Apprenticeship Manitoba

Manitoba

Sheet Metal Worker
Level 1

Rev. October 2018

Apprenticeship Manitoba

Sheet Metal Worker

Unit: A1 Learning About Work

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

One sign than an apprentice has become competent in a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to trade-learning. Even trade veterans rely on peers to refine their knowledge and skill. The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and trade deadlines. As adult trade-learners, apprentices at all levels of training must use their observational, listening and interpersonal skills to benefit from the journeyperson's knowledge and experience. This requires an understanding of the trade's dynamics, as well as the roles and responsibilities which order workplace/jobsite work-life.

This unit profiles the trade's structure and scope as determined by the Apprenticeship and Certification Act through its regulations, Provincial Advisory Committees (PACs) and the Red Seal Occupational Standard (RSOS) from which the training standards are derived (core tasks and skill requirements), as well as its job-ladders and long-term career options and social competencies. This includes information about major areas of working knowledge, activities and interactions at work, and expansive and restrictive workplaces, stressing their application to apprenticeship on-the-job training.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit are part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to teach in this system – a central and time-honored foundation of trades journeywork.

Please note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the structure and scope of the Sheet Metal Worker trade.	**n/a**

a. The Apprenticeship and Certification Act
- Apprenticeship and Certification Board and PACs
- General and specific trade regulation
- Policies regarding attendance, evaluation procedures, conduct and progression requirements (Apprenticeship Manitoba, Training Provider)

b. Uses of the RSOS for Sheet Metal Worker
- Technical training in-school curriculum
- On-the-job record book of hours (Manitoba blue book)
- Logbook of on-the-job task competencies
- Examinations (level placement tests, final certification examinations)

c. Opportunities and future career options
- Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope.

- Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pitfalls of leadership between management and shop-floor workers.
- Geographic mobility. What does it mean to a tradesperson to have to travel to find work? Are there more opportunities if they do? What are they? What are the drawbacks to being away from home for several weeks at a time?
- Job hierarchies and innovations. What trade specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

2. Describe two levels of workplace competency. **n/a**

a. Job competencies related workplace culture
   - Knowledge of workplace equipment and materials
   - Skills and techniques

b. Social competencies related to workplace culture
   - Frame of reference for evaluation workplace events
   - Language of work
   - Workplace belief systems
   - Rules and meanings
   - Multiculturalism and equity in the workplace

3. Describe accommodation for apprentices with disabilities. **n/a**

a. Technical training
   - Requirements
   - Roles and Responsibilities
   - Services and information required by persons with disabilities

b. On-the-job
   - Requirements
   - Roles and Responsibilities
   - Services and information required by persons with disabilities

Apprenticeship Manitoba

Sheet Metal Worker

Unit: A2 Trade Safety Awareness

Level: One

Duration: 10 hours

Theory: 10 hours

Practical: 0 hours

Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury. It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment. It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of trade apprenticeship training both in school and on-the-job. Unit content is supplemented throughout technical training by trade-specific information about trade safety hazards and precautions presented in the appropriate contexts of discussion and study.

***Please note*: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit. A pass mark is assumed to be 70%. Therefore, upon completion, 70% is the mark to be submitted to the Apprenticeship Branch for inputting into computer records.**

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify safety and health requirements.	**n/a**

a. Overview of The Workplace Safety and Health Act
   - Rights and responsibilities of employees under the Act
   - Rights and responsibilities of employers under the Act
   - Rights and responsibilities of supervisors under the Act

b. Fourteen (14) regulations

c. Codes of practice

d. Guidelines

e. Right to refuse
   - Explanation of right to refuse process
   - Rights and responsibilities of employees
   - Rights and responsibilities of employers
   - Rights and responsibilities of supervisors under the Act

2. Identify personal protective equipment (PPE) and procedures. n/a

a. Employer and employee responsibilities as related to personal protective equipment.
b. Standards: Canadian Standards Association (CSA), American National Standards Institute (ANSI) and guidelines
c. Work protective clothing and danger if it fits poorly.
d. Gloves – Importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)
e. Headwear – appropriate protective headwear when required and the approved type of headwear.
f. Eye protection – comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
g. Foot protection – when required according to safety standards
h. Hearing protection
   - Hazards of various noise levels (hearing protection must be worn)
   - Laws
   - Types of hearing protection
i. Respiratory protection – types, overview of proper selection
j. Fall protection – Manitoba requirements standards guidelines
   - CSA
   - ANSI
k. Ladders and scaffolding
l. Safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)

3. Identify electrical safety. **n/a**

a. Effects of electric current on the human body
b. Three factors that affect the severity of an electric shock
c. The effects of arc and blast on the human body and on equipment
d. Hazards/precautions in working with energized equipment

4. Identify workplace regulations applicable to: **n/a**

a. The care and cleanliness in the working area
b. The safe use of chemicals
c. The use of scaffolding
d. The use of ladders and related equipment.

5. Identify fire safety. n/a

a. Types of fires
b. Types of fire-fighting equipment
c. Classification of fire extinguishers (A,B,C)
d. Location of fire extinguishers and exits
e. Fire alarms and drills

6. Identify ergonomics. n/a

a. Definition of ergonomics and conditions that may affect the body
   - Working postures
   - Repetition
   - Force
   - Lifting (simple safety procedures and precautions related to material handling procedures on how to lift, carry and put down a load)
   - Tools
   - Identify tool and safety equipment
   - Causes of hand tool accidents
   - equipment

7. Hazard of confined space entry. **n/a**

a. Identification of a confined space
b. Hazards of a confined space
   - physical
   - biological
c. Working in a confined space
d. Emergency response plan
e. Self-contained breathing apparatus (SCBA)

8. Identify first aid/CPR. n/a

a. Overview of first aid regulation
b. Obligations of employers regarding first aid
   - Who is certified to provide first aid?
   - What to do while waiting for help?
   - Where is first aid kit?
c. Describe basic first aid requirements and techniques
   - Scope and limits of first aid intervention
   - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
   - Interface with other services and agencies (eg. Workers Compensation claims)
d. Describe basic Cardiopulmonary Resuscitation (CPR) requirements and techniques
   - How do you get certified?
   - Scope and limits of CPR intervention (include varieties of CPR certification)

9. Identify the safety requirements as they apply to WHMIS 2015 with emphasis on: **n/a**

a. WHMIS 1988 vs 2015 as a system. What is the same and what has changed? What is GHS?
b. Provincial regulation under the Safety and Health Act
   - Each province has a WHMIS regulation
c. Federal Hazardous Products Act
d. WHMIS generic training:
   - WHMIS defined and the format used to convey information about hazardous materials in the workplace
   - Information found on supplier and workplace labeling using WHMIS
   - Hazardous materials in accordance with WHMIS
   - Compliance with government safety standards and regulations
e. Description of WHMIS (include varieties of WHMIS Certification)
   - Typology of WHMIS labels, symbols, and classifications
   - Scope and use of Materials Safety Data Sheets (MSDS)

10. Identifying and controlling hazards. **n/a**

a. Hazardous Products Act (HPA) and Hazardous Products Regulations (HPR)
b. Basic control measures (injury prevention)
c. Safe work practices and procedures
d. Explanation on the importance of industrial housekeeping
e. Employer responsibilities
f. How and where to store materials
g. Safety measures related to walkways, stairs and floor openings
h. Explanation of how to protect the worker and others when working in traffic paths
i. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them
j. Refrigerants
k. Toxic chemical (non-refrigerant)
l. High pressure fluids

11. Describe the safe storage of stock equipment in service vehicles and transportation of dangerous goods. **n/a**

12. Describe Asbestos Safety and Health Requirements. **n/a**

a. What asbestos is and why it has been used so much
b. The potential health hazards associated with asbestos
c. Typical products and materials that contain asbestos
d. Proper precautions and work practices when working around asbestos
e. How to recognize asbestos hazards due to damage or deterioration
f. Appropriate response to an asbestos fiber release
g. Workplace Safety and Health regulations, guidelines and bulletins that apply to workers who work with or work around asbestos and which regulations affect you or your company

13. Review the amendments to the Workplace Safety and Health Regulation to meet harmonization recommendations of the Occupational Safety and Health of the Canadian Association of Administrators of Labour Legislation, a cross-jurisdictional advisory and consultative body respecting shared issues relating to occupational safety and health which include: **n/a**

a. Updating first-aid kits and first-aid certifications in accordance with newly developed Canadian Standards Association (CSA) standards as part of a national system for workplace first aid
b. Extending baseline hearing test requirements from within 70 days of hire to up to six months and replace annual hearing reports with requirements to report every two years
c. Clarifying existing requirements for the provision and use of several types of personal protective equipment including high-visibility safety apparel, hearing protection, life jackets and personal flotation devices
d. Ensuring a secondary air supply is carried on the person or within arm’s reach for workers working in dangerous atmospheres

Apprenticeship Manitoba

Sheet Metal Worker

Unit: A3 Tools and Equipment

Level: One

Duration: 35 hours

Theory: 28 hours

Practical: 7 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for use.

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

1. Identify types of tools and equipment and describe their applications and procedures for use. — **20%**

a. Hand tools
b. Portable tools
c. Powder-actuated tools
d. Shop tools
e. Measuring and layout equipment
f. Welding and cutting equipment
   - Metal
   - Non-metal/plastic
   - Oxy-fuel
   - Plasma
   - Resistance spot welding
g. Soldering
   - Soft
h. Computer Numerical Control (CNC) equipment
i. Stationary and mobile work platforms
   - Ladders
   - Scaffolds
   - Lifts
j. Hoisting, lifting, rigging equipment
   - Cranes
   - Grip hoists
   - Ropes
   - Slings

2. Identify hazards and safe work practices and procedures pertaining to tools and equipment. — **10%**

a. Codes
b. Regulations

3.	**Identify the factors to consider when selecting tools and equipment.**	**5%**
4.	**Describe the procedures to set up, adjust and dismantle tools and equipment.**	**5%**
5.	**Identify types of knots, hitches, splices and bends and describe the procedures to tie them.** a. Bowline b. Running bowline c. Square/reef d. Half-hitch	**5%**
6.	**Describe the procedures used to communicate during hoisting, rigging and positioning.** a. Hand signals b. Electronic communications	**15%**
7.	**Describe the procedures used to inspect, clean, maintain and store tools and equipment.**	**10%**
8.	**Describe the procedures used to troubleshoot tools and equipment, and identify the criteria for their replacement or repair.**	**10%**
9.	**Demonstrate the correct use of tools and equipment through various projects.**	**20%**

Apprenticeship Manitoba

Sheet Metal Worker

Unit: A4 Welding 1

Level: One

Duration: 25 hours

Theory: 5 hours

Practical: 20 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of gas metal arc welding (GMAW), oxyfuel cutting and heating, brazing, and plasma arc cutting equipment, their applications and maintenance, and of the procedures used to weld and cut materials using these processes.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define and explain terminology associated with welding and cutting equipment.	**5%**
2. Describe types of welding and cutting equipment, their applications and procedures for use. a. GMAW b. Oxyfuel cutting and heating c. Brazing d. Plasma arc cutting	**5%**
3. Describe metal inert gas (MIG) welding and its applications. a. GMAW (gas) b. FCAW (flux-core)	**5%**
4. Identify hazards, safety precautions, codes and regulations when using welding and cutting equipment. a. Personal b. Shop/facility c. Equipment d. Ventilation	**5%**
5. Describe hot work procedures.	**5%**
6. Identify and describe welding and cutting materials, consumables and accessories.	**5%**
7. Interpret the symbols and information pertaining to welding and cutting found on drawings and specifications.	**5%**

8. Describe the procedures used to prepare materials using welding and cutting equipment. 5%

9. Describe the considerations and procedures used to set-up, adjust and shut-down welding and cutting equipment. 5%

10. Identify the types of welds performed using the GMAW process. 10%

a. Plug
b. Fillet (continuous)
c. Stitch
d. Tack
e. Edge
f. Corner

11. Describe the procedures used to inspect, maintain and troubleshoot welding and cutting equipment. 10%

12. Demonstrate the correct procedures for welding and cutting metal using a variety of materials. 35%

Apprenticeship Manitoba

Sheet Metal Worker

Unit: A5 Trade Mathematics 1

Level: One

Duration: 36 hours

Theory: 36 hours

Practical: 0 hours

Overview:

This unit is designed to provide the apprentice with the knowledge and ability to use mathematics with precision, resourcefulness and confidence. The unit begins with an overview of the importance of math to the trade, including a review of general mathematical concepts, the use of calculators, and trade-related mathematics.

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

1. Describe the practical importance of math disciplines to the Sheet Metal Worker trade. — **5%**

a. Definition and scope of relevant math disciplines
b. Time-sheets, wages, and personal budgeting
c. Manufacture and packaging of sheet metal materials and products
d. Trade documents, including manufacturers' specifications
e. Computer technology/applications
f. Design/technical drawing
g. Work order preparation
h. Machinery and equipment set-up
i. Measurement and related test readings
   - Temperatures
   - Pressures
   - Other measured quantities
j. Customer relations/perceptions (e.g. schedules, timetables, etc.)

2. Review general math concepts. — **70%**

a. Basic operations
   - Linear measure
   - Area and volume
   - Perimeter
   - Addition
   - Subtraction
   - Multiplication
   - Division
   - Order of operations
   - Fractions and decimals

b. Units of measure
   - Imperial
   - Metric (SI)
   - Conversion factors

c. Calculator use
   - Basic operation keys/functions
   - Percentage keys/functions
   - Trig keys/functions
   - Keys/functions re: memory and constants

3. Demonstrate trade-related calculations as specified by instructor. 25%

a. Basic operations
   - Linear measure
   - Area and volume
   - Perimeter
   - Addition
   - Subtraction
   - Multiplication
   - Division
   - Order of operations
   - Fractions and decimals

b. Units of measure
   - Imperial
   - Metric (SI)
   - Conversion factors

c. Calculator use
   - Basic operation keys/functions
   - Percentage keys/functions
   - Trig keys/functions
   - Keys/functions re: memory and constants

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Unit: A6 Trade Related Documents

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 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, and how to plan their project tasks, and obtain and organize required materials.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with trade-related documents.	**10%**
2. Identify types of trade related documents and describe their applications and procedures used to prepare and complete them. a. Time cards b. As-builts c. Work orders • Change • Job • Material d. Change orders e. Change directives f. Invoices g. Requests for information (RFI) h. Manufacturers' specifications i. Drawings, specifications, blueprints j. Codes and standards • SMACNA • ASHRAE • National Building Code (NBC) • B-149 gas code • NFPA96	**10%**

3. Explain responsibilities associated with completing and signing trade-related and safety-related documents. **10%**

a. Accident-incident reports
b. Near miss reports
c. Safety inspection reports
d. WHMIS reports
e. Safety Data Sheets (SDS)

4. Identify types of materials and equipment required for work project. **10%**

a. Consumables
b. Fasteners
c. Sheets
d. Sealants
e. Ductwork
f. Hoisting
g. Air handling components
h. Hazardous materials
i. Material lifts

5. Describe considerations for determining material, supply and job requirements. **10%**

a. Plans
b. Specifications
c. Drawings
d. Environment
e. Personnel
f. Tools and equipment
g. Permits
h. LEED requirements

6. Describe the procedures to organize, store and maintain inventory and the associated trade documents required. **10%**

7. Describe safety requirements for handling materials and equipment for work project and the associated trade documents required. **10%**

8. Identify sources of information relevant to job planning. **10%**

9. Describe the procedures used to plan job tasks and complete trade-related documentation. **10%**

a. Scheduling
b. Estimating

10. Demonstrate the ability to plan job tasks and complete various trade-related forms. **10%**

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Unit: A7 Drafting

Level: One

Duration: 20 hours

Theory: 10 hours

Practical: 10 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of basic drafting, basic drafting tools and equipment and their procedures for use, and basic knowledge of Computer Aided Drafting (CAD).

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define and explain terminology associated with drafting. a. Basic b. Computerized (CAD)	**10%**
2. Identify basic drafting tools and equipment and describe their applications and procedures for use.	**10%**
3. Describe the procedures used to develop basic drawings and sketches. a. Pictorial b. Orthographic	**10%**
4. Identify types of computer technology used for pattern development and describe their applications. a. CAD	**5%**
5. Demonstrate basic drafting skills.	**65%**

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Unit: A8 Communication

Level: One

Duration: 12 hours

Theory: 10 hours

Practical: 2 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of effective communication practices.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology used in the trade.	**10%**
2. Describe the importance of using effective verbal and non-verbal communication with people in the workplace. a. Tradespeople b. Colleagues c. Apprentices d. Supervisors e. Clients f. Public g. Authorities having jurisdiction h. Manufacturers	**20%**
3. Identify sources of information to effectively communicate.	**10%**
4. Identify communication and learning styles.	**10%**
5. Describe effective listening and speaking skills.	**10%**
6. Identify personal responsibilities and attitudes that contribute to on-the-job success.	**20%**
7. Identify the value of diversity in the workplace.	**10%**
8. Identify communication that constitutes harassment and discrimination.	**10%**

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Unit: A9 Pattern Development 1

Level: One

Duration: 45 hours

Theory: 20 hours

Practical: 25 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of basic pattern development and simple/straight line layout, their applications and associated calculations. This unit also introduces the apprentice to Parallel Line, Radial Line, and Triangulation pattern development.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with simple and straight line layout.	**10%**
2. Identify the types of basic patterns and fittings that require simple and straight line layout.	**5%**
3. Identify different views used when sketching and describe their applications. a. Elevation b. Plan c. Section d. auxiliary	**10%**
4. Identify calculations used in simple and straight line layout and the procedures used to perform them.	**10%**
5. Identify layout methods and their associated tools, and describe their applications and procedures for use. a. Simple/straight line b. Parallel line c. Radial line d. Triangulation e. Computerized f. Combination	**25%**

6. Describe the procedures used to develop basic patterns and fabricate fittings using simple and straight line layout. **20%**

a. Determine views
b. Label lines and points
c. Prepare pattern
d. Determine types of seams, joints and edges
e. Calculate allowances
f. Determine stretchouts
g. Confirm pattern accuracy
h. Cut pattern
i. Label pieces

7. Demonstrate the ability to develop patterns using simple and straight line layout. **20%**

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Unit: A10 Fabrication 1

Level: One

Duration: 49 hours

Theory: 0 hours

Practical: 49 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of the procedures used in cutting, insulating and fabricating sheet metal components including basic ductwork, fittings, hanger systems, supports and bases.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with fabrication.	**5%**
2. Identify and describe sheet metal components associated with air and material handling systems. a. Ductwork b. Fittings c. Dampers d. Fire Dampers e. Flexible connections f. Hangers g. Equipment supports/bases h. Louvers i. Attenuators (silencers) j. Blast gates k. Clean-outs l. Access doors m Plenums	**15%**
3. Identify types and properties of insulation used for insulating ductwork, fittings and components.	**5%**
4. Identify tools and equipment used to fabricate sheet metal components and describe their applications, limitations and procedures for use.	**5%**
5. Interpret information pertaining to the fabrication of sheet metal components found on drawings and specifications.	**5%**
6. Identify hazards and describe safe work practices and procedures associated with fabrication of sheet metal components.	**5%**

7.	**Identify codes, regulations and industry standards pertaining to fabrication of sheet metal components.**	**10%**
8.	**Identify considerations and requirements when fabricating sheet metal components for air and material handling systems.**	**5%**
9.	**Calculate the measurements required for seam allowances according to material handling requirements.**	**5%**
10.	**Describe the procedures used to cut, insulate and fabricate sheet metal components.**	**5%**
11.	**Demonstrate the ability to cut, insulate and fabricate sheet metal components.**	**35%**

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Unit: A11 Installation 1

Level: One

Duration: 34 hours

Theory: 13 hours

Practical: 21 hours

Overview:

Upon completion of this unit of instruction the apprentice will demonstrate knowledge of types of metals and their applications, and the installation procedures for air handling systems and their components.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology and identify the basic principles of electricity, electrical devices, and types of air handling systems and describe their purposes, applications, principles and operation. a. Exhaust b. Make-up air c. Supply/return air	**5%**
2. Describe the properties of and identification systems for metal materials. a. Numbering b. Colour coding c. Gauging	**5%**
3. Identify types of metals and describe their applications. a. Steel b. Copper c. Brass d. Aluminum e. Cast iron f. Stainless steel	**5%**
4. Identify air handling system components and describe their applications. a. Sheet metal components • Ductwork • Fittings b. System components • Dampers • Registers/diffusers • Grilles • Louvers	**10%**

- Plenums

5.	**Identify tools and equipment used for installing air handling equipment and describe their applications and procedures for use.**	**5%**
6.	**Identify hazards and describe safe work practices and procedures pertaining to installing air handling equipment and working on or around electrical equipment and sources.**	**5%**
7.	**Interpret information pertaining to installing air handling equipment found on drawings and specifications.**	**5%**
8.	**Describe the considerations and requirements associated with the procedures used to install air handling equipment.** a. Codes, regulations, trade standards b. Manufacturers' specifications c. Isolators d. Building materials e. Environmental conditions	**10%**
9.	**Identify the types of fasteners, connections and sealants and describe their applications.** a. Concrete b. Metal c. Wood	**10%**
10.	**Describe the methods used to install air handling system components.**	**10%**
11.	**Demonstrate the ability to install air handling systems.**	**25%**