum Fabrication  
 16%

**D**  
 Stainless Steel Fabrication  
 28%

**SECTION TWO**

**DUCT CONSTRUCTION USING TRIANGULATION PATTERN DEVELOPMENT**  
 43%



**A**  
 Triangulation Pattern Development  
 28%

**B**  
 Medium Pressure Duct Fabrication  
 72%

**SECTION THREE**

**COMMERCIAL HVAC**  
 39%



**A**  
 Air Flow  
 5%

**B**  
 Heat Loss and Gain  
 16%

**C**  
 Residential HVAC Design  
 9%

**D**  
 Commercial Duct Design  
 9%

**E**  
 Multi Zone Equipment  
 9%

**F**  
 Job Takeoffs  
 15%

**G**  
 Commercial Installation  
 15%

**H**  
 Mechanical Air Movement and Control  
 5%

**I**  
 Commercial HVAC Systems  
 9%

**J**  
 Commercial and Industrial Indoor Air Quality  
 8%

**FOURTH PERIOD**  
**(10 Weeks 30 Hours per Week – Total of 300 Hours)**

**SECTION ONE**

|                                    |   |  |   |
|------------------------------------|---|--|---|
| <b>ADVANCED FABRICATION</b><br>35% | <b>A</b><br>Simple and Advanced Radial<br>Line Pattern Development<br>19% | <b>B</b><br>Pattern Development Short<br>Cuts<br>3%      | <b>C</b><br>Specialty GMAW Welding<br>8%                  |
|                                    | <b>D</b><br>Cladding and Lagging<br>3%                                    | <b>E</b><br>Specialized Fabrication<br>Procedures<br>64% | <b>F</b><br>Architectural and Custom<br>Sheet Metal<br>3% |

**SECTION TWO**

|  |  |  |  |
|--|--|--|--|
| <b>COMMERCIAL AND INDUSTRIAL<br/>HVAC</b><br>14% | <b>A</b><br>Industrial Exhaust Systems<br>15%      | <b>B</b><br>Commercial Kitchen Exhaust<br>Systems<br>15%         | <b>C</b><br>Industrial Drawings<br>23% |
|  | <b>D</b><br>Specifications and<br>Schedules<br>15% | <b>E</b><br>Estimating, Pricing and<br>Bidding Procedures<br>22% | <b>F</b><br>Jobsite Supervision<br>10% |

**SECTION THREE**

|                             |   |                                  |
|-----------------------------|---|----------------------------------|
| <b>REFRIGERATION</b><br>17% | <b>A</b><br>Refrigerant and Oil Handling<br>31% | <b>B</b><br>Split Systems<br>69% |
|-----------------------------|---|----------------------------------|

**SECTION FOUR**

|                           |  |   |  |
|---------------------------|--|---|--|
| <b>DIAGNOSTICS</b><br>34% | <b>A</b><br>Electronic Ignition Systems<br>17% | <b>B</b><br>System Controls and<br>Schematics<br>18%                            | <b>C</b><br>Commercial HVAC<br>Equipment Commissioning<br>and Maintenance<br>15% |
|                           | <b>D</b><br>Testing and Troubleshooting<br>29% | <b>E</b><br>Troubleshooting Commercial<br>and Industrial HVAC<br>Systems<br>10% | <b>F</b><br>Air Balancing<br>6%  |
|                           | <b>G</b><br>Workplace Coaching Skills<br>2%    | <b>H</b><br>Interprovincial Standards<br>Red Seal Program<br>3%                 |  |

**FIRST PERIOD TECHNICAL TRAINING  
SHEET METAL WORKER TRADE  
CURRICULUM GUIDE**

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

**SECTION ONE:..... SAFETY, TOOLS AND EQUIPMENT..... 18 %**

**A. Safety Legislation, Regulations & Industry Policy in the Trades ..... 4%**

**Outcome:**     ***Apply legislation, regulations and practices ensuring safe work in this trade.***

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the sponsor's and employee's role with Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations and related advisory bodies and agencies.
3. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of worker and sponsors to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of sponsors and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

**B. Climbing, Lifting, Rigging and Hoisting ..... 4%**

**Outcome:**     ***Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.***

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and load moving equipment.

**C. Hazardous Materials & Fire Protection ..... 4%**

**Outcome:**     ***Apply industry standard practices for hazardous materials and fire protection in this trade.***

1. Describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe three key elements of WHMIS.
3. Describe handling, storing and transporting procedures for hazardous material.
4. Describe venting procedures when working with hazardous materials.
5. Describe hazards, classes, procedures and equipment related to fire protection.

**D. Apprenticeship Training Program..... 4%****Outcome: Manage an apprenticeship to earn journeyman certification.**

1. Describe the contractual responsibilities of the apprentice, sponsor and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the apprentice competency portfolio.
3. Describe the procedure for changing sponsors during an active apprenticeship.
4. Describe the purpose of the curriculum guide.
5. Describe the procedure for progressing through an apprenticeship.
6. Describe advancement opportunities in this profession.

**E. Sheet Metal Safety ..... 4%****Outcome: Apply safe work practices while working in the Sheet Metal trade.**

1. Describe handling of sharp edges on sheet metal projects.
2. Describe hazards associated with sheet metal tooling and equipment.

**F. Ladders, Scaffolds and Lifts ..... 5%****Outcome: Use ladders, scaffolds and man lifts.**

1. Describe the use of ladders.
2. Describe the use of scaffolds.
3. Describe the use of lifts.

**G. Welding Safety ..... 7%****Outcome: Follow safety procedures in welding.**

1. Identify hazards associated with welding.
2. Describe Personal Protective Equipment (PPE) used for welding.
3. Identify oxy-fuel outfit components.
4. Describe the handling of oxy-fuel equipment.

**H. Hand and Power Tools ..... 9%****Outcome: Use hand tools.**

1. Identify types of hand tools.
2. Describe types of hand tools.
3. Identify types of power tools.
4. Describe types of power tools.
5. Use hand and power tools.

**I. Bench Machines ..... 5%****Outcome: Use bench machines.**

1. Use rotary machines.
2. Use bench machines for punching, shearing and forming.
3. Use stakes and stakeholders.

**J. Floor, Portable and Power Shop Equipment ..... 12%****Outcome: Use floor, portable and power equipment.**

1. Use portable equipment and accessories.
2. Use sheet metal floor machines.
3. Set up a power shear.
4. Use a power shear.
5. Calculate bend allowance and mean diameters for various thicknesses of metal.
6. Set up a power roll.
7. Operate a power roll.

**K. Materials, Valves, Welded Pipe and Fittings..... 15%****Outcome: Describe materials, valves, welded pipe and fittings.**

1. Describe properties of metals.
2. Describe ferrous and non-ferrous sheet metal materials.
3. Describe alternate sheet metal materials.
4. Identify types of valves.
5. Describe fundamental valve design variations and their applications.
6. Identify types, markings, designations and pressure rating for welded pipe fittings.
7. State requirements, methods and torque measurements for bolt ups.
8. Identify types, markings, designations, temperature and pressure ratings of flanged fittings and gaskets.
9. Describe the fabrication process for welded pipe and fittings to the tack-up stage.

**L. Joints, Seams, Fasteners, Sealants and Insulation ..... 7%****Outcome: Fabricate seams, edges and joints.**

1. Identify seams, edges, locks and joints.
2. Identify sheet metal fasteners.
3. Identify caulking, sealants and insulations used in sheet metal fabrication.
4. Perform joining, seaming, fastening, sealing and insulation processes.

**M. Plastic Pipe and Tube ..... 13%****Outcome: Construct plastic piping and tubing systems.**

1. Identify types, applications and designations of plastic pipe, tubing and fittings.
2. Describe fabrication processes for solvent welding plastic pipe.
3. Describe fabrication processes for plastic pipe and tubing using alternative joining methods.
4. Describe fabrication processes for bell end joints.
5. Describe fabrication processes for plastic pipe using thermal fusion and electric resistance welding.
6. Fabricate and test a solvent weld spool to manufacturer's specifications.

**N. Electrical Safety..... 7%**

**Outcome:**     **Apply arc flash safety and lockout and tag-out on a jobsite.**

1. Identify safe work practices to protect from arc flash hazards.
2. Describe lockout/tag-out procedures.
3. Identify safe work practices to prevent electrical shock.

**SECTION TWO:..... DUCT CONSTRUCTION USING SIMPLE AND..... 44%**  
**CONICAL LINE PATTERN DEVELOPMENT**

**A. Geometry and Calculations ..... 15%**

**Outcome:**     **Use geometry and calculations.**

1. Draw bisecting lines, arcs and angles.
2. Use drafting equipment to construct various lines.
3. Construct a circle and label its parts.
4. Construct shapes using drafting equipment.
5. Demonstrate calculation skills including conversion and linear measurement.
6. Demonstrate calculation skills including volumes and capacities.

**B. Pattern Development..... 12%**

**Outcome:**     **Develop simple patterns for sheet metal projects.**

1. Identify methods of pattern development.
2. Describe principles of pattern development.
3. Identify simple layout items.
4. Develop simple net patterns.

**C. Conical Layout and Projects ..... 8%**

**Outcome:**     **Fabricate conical items.**

1. Describe principles of conical layout.
2. Identify conical layout items.
3. Develop conical layout patterns.
4. Fabricate conical items.

**D. Welding and Cutting Processes..... 3%**

**Outcome:**     **Use welding and cutting processes in sheet metal fabrication.**

1. Describe electric welding processes.
2. Describe the use of oxy acetylene (OAW) and oxy-fuel equipment.
3. Use a hand held plasma cutter.
4. Use a resistance spot welder.

**E. Soldering and Brazing ..... 6%****Outcome: Use soldering processes in sheet metal fabrication.**

1. Describe soft soldering, brazing and their applications.
2. Describe the safety precautions associated with soldering and brazing.
3. Describe the soldering process.
4. Describe the brazing process.
5. Fabricate and test assigned project.

**F. Rectangular Duct System Fabrication ..... 56%****Outcome: Fabricate a rectangular HVAC duct line using simple layout.**

1. Fabricate rectangular duct fittings.
2. Fabricate rectangular flex connectors.
3. Assemble fittings to form duct lines.
4. Apply installation codes and standards to residential construction.
5. Install a rectangular duct line.
6. Install supplied round fittings to a rectangular duct line.

**SECTION THREE: ..... RESIDENTIAL HVAC DRAWINGS ..... 17%****A. Orthographic Projection ..... 15%****Outcome: Develop orthographic drawings for sheet metal fabrication.**

1. Identify orthographic views.
2. Draw orthographic views from isometric drawings.
3. Draw orthographic drawings of sheet metal components.

**B. Pictorial Drawings ..... 17%****Outcome: Develop pictorial drawings for sheet metal and gas line fabrication.**

1. Identify pictorial drawings.
2. Draw isometric drawings from orthographic projections.
3. Draw isometric drawings of sheet metal components.
4. Produce sketches of components in sheet metal fabrication.
5. Identify piping symbols.
6. Draw and label orthographic single-line drawings.
7. Draw and label isometric single-line piping drawings.

**C. Drawing Components ..... 16%****Outcome: Interpret drawings.**

1. Identify fundamental information found on a drawing.
2. Identify common symbols used in drawings and legends.
3. Identify abbreviations commonly used in drawings.

**D. HVAC Drawings ..... 29%**

**Outcome:** *Interpret mechanical drawings.*

1. Interpret supply air ducting from a drawing.
2. Interpret return air ducting from a drawing.
3. Interpret exhaust air from a drawing.
4. Interpret HVAC equipment from a drawing.
5. Interpret line schematics from a drawing.

**E. Residential HVAC Components and Material Takeoff ..... 23%**

**Outcome:** *Install residential duct systems.*

1. Describe supply air components of an HVAC system.
2. Describe return air components of an HVAC system.
3. Describe components of an under slab heating system.
4. Describe components used to exhaust and support combustion.
5. Describe components used to ventilate residential buildings.
6. Describe how system components effect air movement in low pressure duct systems.
7. Describe zoning components related to low pressure duct systems.
8. Describe the process for developing a material takeoff list.
9. Develop a material takeoff list from a drawing.

**SECTION FOUR: ..... RESIDENTIAL HVAC INSTALLATION ..... 21%**

**A. Residential Heating Systems and Equipment ..... 19%**

**Outcome:** *Install residential duct systems.*

1. Identify components of furnaces.
2. Identify accessories related to residential HVAC systems.
3. Describe residential distribution systems.
4. Describe residential air requirements.
5. Describe various heating appliances.

**B. Installation Codes ..... 16%**

**Outcome:** *Interpret codes and regulations that apply to sheet metal and gas line installations.*

1. Identify codes and regulations.
2. Describe various heating appliance installation codes and regulations.

**C. Principles of Indoor Air Quality ..... 29%**

**Outcome:** *Control Indoor Air Quality (IAQ) in residential HVAC installations.*

1. Describe how IAQ affects the human body.
2. Describe how heat is produced and transferred.
3. Describe relative humidity and how it is measured.
4. Describe ventilation air requirements for residential construction.



5. Describe air particulate and its effect on comfort and equipment.
6. Identify how air circulation and noise affect comfort.
7. Describe the effects of IAQ on structures and personal comfort.
8. List the methods to correct poor IAQ.
9. Describe the methods used to control bacteria, germ, and volatile organic compounds.
10. Measure temperature and relative humidity and apply the effects on IAQ.

**D. Indoor Air Quality Equipment..... 36%**

**Outcome:      *Install residential indoor air quality equipment.***

1. Describe the operation of air filtering methods and equipment.
2. Describe the operation of air ventilation methods and equipment.
3. Describe the operation of air circulation methods and equipment.
4. Describe the maintenance of IAQ equipment.
5. Install residential ventilator.
6. Commission a ventilator.

**SECOND PERIOD TECHNICAL TRAINING  
SHEET METAL WORKER TRADE  
CURRICULUM GUIDE**

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

**SECTION ONE:.....FABRICATION USING PARALLEL LINE PATTERN DEVELOPMENT ..... 32%**

**A. Parallel Line Pattern Development ..... 24%**

**Outcome:**     *Demonstrate parallel line layout procedures when fabricating sheet metal items.*

1. Define terms used in parallel line development.
2. Describe principles of parallel line development.
3. Identify items that can be laid out using parallel line pattern development.
4. Develop net patterns using parallel line development.
5. Develop net patterns for right and oblique cylinders.

**B. Transitional Fitting Fabrication..... 5%**

**Outcome:**     *Install transitional fittings.*

1. Describe a transitional fitting.
2. Fabricate a transitional fitting with a minimum one flat side from an appliance to plenum.

**C. Round Fitting Fabrication ..... 56%**

**Outcome:**     *Fabricate round fittings using parallel line pattern development.*

1. Describe seams used to fabricate round fittings.
2. Fabricate round fittings using parallel line pattern development.

**D. Mild Steel GMAW Welding ..... 15%**

**Outcome:**     *Weld mild steel using Gas Metal Arc Welding (GMAW).*

1. Describe the GMAW process.
2. Set up GMAW equipment.
3. Perform GMAW techniques to various weld joints.
4. Perform GMAW on a round fitting.
5. Identify weld faults.
6. Repair weld faults.

**SECTION TWO:..... LIGHT COMMERCIAL HVAC ..... 21%**

**A. Multi Equipment Systems ..... 34%**

**Outcome:**     *Interpret multifamily and multi equipment system drawings.*

1. Describe multi equipment systems.

2. Describe multifamily systems.
3. Identify components of a multi equipment system.
4. Identify components of a multi equipment system from a drawing.
5. Produce a material take off complete with shop drawings.

**B. Smoke and Fire Containment..... 16%**

**Outcome:     *Install smoke and fire containment.***

1. Identify fire protection devices.
2. Describe installation requirements for fire protection devices.
3. Describe fire and smoke management.
4. Identify codes and regulations pertaining to smoke and fire containment devices.
5. Install fire dampers.
6. Install fire stop flaps.

**C. Roofing and Building Envelope Penetrations ..... 10%**

**Outcome:     *Apply weatherproofing techniques when penetrating building envelopes.***

1. Define roofing terms.
2. Describe advantages and disadvantages of different roofing materials.
3. Describe joints and seams used in roofing.
4. Describe types of flashings and components used in roof penetrations.
5. Describe procedures and precautions when performing roof penetrations.
6. Describe procedures and precautions when performing wall penetrations.

**D. Pumps..... 6%**

**Outcome:     *Describe pumps for piping systems.***

1. Identify types of pumps.
2. Describe applications for pumps.
3. Describe factors affecting the operation of a pump.

**E. Boiler Controls..... 19%**

**Outcome:     *Install and service gas fired boilers.***

1. Describe the operation of boilers.
2. Apply standards from CSA B149.1, ASME and CSA B51.
3. Describe the operation of boiler controls.
4. List the sequencing process of the boiler controls.
5. Sketch wiring diagrams for a gas fired boiler.
6. Troubleshoot a gas fired boiler.

**F. Natural Ventilation ..... 5%**

**Outcome:     *Install natural ventilation systems.***

1. Describe principles of natural ventilation.

2. Describe natural ventilation devices.
3. Describe natural ventilation openings and exhaust outlets.
4. Design natural ventilation systems used in agricultural and industrial building designs.
5. Describe Alberta Building Code standards as they apply to attics and crawl spaces.

**G. Energy Efficient Buildings ..... 10%**

**Outcome:** *Describe energy efficient building designs.*

1. Describe high efficiency and alternate energy systems.
2. Describe various energy programs and agencies.
3. Describe energy efficient construction techniques related to new and existing buildings.

**SECTION THREE: ..... HVAC HEATING APPLIANCE INSTALLATION ..... 47%**

**A. Electricity and Electrical Meters ..... 6%**

**Outcome:** *Use electrical measuring equipment.*

1. Explain electron flow.
2. Describe various electrical circuits.
3. Calculate Ohm's law.
4. Use electrical measuring equipment.
5. Identify types of test equipment.
6. Describe settings for electrical testing equipment.
7. Use test equipment to service appliances.

**B. Pilots, Thermocouples and Thermopiles ..... 4%**

**Outcome:** *Service pilots, thermocouples and thermopiles.*

1. Identify pilot burner types and terminology.
2. Describe characteristics of pilot burners.
3. Explain operating principles of thermocouples and thermopiles.
4. Describe operational tests performed on thermopiles and thermocouples.
5. Describe causes for thermocouple and thermopile failures.
6. Troubleshoot pilots, thermocouples and thermopiles.

**C. Wiring Diagrams ..... 11%**

**Outcome:** *Interpret wiring diagrams.*

1. Interpret millivolt wiring diagrams.
2. Interpret 24 volt wiring diagrams.
3. Interpret operation of equipment using diagrams.
4. Describe appliance sequence of operation.

**D. Matter, Density and Relative Density ..... 4%**

**Outcome:** *Apply concepts related to matter, densities and relative densities.*

1. Describe the three common states of matter.
2. Define the terms matters, element, compound and mixture.
3. Define the terms adhesion, cohesion, surface tension and capillarity.
4. Calculate mass and density using relative densities.

**E. Pressure and Atmosphere ..... 4%**

**Outcome:** *Apply fundamentals of pressure, force and atmosphere.*

1. Define pressure and force.
2. State the six principles of hydrostatics.
3. Define pressure constants used for calculating pressures.
4. Describe atmospheric pressure and the effect of altitude.
5. Perform pressure and force calculations in both imperial and metric units.
6. Perform calculations to convert absolute, gauge and mercury pressures.

**F. Properties of Gas ..... 9%**

**Outcome:** *Apply knowledge of the properties of gas.*

1. Describe the properties of fuel gas.
2. Identify chemical formulas.
3. Calculate problems using properties of gases.
4. Explain the principles of combustion.
5. Define terms relating to combustion in gas appliances.
6. Describe types of heat and units of heat measurement.
7. Describe types of burners used in gas appliances.
8. Calculate combustion air requirements for heating appliances.
9. Describe the products of complete and incomplete combustion.
10. Identify impurities found in fuel gas.

**G. Temperature and Heat ..... 2%**

**Outcome:** *Apply knowledge of the heat transfer process relative to gasfitter and sheet metal trades.*

1. Explain the three methods of heat transfer.
2. Describe the principles of Charles and Boyles Law.
3. Define the terms latent and specific heat.

**H. Gas System Components ..... 8%**

**Outcome:** *Install and service gas line components.*

1. Describe types of regulators.
2. Describe types of reliefs and vent piping.
3. Calculate vent sizing of reliefs.

4. Describe the types of meters.
5. Clock a meter at low pressure.
6. Clock a meter at high pressure.
7. Troubleshoot a regulator.
8. Describe temperature sensing devices.
9. Describe furnace line and control voltage devices.
10. Describe combustion related components.
11. Apply standards for CSA B149.1.

**I. Pipe Sizing..... 6%**

**Outcome:     *Size a gas line system.***

1. Identify the type of gas and pressure.
2. Identify the type of gas line material.
3. Calculate the volume of gas consumed by appliance(s).
4. Sketch a gas line system.
5. Calculate the length of the gas piping system using different piping materials.
6. Apply standards for CSA B149.1.

**J. Gas Piping ..... 7%**

**Outcome:     *Connect gas piping.***

1. Identify types, markings, designations, temperature and pressure ratings of ferrous pipe and fittings.
2. Identify applications of codes, regulations and manufacturer’s specifications.
3. Describe fabrication steps for threading and grooving pipe.
4. Describe black malleable fittings and joining methods.
5. Describe copper pipe and joining methods.
6. Describe stainless steel flexible coated gas pipe.
7. Demonstrate threading, bending, joining and flaring of gas piping.
8. Describe installation codes found in the applicable gas code.
9. Demonstrate cutting and joining of stainless steel flexible coated piping.

**K. Pipe Installation and Pressure Testing ..... 6%**

**Outcome:     *Install and test a gas line system.***

1. Identify equipment used for pressure testing piping installations.
2. Describe procedures and requirements for pneumatic and hydrostatic testing.
3. Describe hazards specific to pressure testing.
4. Compile a materials list for a gas line.
5. Apply standards for CSA B149.1.
6. Install a gas line.
7. Test a gas line.

**L. Appliance Venting and Installer Responsibilities ..... 11%**

**Outcome:**     *Install appliance venting.*

1. Define terms in appliance venting.
2. Describe types of vents used for gas appliances.
3. Describe installation rules, codes and procedures for types of vents.
4. Describe minimum distances and code requirements for direct-vented appliances.
5. Describe types of vents and flue dampers including operation and code requirements.
6. Determine vent sizes using manufactures specification and applicable codes.
7. Install appliance venting.

**M. Furnace Commissioning and Maintenance ..... 13%**

**Outcome:**     *Perform furnace commissioning.*

1. Perform furnace start-up procedures following manufacturer’s specifications.
2. Verify operation of furnaces.
3. Describe maintenance of furnaces.

**N. Propane Storage and Handling Systems ..... 9%**

**Outcome:**     *Install and service propane storage and handling systems.*

1. Describe types of propane handling vessels.
2. Describe components used on propane systems.
3. Describe types of vapourizers.
4. Explain maintenance procedures for vessels and components.
5. Apply standards from CSA B149.1 & B149.2.
6. Calculate size and placement of components.

**THIRD PERIOD TECHNICAL TRAINING  
SHEET METAL WORKER TRADE  
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*UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.*

**SECTION ONE: .....GTAW WELDING AND PLASMA CUTTING ..... 18%**

**A. Computerized Layouts and Plasma Cutting ..... 28%**

**Outcome:**     *Use computerized plasma cutting equipment.*

1. Describe types of computerized cutting equipment.
2. Input duct fitting information to a plasma cutting machine.
3. Operate a plasma cutting machine.
4. Cut a medium pressure duct project on a plasma table.

**B. Gas Tungsten Arc Welding (GTAW) ..... 28%**

**Outcome:**     *Join projects using Gas Tungsten Arc Welding equipment.*

1. Describe safety precautions associated with GTAW.
2. Set-up and operate the equipment for GTAW.
3. Produce GTAW welds on mild steel, aluminum and stainless steel.
4. Troubleshoot welding problems associated with GTAW.

**C. Aluminum Fabrication ..... 16%**

**Outcome:**     *Fabricate items using aluminum.*

1. Describe fabrication considerations when working with aluminum.
2. Fabricate an aluminum project with welded seams.

**D. Stainless Steel Fabrication ..... 28%**

**Outcome:**     *Fabricate items using stainless steel.*

1. Describe types of stainless steels and their applications.
2. Describe fabrication considerations when cutting and forming stainless steel.
3. Construct a stainless steel project with GTAW joints.
4. Demonstrate finishing techniques on a stainless steel project.

**SECTION TWO: ..... DUCT CONSTRUCTION USING ..... 43%**  
**TRIANGULATION PATTERN DEVELOPMENT**

**A. Triangulation Pattern Development ..... 28%**

**Outcome:**     *Demonstrate triangulation layout procedures when fabricating sheet metal items.*

1. Define terms used in triangulation.
2. Identify objects that can be fabricated using triangulation.



3. Identify principles of triangulation.
4. Develop patterns using triangulation.

**B. Medium Pressure Duct Fabrication ..... 72%**

**Outcome:      *Fabricate a medium pressure duct system.***

1. Describe how duct is classified according to velocity and pressure.
2. Describe the mechanical duct connections and duct sealant procedures as they apply to different pressure classifications.
3. Describe considerations incorporating Sheet Metal and Air Conditioning Contractors National Association (SMACNA) standards when fabricating fittings used in various pressure duct systems.
4. Develop patterns and fabricate two way Plenum Transitions for a medium pressure duct line.
5. Develop patterns and fabricate Transition Change Elbows for a medium pressure duct line.
6. Develop patterns and fabricate Rectangular Elbows with turning vanes for a medium pressure duct line.
7. Develop patterns and fabricate Rectangular to Round Transition for a medium pressure duct line.
8. Fabricate Pipe Tees and Conical Tees for a medium pressure duct line from plasma cut supplied patterns.
9. Fabricate Round Pipe Reducers for a medium pressure duct line from plasma cut supplied patterns.
10. Fabricate Round Y Branches for a medium pressure duct line from plasma cut supplied patterns.
11. Fabricate Round Tapering Offsets for a medium pressure duct line from plasma cut supplied patterns.
12. Fabricate fittings for a medium pressure duct system with welded joints and seams.
13. Assemble a medium pressure duct line.
14. Install a sealed medium pressure duct line.
15. Perform a pressure test on a medium pressure duct line.

**SECTION THREE: ..... COMMERCIAL HVAC..... 39%**

**A. Air Flow..... 5%**

**Outcome:      *Test systems for air flow.***

1. Describe air flow.
2. Describe common air flow testing instruments.
3. Describe common air flow terms and their relationship to air flow movement.
4. Describe various components of HVAC systems and their effects on air flow noise.

**B. Heat Loss and Heat Gain ..... 16%**

**Outcome:      *Perform heat loss and heat gain calculations.***

1. Describe heat loss and heat gain calculations.
2. Describe heat loss and heat gain design considerations.
3. Perform heat loss and heat gain calculations using Heating Refrigeration Air Conditioning Institute (HRAI) methods.

**C. Residential HVAC Design ..... 9%**

**Outcome:**     *Design a residential HVAC system.*

1.    Select equipment to match load calculation.
2.    Design a residential air distribution system.

**D. Commercial Duct Designs ..... 9%**

**Outcome:**     *Design a small commercial HVAC system.*

1.    Select correct size and type of equipment.
2.    Design a small commercial air distribution system using the Sheet Metal & Air Conditioning Contractors’ National Association (SMACNA) standards.
3.    Identify additional regulatory bodies and training.

**E. Multi Zone Equipment ..... 9%**

**Outcome:**     *Install multi zone equipment.*

1.    Identify residential multi zone equipment.
2.    Identify light commercial multi zone equipment.
3.    Identify large commercial multi zone equipment.

**F. Job Takeoffs ..... 15%**

**Outcome:**     *List all parts of an HVAC installation.*

1.    Generate a material list from a large commercial HVAC drawing.
2.    Develop strategies to complete a mechanical room from drawings and onsite measurements.

**G. Commercial Installation ..... 15%**

**Outcome:**     *Install a commercial duct line in a ceiling.*

1.    Identify considerations when installing a commercial duct line.
2.    Identify considerations when penetrating commercial walls, floors, and ceilings.
3.    Apply installation codes and standards to commercial construction.
4.    Generate a complete material list from a light commercial HVAC drawing.
5.    Install components of a commercial duct line from a drawing.

**H. Mechanical Air Movement and Control ..... 5%**

**Outcome:**     *Install air handling devices.*

1.    Describe various fan and blower terminology.
2.    Identify various fan configurations and describe their characteristics.
3.    Interpret fan performance graphs and curves.
4.    Describe air controlling devices and their application.

**I. Commercial HVAC Systems ..... 9%**

**Outcome:**     *Install commercial HVAC systems.*

1.    Describe the operation of commercial heating systems.

2. Describe the operation of commercial cooling systems.
3. Describe the operation of make-up air systems.
4. Describe the operation of exhaust systems.
5. Describe the operation of ventilation systems.

**J. Commercial and Industrial Indoor Air Quality (IAQ) ..... 8%**

**Outcome:**     *Use air filtration and noise reduction methods when installing HVAC equipment.*

1. Describe sound attenuation and the methods used in reducing sound transmission.
2. Describe materials used in sound attenuation and their application.
3. Describe the effects of sound attenuation on air flow.
4. Describe the purpose and types of various air filtering devices.
5. Describe air cleaning techniques.
6. Identify air cleaning equipment.
7. Describe methods used to measure filter efficiency.
8. Describe methods used to control humidity.
9. Describe methods used to control bacteria, germ, and volatile organic compounds.

**FOURTH PERIOD TECHNICAL TRAINING  
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**SECTION ONE: ..... ADVANCED FABRICATION ..... 35%**

**A. Radial Line Pattern Development ..... 19%**

**Outcome:**     *Demonstrate radial line layout procedures when fabricating sheet metal items.*

1. Define the terms used in radial line pattern development.
2. Identify objects that can be fabricated using radial line pattern development
3. Identify principles of radial line pattern development.
4. Develop patterns using radial line pattern development.

**B. Pattern Development Short Cuts ..... 3%**

**Outcome:**     *Use pattern development short cuts.*

1. Describe a net pattern for a square to round reducer using rollation.
2. Describe a net pattern for a round to round reducer using rollation.
3. Describe slip technique.
4. Describe the techniques necessary to calculate a mitre at a job site.

**C. Specialty Gas Metal Arc Welding (GMAW) ..... 8%**

**Outcome:**     *Perform GMAW on aluminum and stainless steel.*

1. Describe safety precautions associated with the GMAW process.
2. Set-up equipment for GMAW (MIG) process.
3. Produce finished stainless steel welds using the GMAW process.
4. Weld aluminum using the GMAW process.

**D. Cladding and Lagging ..... 3%**

**Outcome:**     *Install cladding and lagging on industrial piping systems and vessels.*

1. Describe cladding and lagging material.
2. Describe applications for cladding and lagging.
3. Describe installation techniques.
4. Explain shortcuts used for developing patterns.

**E. Specialized Fabrication Procedures ..... 64%**

**Outcome:**     *Fabricate advanced sheet metal projects.*

1. Set up a power brake.
2. Operate a power brake.
3. Interpret shop drawings.

4. Fabricate opposed and parallel multiple blade volume dampers.
5. Fabricate equipment plenums or equipment casings with 2 inch duct liner and perforated metal with an inlet, outlet and access door.
6. Fabricate a specialty metals project using radial line pattern development.
7. Fabricate stainless and aluminum GMAW welded projects.
8. Fabricate a project using a shortcut method.

**F. Architectural and Custom Sheet Metal ..... 3%**

**Outcome:     *Fabricate architectural and custom sheet metal components.***

1. Identify custom kitchen accessories.
2. Identify custom signage applications.
3. Describe custom architectural and structural applications.
4. Describe decorative sheet metal applications.

**SECTION TWO:..... COMMERCIAL AND INDUSTRIAL HVAC..... 14%**

**A. Industrial Exhaust Systems..... 15%**

**Outcome:     *Install commercial and industrial extraction systems.***

1. Describe collection and extractions systems.
2. Describe material types and construction methods used in collection and extraction systems.
3. Apply sizing techniques for a collection and extraction system.

**B. Commercial Kitchen Exhaust Systems ..... 15%**

**Outcome:     *Install a commercial kitchen exhaust system.***

1. Describe the purpose and components of a commercial kitchen exhaust system.
2. Interpret codes and regulations for designing and installing commercial kitchen exhaust systems.
3. Describe grease removal devices and their applications.
4. Size a grease filter for a commercial kitchen canopy.
5. Calculate make up air requirements for a commercial kitchen installation.
6. Select equipment and components for a commercial kitchen exhaust system.

**C. Industrial Drawings ..... 23%**

**Outcome:     *Interpret industrial drawings.***

1. Interpret industrial plant drawings.
2. Identify industrial air handling equipment from a drawing.
3. Identify industrial material handling equipment from a drawing.

**D. Specifications and Schedules ..... 15%**

**Outcome:     *Interpret specifications and material schedules.***

1. Describe the purpose of engineered specifications.
2. Describe the relationship between specifications and drawings.
3. Identify information from an engineered specification.

4. Describe the purpose of divisions within engineered specifications.

**E. Estimating, Pricing and Bidding Procedures ..... 22%**

**Outcome: Complete an HVAC bid.**

1. Identify the categories of an estimate to a job take off.
2. Describe overhead labour costs and correction factors to a job take off.
3. Describe pricing strategies and their effect on the estimate.
4. Calculate a selling price and write a proposal.
5. Describe job costing and how it determines profit and loss.
6. Describe the process and methods used to tender projects.
7. Describe goals of a commercial or industrial estimate.
8. Describe the possible problems associated with creating an estimate.
9. Describe bonds associated with the sheet metal trade.

**F. Job Supervision..... 10%**

**Outcome: Organize tasks related to construction projects.**

1. Identify the challenges of scheduling and coordinating.
2. Describe the procedure for ordering equipment and materials.
3. Identify the challenges of coordinating sub trades.
4. Identifying technology to aid in supervision.

**SECTION THREE: ..... REFRIGERATION..... 17%**

**A. Refrigerant and Oil Handling..... 31%**

**Outcome: Demonstrate refrigerant and refrigeration oil handling practices.**

1. Describe the evolution and properties of refrigerants.
2. Describe the evolution and properties of refrigerant oils.
3. Describe handling and storage of refrigerants and refrigeration oils.
4. Describe recovery and disposal of refrigerants and refrigeration oils.
5. Describe leak testing methods and instruments used.
6. Describe the evacuation process of split systems.
7. Demonstrate recovery and disposal of refrigerants.
8. Demonstrate recovery and disposal of refrigeration oils.
9. Demonstrate leak testing methods and instruments used.
10. Demonstrate the evacuation process of split systems.
11. Demonstrate maintenance procedures of recovery and evacuation equipment.

**B. Split Systems ..... 69%**

**Outcome: Install split air conditioning systems.**

1. Describe the operation of a split system.
2. Identify components of a split system.

3. Identify tools used for installation and diagnostics.
4. Identify tubing types, designations and pressure ratings.
5. Identify tube fitting types and joining techniques.
6. Describe the process for bending tubing.
7. Describe specialty tools and equipment used.
8. Install and leak test tube and pipe connections.
9. Describe system installation.
10. Install an evaporator.
11. Commission a split system.
12. Describe split system maintenance.

**SECTION FOUR: ..... DIAGNOSTICS ..... 34%**

**A. Electronic Ignition ..... 17%**

**Outcome:**     *Repair electronic ignition systems up to 400 MBH.*

1. Describe the operation of ignition systems.
2. Describe routine maintenance for ignition systems.
3. Diagnose electronic ignition systems.

**B. System Controls and Schematics..... 18%**

**Outcome:**     *Install system accessories of appliances up to 400 MBH.*

1. Describe HVAC accessories and controls.
2. Interpret electrical schematics used in HVAC control systems.
3. Install HVAC accessories to a control system.

**C. Commercial HVAC Equipment Commissioning and Maintenance..... 15%**

**Outcome:**     *Perform start up procedures on commercial HVAC equipment up to 400 MBH.*

1. Describe the commissioning process for commercial HVAC equipment.
2. Describe maintenance of commercial HVAC equipment.

**D. Testing and Troubleshooting ..... 29%**

**Outcome:**     *Repair HVAC systems up to 400 MBH.*

1. Describe instruments used for testing and troubleshooting HVAC equipment.
2. Describe annual fuel utilisation efficiency (AFUE) program.
3. Demonstrate procedures for an appliance efficiency test.
4. Describe the procedures for diagnosing faults in a gas furnace.
5. Diagnose a mal-functioning gas furnace.
6. Diagnose safety interlock problems on mid and high efficient furnaces.
7. Diagnose a mal-functioning HVAC accessory.
8. Diagnose gas train components.
9. Install gas train components.

- 10. Diagnose temperature sensing devices.
- 11. Diagnose line voltage devices.
- 12. Diagnose combustion related devices.
- 13. Install combustion related devices.

**E. Troubleshooting Commercial and Industrial HVAC Systems..... 10%**

**Outcome:**     *Repair commercial and industrial HVAC equipment.*

- 1. Diagnose commercial and industrial HVAC equipment.
- 2. Demonstrate techniques used to start up, monitor the sequence of operation, and shut down commercial equipment and appliances.
- 3. Repair commercial and industrial HVAC equipment.

**F. Air Balancing..... 6%**

**Outcome:**     *Perform air flow balancing.*

- 1. Identify the instruments used for air flow testing and balancing.
- 2. Measure the airflow on various outlets, grills and ductwork.
- 3. Describe the process for air balancing an HVAC system.
- 4. Balance a multi-outlet, single zone system using air balancing equipment.
- 5. Balance an HRV system.

**G. Workplace Coaching Skills..... 2%**

**Outcome:**     *Use coaching skills when training an apprentice.*

- 1. Describe the process for coaching an apprentice.

**H. Interprovincial Standards Red Seal Program ..... 3%**

**Outcome:**     *Use Red Seal products to challenge an Interprovincial examination.*

- 1. Identify Red Seal products used to develop Interprovincial examinations.
- 2. Use Red Seal products to prepare for an Interprovincial examination.





# Apprenticeship and Industry Training

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