Apprenticeship Manitoba

Manitoba

Sheet Metal Worker
Level 2

Rev. September 2009

Apprenticeship Manitoba

Sheet Metal Worker

Unit: A9 Advanced Gas Metal Arc Welding (GMAW)

Level: Two

Duration: 24 hours

Theory: 10 hours

Practical: 14 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of the procedures used to weld aluminum and stainless steel using the GMAW process.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify and describe GMAW equipment, consumables and accessories used to weld aluminum and stainless steel.	**10%**
2. Describe the procedures to set-up, adjust and shut-down GMAW equipment for welding aluminum and stainless steel.	**10%**
3. Describe the procedures used to weld aluminum and stainless steel using the GMAW process. a. Plug b. Fillet (continuous) c. Stitch d. Tack e. Edge f. Corner	**10%**
4. Describe weld defects, their causes and the procedures to prevent and correct them.	**10%**
5. Demonstrate procedures by welding aluminum and stainless steel using GMAW process.	**60%**

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: A14 Introduction to Blueprint Reading/Specifications

Level: Two

Duration: 20 hours

Theory: 20 hours

Practical: 0 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of the blueprints and their applications.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify the types of drawings and describe their applications.	**10%**
a. Civil/site b. Architectural c. Mechanical d. Structural e. Electrical f. Shop drawings g. Sketches h. As-built	
2. Identify the views used on blueprints.	**20%**
a. Elevation b. Plan c. Section d. Detail e. Auxiliary	
3. Identify the parts of a blueprint and describe their purpose and applications.	**20%**
a. Lines b. Legend c. Symbols and abbreviations • Duct • Welding • Electrical • Plumbing • Architectural d. Title block e. Notes and specifications	

4.	**Identify and interpret common symbols and abbreviations found on drawings.**	**20%**
5.	**Identify the types of scales and describe their applications and procedures for use.**	**20%**
6.	**Describe metric and imperial systems of measurement.**	**10%**

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: A17 Introduction to Gas Tungsten Arc Welding (GTAW)

Level: Two

Duration: 20 hours

Theory: 10 hours

Practical: 10 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of GTAW equipment, its applications and maintenance and the procedures used to weld mild steel using the GTAW process.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define and explain terminology associated with GTAW	**5%**
2. Describe GTAW and its applications.	**5%**
3. Identify safety precautions when using GTAW equipment. a. Personal b. Shop/facility c. Equipment d. Ventilation	**5%**
4. Identify and describe GTAW equipment, consumables and accessories.	**5%**
5. Describe the procedures to set-up, adjust and shut-down GTAW equipment for welding steel.	**5%**
6. Describe the procedures used to maintain and troubleshoot GTAW equipment.	**5%**
7. Identify the types of welds performed using the GTAW Process. a. Plug b. Fillet (continuous) c. Stitch d. Tack e. Edge f. Corner	**5%**
8. Describe the procedures used to weld steel using the GTAW process.	**5%**
9. Describe weld defects, their causes and the procedures to prevent and correct them.	**5%**
10. Demonstrate procedures for GTAW welding.	**55%**

Apprenticeship Manitoba

Sheet Metal Worker

Unit: B2 Trade Mathematics II

Level: Two

Duration: 24 hours

Theory:	24	hours
Practical:	0	hours

Overview:

This unit is designed to provide the apprentice with the knowledge and ability to apply mathematics with precision, resourcefulness and confidence. This unit, which builds on the course Trade Mathematics I, is intended to provide the apprenticeship with ample opportunity to build on general mathematical concepts. Beginning with a review of trade-related calculations for occupational skills, the unit covers trade-related calculations.

Objectives and Content:	Percent of Unit Mark (%)
1. Review general math concepts related to average and percentage.	**25%**
2. Review general math concepts related to costs and wages.	**25%**
3. Review general math concepts related to equations.	**25%**
4. Review general math concepts related to ratio and proportion.	**25%**

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: B5 Science I

Level: Two

Duration: 24 hours

Theory:	24	hours
Practical:	0	hours

Overview:

This unit is designed to provide the apprentice with the knowledge and ability to use science with precision, resourcefulness and confidence. Beginning with an overview of the importance of science to the trade, the unit covers a review of general science concepts including an overview of trade-related science.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Review science concepts of thermodynamics and heat.	**50%**
a. Thermodynamics	
b. First law of thermodynamics	
c. Second law of thermodynamics	
d. Temperature conversion	
e. Heat	
f. Heat measurement	
g. Heat transfer	
h. Heat production	
2. Review science concepts of combustion and fuels	**50%**
a. Combustion	
b. Fuels and heating values	
c. Combustion air	
d. Flames	
e. Products of combustion	
f. Combustion efficiency	
g. Electrical energy	
h. Electrical energy production	
i. electricity	

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: C3 Trade Related Documents

Level: Two

Duration: 21 hours

Theory: 16 hours

Practical: 5 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of trade related documents and their use and procedures used to prepare documentation.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify types of trade related documents and describe their applications.	**40%**
a. Manufacturers' specifications b. Blueprints c. Codes and standards • SMACNA • ASHRAE • National Building Code (NBC) • B-149 gas code • NFPA96 d. Work orders • Change • Job • Material	
2. Identify types of documentation and describe the procedures used to prepare them.	**40%**
a. Work orders b. Reports • Hazard assessment • Safety • Worker's Compensation c. Maintenance/service records d. Stock/inventory records • Shop • Job site • Vehicle	
3. Demonstrate the completion of various trade-related forms.	**20%**

Apprenticeship Manitoba

Sheet Metal Worker

Unit: C5 Fabrication (Air Handling Systems and Components)

Level: Two

Duration: 50 hours

Theory: 15 hours

Practical: 35 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of sheet metal components for air handling systems and the procedures used to fabricate them.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define and explain terminology associated with air handling systems.	**5%**
2. Identify tools and equipment used to fabricate sheet metal components for air handling systems and describe their applications.	**5%**
3. Identify types of materials used in fabricating sheet metal components for air handling systems and describe their characteristics and applications.	**5%**
4. Identify and describe sheet metal components associated with air handling systems. a. ductwork b. Fittings c. Dampers d. Fire dampers e. Flexible connections f. Hangers g. Equipment supports/bases h. Louvers i. Attenuators (silencer)	**5%**
5. Identify considerations and requirements when fabricating sheet metal components for air handling systems. a. Load bearing capacities b. System specifications c. Codes and regulations d. SMACNA e. ASHRAE f. NBC g. Environmental conditions	**5%**

6. Describe the procedures used to fabricate sheet metal components for air handling systems. **5%**

a. Cut
b. Label
c. Form
d. Insulate
e. Assemble

7. Identify the types of basic surface finishes and describe their applications. **5%**

8. Demonstrate procedures for fabricating sheet metal components for air handling systems. **65%**

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: C8 Parallel Line Development II

Level: Two

Duration: 14 hours

Theory: 6 hours

Practical: 8 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of the procedures used to develop and fabricate advanced fittings using parallel line development..

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the types of advanced fittings and components that require parallel line development.	**25%**
2. Describe the procedures used to develop and fabricate advanced fittings and components using parallel line development.	**25%**
3. Demonstrate parallel line development.	**50%**

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: C11 Radial Line Development II

Level: Two

Duration: 14 hours

Theory: 6 hours

Practical: 8 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of the procedures used to develop and fabricate advanced fittings using radial line development.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the types of advanced fittings and components that require radial line development.	**25%**
2. Describe the procedures used to develop and fabricate advanced fittings and components using radial line development.	**25%**
3. Demonstrate radial line development.	**50%**

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: C14 Triangulation II

Level: Two

Duration: 14 hours

Theory: 6 hours

Practical: 8 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of the procedures used to develop and fabricate advanced fittings using triangulation.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the types of advanced fittings and components that require the triangulation method.	**25%**
2. Describe the procedures used to develop and fabricate advanced fittings and components using the triangulation method.	**25%**
3. Demonstrate triangulation.	**50%**

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Apprenticeship Manitoba

Sheet Metal Worker

Unit: D1 Installation (Air Handling Systems)

Level: Two

Duration: 35 hours

Theory: 30 hours

Practical: 5 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of installation procedures for air handling systems.

Objectives and Content:	**Percent of Unit Mark (%)**

1. Identify types of air handling systems and describe their principles and operation. **10%**

a. Exhaust
b. Make-up air
c. Supply/return air

2. Identify air handling system components and describe their applications. **10%**

a. Sheet metal components
   - Ductwork
   - Fittings
   - Hangers
   - Braces
   - Brackets
   - Cladding/lagging

b. System components
   - Units
   - Dampers
   - Fire dampers
   - Registers/diffusers
   - Grilles
   - Louvers
   - Coils
   - Heat and energy recovery ventilators
   - Automatic controls and instruments

c. Accessories
   - Humidifiers
   - Filters
   - Mixing boxes

3. Identify the types of fasteners and describe their applications. **10%**

a. Concrete
b. Metal
c. Wood

4. Describe the procedures used to prepare for installation of residential and commercial/industrial air handling systems and components. **10%**

a. Determine equipment requirements
b. Determine penetration locations
c. Perform site measurements
d. On-site co-ordination
   - Staging (storing material)
   - Planning
   - Distributing (material to installation area)
   - Sectioning (pre-assembling on site)
   - Erecting
e. Final inspection (completing)

5. Identify considerations and requirements for installing air handling system components. **10%**

a. Codes and regulations
b. Manufacturers' specifications
c. Isolators
d. Building materials
e. Environmental conditions

6. Describe the methods used to install air handling system components. **10%**

7. Demonstrate installation of air handling systems. **40%**

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Apprenticeship Manitoba

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Unit: D3 Chimneys Breeching and PVC Venting

Level: Two

Duration: 20 hours

Theory: 18 hours

Practical: 2 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of installation procedures for chimneys, breeching and PVC venting.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define and explain terminology associated with chimneys, breeching and PVC venting.	**9%**
2. Identify codes, standards and regulations pertaining to installing chimneys, breeching and PVC venting. a. Jurisdictional requirements	**9%**
3. Identify types of chimneys, breeching and PVC venting systems and their components and describe their applications. a. Chimney classifications b. Vent classifications/combustion air	**9%**
4. Describe the procedures used to connect chimneys, breeching and PVC venting.	**9%**
5. Describe the procedures used to connect chimneys, breeching and PVC venting to the appliance.	**9%**
6. Identify types of flashing and describe their applications.	**9%**
7. Identify cladding and lagging materials used for chimneys, breeching and PVC venting and describe their characteristics and applications.	**9%**
8. Describe the procedures used to install cladding and lagging on chimneys, breeching and PVC venting.	**9%**
9. Describe the factors to consider when installing flashing. a. Environmental conditions b. Architectural conditions	**9%**
10. Describe the procedures used to install flashing.	**9%**
11. Demonstrate installation procedures for chimneys, breeching and PVC venting.	**10%**