

Welder Level 1

Welder

Unit: A1 Trade Safety Awareness

Level: One

Duration: 14 hours

Theory: 14 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's 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 Welder apprenticeship training both in school and on-the-job. Unit content is supplemented throughout technical training by trade-specific information about Welder safety hazards and precautions presented in the appropriate contexts of discussion and study.

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. Identify safety and health requirements.	n/a
a. Overview of the Workplace Safety and Health Act <ul style="list-style-type: none">• 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 <ul style="list-style-type: none">• 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.	
a. Employer and employee responsibilities as related to PPE	
b. Standards: CSA, ANSI and guidelines	
c. Work protective clothing and danger if it fits poorly	
d. Importance of selecting and using appropriate gloves to suit task (e.g., re: chemicals, cold/hot items, slivers, etc.)	
e. Standards and requirements re: selection/use of appropriate headwear	

- f. Eye protection – Comparison/contrast 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; selection
- j. Fall protection - Manitoba requirements Standards Guidelines
 - ANSI (U.S.A. standards), etc.
- k. Ladders and scaffolding
- l. Safety principles for working with or around industrial trucks site specific (forklifts, pallet trucks, etc.)

3. Identify electrical safety.

- a. Effects of electric current on the human body
- b. Three factors that affect the severity of an electric shock
- c. The effects of electrical arcs/blasts on the human body and on equipment
- d. Hazards/precautions re: working with energized equipment

4. Identify fire safety.

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

5. Identify ergonomics.

- a. Definition of ergonomics and conditions that may affect the body
 - Working postures
 - Repetition
 - Force
 - Lifting
 - Special hazards and precautions re: materials handling
 - Special hazards/precautions re: lifting, carrying, and setting down a load
 - Tools
 - Identify tool and safety equipment
 - Causes of hand tool accidents
 - Equipment

6. Describe hazard recognition and control.

- a. Safe work practices
- b. Basic risk assessment
- c. Injury prevention and control measures
- d. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them

7. Describe the hazards of confined-space entry.

- 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.

- 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

- Location of, and access to, First Aid kit
- c. Define First Aid, and explain 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 (e.g., Workers Compensation claims)
- d. Describe basic CPR requirements and techniques
 - Obtaining certification
 - Scope and limits of CPR intervention (include varieties of CPR certification)

9. Identify safety requirements as they apply to WHMIS.

- a. WHMIS as a system
- 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. Describe the identification and control of specified hazards.

- a. Basic control measures (injury prevention)
- b. Safe work procedures
- c. Explanation on the importance of industrial housekeeping
- d. Employer responsibilities
- e. How and where to store materials
- f. Safety measures related to walkways, stairs and floor openings
- g. Traffic-pathway protection of workers and persons

A1.a Communication and Trade Documentation

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe effective verbal and non-verbal communication.	20%
2. Identify types of communication devices and describe their applications.	20%
3. Identify types of trade related documentation and describe their applications and procedures for use.	60%
<ul style="list-style-type: none"> a. Manufacturers' specifications b. Safety/hazard assessment forms c. Mill certificates d. Heat numbers e. Customer specifications f. Codes and standards g. Manuals/catalogues h. Work orders i. Requisitions/purchase orders, permits, procedure sheets j. Welding symbols 	

Welder

Unit: A2 Orientation I: Structure/Scope of Trade

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

One sign that a Welder has mastered a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to Welder 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 construction deadlines. As adult trade-learners, Welder apprentices at all levels of training must use their eyes, ears, prior knowledge, and interpersonal skills to encourage journeypersons to teach as well as to supervise them. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order jobsite work-life.

This unit profiles the trade's historical and modern significance, core tasks and skill requirements, as well as its job-ladders and long-term career options. It includes information about learning styles/strategies, stressing their application to apprenticeship and journey-level trade education. The unit also introduces the concept of skills stewardship, stressing the obligation that apprentices incur to help convey what their own journeypersons teach them to those who in turn follow them into the trade.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit is 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-honoured foundation of Welder journeywork.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1 Describe structure and scope of the modern Welder trade.	30%
a Historical background, incl. apprentice experience	
b Structure/scope of the trade	
• International and national characteristics	
• Characteristics and practice of the trade in Manitoba	
• Trade organizations	
c Opportunities and career ladders	
• Generalists and specialists	
• 'lead hands and other immediate supervisors	
• Geographic mobility	
• Job hierarchies and innovations	
2 Describe the Manitoba Welder Apprenticeship Program.	30%
a Concept and significance of skills stewardship	
• To the trade	
• To apprentices	

- To journeypersons
- To employers
- To the community
- b Practical training (on-the-job)
 - Roles/responsibilities of employer and journeyperson(s)
 - Roles responsibilities of Apprenticeship Training Coordinator (ATC)
 - Roles/responsibilities of apprentice(s)
 - Role/responsibilities of instructors (including 'related'-area faculty)
- c Technical training (offsite)
- d Attendance requirements
- e Progression requirements
- f Reporting of grades
- g Trade regulation and its significance
- h Policies (e.g., re: personal conduct, "missed" units, fees, harassment, etc.)
 - Apprenticeship Manitoba
 - Training provider(s)

3 Explain special challenges and opportunities re: apprenticeship training.

40%

- a. Adapting personal learning goals to program contexts
 - Characteristics and 'domains' (types) of adult learning
 - Description/recognition of learning and teaching styles
 - Work culture (incl. work-crew hierarchy), interpersonal skills, and trade-learning
 - Integrating technical training and practical training content
 - Possibilities and perils of peer-learning
 - Budgeting and other necessary personal arrangements
 - Handling common varieties of stress at work and in school
- b. On-the-job challenges/opportunities
 - Description/recognition of jobsite teaching styles/roles
 - Communicating with journeypersons and employers
 - Coverage/documentation of formally prescribed tasks and subtasks
 - Personal record of achievements/needs: the Trade Learning Journal option
 - Getting help and fixing mistakes
- c. In-school opportunities/challenges
 - Personal arrangements that support in-school progress
 - "Baggage handling" – self-assessing potential impacts of previous school experience on current learning (favourable/unfavourable); resources
 - Techniques for note-taking, record-keeping, and review
 - Relations with instructors (including 'related'-area faculty)
 - College resources (library, support services, etc.)
 - 'Missed Units' – policies re: supplementals, re-tests, make-up assignments, etc.

- 4. Accommodation for apprentices with disabilities.**
- 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.

Welder

Unit: A3 Equipment

Level: One

Duration: 21 hours

Theory: 21 hours

Practical: 0 hours

Overview:

This unit is designed to introduce knowledge of tools and equipment, their applications, maintenance and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Interpret regulations pertaining to tools and equipment.	2%
2. Identify types of hand tools and describe their applications and procedures for use.	4%
3. Describe the procedures used to inspect, maintain and store hand tools.	5%
4. Identify types of power tools and describe their applications and procedures for use.	4%
a. Electric	
b. Hydraulic	
c. Pneumatic	
5. Identify power tool attachments and consumables and describe their applications and procedures for use.	4%
6. Describe the procedures used to inspect, maintain and store power tools.	2%
7. Identify types of layout and measuring tools and equipment and describe their applications and procedures for use.	2%
8. Describe the procedures used to inspect, maintain and store layout and measuring tools and equipment.	3%

A3.a Stationary Machinery

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with stationary machinery.	2%

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|----|---|----|
| 2. | Identify hazards and describe safe work practices pertaining to stationary machinery. | 5% |
| 3. | Identify types of stationary machinery and describe their characteristics and applications.
a. Presses
b. Drill presses
c. Stationary grinders
d. Shears
e. Saws
f. Press brakes
g. Ironworkers | 7% |
| 5. | Perform the procedures used to set up and operate stationary machinery. | 8% |
| 6. | Perform the procedures used to inspect and maintain stationary machinery. | 2% |

A3.b Hoisting, Lifting and Rigging

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with hoisting, lifting and rigging.	2%
2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.	2%
3. Identify regulations pertaining to hoisting, lifting and rigging.	2%
4. Identify types of rigging equipment and accessories and describe their limitations, applications and procedures for use.	2%
5. Identify types of hoisting and lifting equipment and accessories and describe their applications and procedures for use. a. Jacks b. Hoists c. Cranes <ul style="list-style-type: none"> • Overhead travelling cranes (OTC) • Gantry 	2%
6. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.	2%
7. Describe the procedures used to rig material/equipment for lifting.	2%
8. Describe the procedures used to attach and use tag lines.	2%
9. Describe the procedures used to ensure the work area is safe for lifting. a. Supervision of lift b. Securing work area c. Communication	2%
10. Identify and describe the procedures used to communicate during hoisting, lifting and rigging operations. a. Hand signals	2%

- b. Electronic communications
 - c. Audible and visual warnings
- 11. Identify the factors to consider when selecting rigging equipment. 3%**
- a. Load characteristics
 - b. Sling angle
 - c. Environment
 - Chemical hazards
 - Grounding requirements
 - Weather conditions
 - d. Working load limit
- 12. Describe the procedures used to perform a lift. 4%**
- a. Pre-lift checks
 - b. Lifting load
 - c. Placement of load
 - d. Post-lift inspection

A3.c Access Equipment Overview

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with access equipment.	2%
2. Identify hazards and describe safe work practices pertaining to access equipment.	4%
3. Identify regulations pertaining access equipment.	2%
4. Identify types of access equipment and describe their characteristics and applications.	5%
<ul style="list-style-type: none"> a. Scaffolding b. Ladders c. Man lifts d. Elevated work platforms 	
5. Identify types of fall protection and fall arrest erect and dismantle access equipment.	5%
6. Describe the procedures used to erect and dismantle access equipment.	3%
7. Describe the procedures used to inspect and maintain access equipment.	2%

Welder

Unit: D1 Introduction to Welding Processes

Level: One

Duration: 21 hours

Theory: 21 hours

Practical: 0 hours

Overview:

This unit is designed to introduce knowledge of welding processes and their applications. It also introduces knowledge of welding equipment and accessories.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with welding.	5%
2. Interpret information pertaining to welding found on drawings.	10%
a. Symbols	
b. Abbreviations	
3. Identify hazards and describe safe work practices pertaining to welding.	10%
a. Personal	
b. Shop/facility	
c. Fire and explosion	
d. Equipment	
e. Ventilation/fumes	
f. Storage, handling and transportation	
4. Identify codes and standards pertaining to welding	10%
a. Canadian Standards Association (CSA)	
b. American Society of Mechanical Engineers (ASME)	
c. American Welding Society (AWS)	
5. Identify welding processes and describe their characteristics and applications.	15%
a. Shielded metal arc welding (SMAW)	
b. Gas Metal arc welding (GMAW)	
c. Metal core arc welding (MCAW)	
d. Flux core arc welding (FCAW)	
e. Gas tungsten arc welding (GTAW)	
f. Stud welding	
g. Resistance welding (RW)	
h. Submerged arc welding (SAW)	

- 6. Identify types of power sources for welding equipment and describe their applications and limitations. 10%**
- a. AC transformer
 - b. AC/DC rectifier
 - c. DC generator
 - d. Engine driven
 - Alternators
 - Generators
 - e. Inverters
- 7. Identify the types of beads and describe their characteristics and applications. 10%**
- a. Stringer
 - b. Weave
- 8. Identify types of welds and describe their characteristics and applications. 10%**
- a. Fillet
 - b. Groove
 - c. Surfacing
 - d. Plug or slot
- 9. Identify welding positions and describe their applications. 10%**
- a. Flat (1F or 1G)
 - b. Horizontal (2F or 2G)
 - c. Vertical (3F or 3G)
 - d. Overhead (4F or 4G)
 - e. Pipe fixed – horizontal (5F or 5G)
 - f. Pipe fixed – 45 degree plane (6F or 6G)
- 10. Identify welding test positions and describe their characteristics and restrictions. 10%**

Welder

Unit: D3 Shielded Metal Arc Welding (SMAW) I

Level: One

Duration: 74 hours

Theory: 14 hours

Practical: 60 hours

Overview:

This unit is designed to introduce knowledge of shielded metal arc welding (SMAW) equipment, consumables and accessories. It also introduces knowledge of the procedures used to set up, adjust, operate, inspect and maintain SMAW welding equipment. In addition, it introduces knowledge of the procedures used to deposit a weld bead using SMAW welding equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with SMAW welding.	3%
2. Identify hazards and describe safe work practices pertaining to SMAW welding.	3%
a. Personal	
b. Shop/facility	
c. Fire and explosion	
d. Equipment	
e. Ventilation/fumes	
f. Storage/handling	
3. Identify codes and standards pertaining to SMAW welding.	5%
a. Canadian Standards Association (CSA)	
b. American Society of Mechanical Engineers (ASME)	
c. American Welding Society (AWS)	
4. Identify SMAW welding equipment, consumables and accessories and describe their applications.	8%
5. Describe the procedures used to set up and adjust SMAW welding equipment.	5%
6. Describe the procedures used to strike and maintain an arc using SMAW welding equipment.	5%
7. Describe the procedures and techniques used to deposit a weld bead using SMAW welding equipment.	10%
a. Arc length	
b. Travel speed	
c. Work and travel angles	

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| 8. | Describe the procedures used to inspect and maintain SMAW welding equipment. | 5% |
| 9. | Describe the procedures used to strike and maintain an arc. | 5% |

D3.a Shielded Metal Arc Welding (SMAW) I

Objectives and Content:	Percent of <u>Unit Mark (%)</u>
1. Define terminology associated with SMAW fillet welds.	3%
2. Interpret information pertaining to SMAW fillet welds found on drawings and specifications.	3%
3. Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW fillet welds in all positions.	5%
a. Specific requirements	
b. Base metal	
• Composition	
• Thickness	
c. Power source	
d. Welding position	
e. Joint type and design	
4. Identify the requirements and describe the procedures to store consumables used for SMAW fillet welds on low carbon steel.	5%
5. Perform the procedures used to set up and adjust SMAW welding equipment.	5%
6. Perform the procedures used to perform fillet welds on low carbon steel in all positions using the SMAW process.	5%
7. Perform the procedures used to prevent and correct weld faults.	5%
8. Perform fillet welds on low carbon steel in all positions.	20%

Welder

Unit: D6 Gas Metal Arc Welding (GMAW) I

Level: One

Duration: 34 hours

Theory: 7 hours

Practical: 28 hours

Overview:

This unit is designed to introduce knowledge of the gas metal arc welding (GMAW) welding equipment, consumables and accessories. It also introduces knowledge of the procedures used to set up, adjust, operate, inspect and maintain GMAW welding equipment. In addition, it introduces knowledge of the procedures used to deposit a weld bead using GMAW welding equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with GMAW welding.	2%
2. Identify hazards and describe safe work practices pertaining to GMAW welding.	2%
a. Personal	
b. Shop/facility	
c. Fire and explosion	
d. Equipment	
e. Ventilation/fumes	
f. Storage, handling, and transportation	
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW fillet welds in all positions.	2%
a. Canadian Standards Association (CSA)	
b. American Society of Mechanical Engineers (ASME)	
c. American Welding Society (AWS)	
d. Welding position	
e. Joint type and design	
4. Identify GMAW welding equipment, consumables and accessories and describe their applications.	5%
5. Describe the procedures used to assemble and disassemble GMAW welding equipment.	5%
6. Describe the procedures used to establish and maintain an arc using GMAW welding equipment.	5%
7. Identify the modes of transfer relating to GMAW welding and describe their characteristics and applications.	5%

- a. Short circuiting
 - b. Globular
 - c. Spray
 - d. Pulse
8. **Describe the procedures and techniques used to deposit a weld bead using GMAW welding equipment.** 5%
- a. Electrode extension
 - b. Travel speed
 - c. Work and travel angles
 - d. Flow rates
 - e. An arc
9. **Perform the procedures and techniques used to deposit a weld bead using GMAW welding equipment.** 20%

D6.a Gas Metal Arc Welding (GMAW) I

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with GMAW fillet welds.	5%
2. Interpret information pertaining to GMAW fillet welds found on drawings and specifications.	2%
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW fillet welds on low carbon steel in all positions.	2%
<ul style="list-style-type: none"> a. Specification requirements b. Base metal <ul style="list-style-type: none"> • Composition • Thickness c. Shielding gas selection d. Welding position e. Joint type and design 	
4. Identify GMAW welding equipment, consumables and accessories and describe their applications.	5%
5. Describe the requirements and describe the procedures to store consumables used for GMAW fillet welds on low carbon steel plate.	5%
6. Describe the procedures used to perform fillet welds on low carbon steel plate in all positions using the GMAW process.	5%
7. Describe the procedures used to prevent and correct weld faults.	5%
8. Perform fillet welds on low carbon steel plate in all positions.	20%

Welder

Unit: D11 Flux Core Arc Welding (FCAW) I

Level: One

Duration: 70 hours

Theory: 14 hours

Practical: 56 hours

Overview:

This unit is designed to introduce knowledge of the flux core arc welding (FLAW) welding equipment, consumables and accessories. It also introduces knowledge of the procedures used to set up, adjust, operate, inspect and maintain FCAW welding equipment. In addition, it introduces knowledge of the procedures used to deposit a weld bead using FCAW welding equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with FCAW welding.	2%
2. Identify hazards and describe safe work practices pertaining to FCAW welding.	2%
a. Personal	
b. Shop/facility	
c. Fire and explosion	
d. Equipment	
e. Ventilation/fumes	
f. Storage, handling, and transportation	
3. Identify codes and standards pertaining to FCAW welding.	2%
a. Canadian Standards Association (CSA)	
b. American Society of Mechanical Engineers (ASME)	
c. American Welding Society (AWS)	
4. Identify FCAW welding equipment, consumables and accessories and describe their applications.	2%
5. Describe the procedures used to assemble and disassemble FCAW welding equipment.	3%
6. Describe the procedures and techniques used to deposit a weld bead using FCAW welding equipment.	10%
a. Electrode extension	
b. Travel speed.	
c. Work and travel angles	
d. Flow rates	
e. An arc	

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| 7. | Describe the procedures used inspect, maintain and troubleshoot FCAW welding equipment. | 4% |
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D11.a Flux Core Arc Welding (FCAW I)

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with FCAW fillet and groove welds.	2%
2. Interpret information pertaining to FCAW fillet and groove welds found on drawings and specifications.	2%
3. Identify the considerations when selecting consumables and determining equipment set-up for performing FCAW fillet and groove welds on plate.	2%
a. Specification requirements	
b. Base metal	
• Composition	
• Thickness	
c. Shielding gas selection	
d. Power source	
e. Welding position	
f. Joint type and design	
4. Identify the requirements and describe the procedures to store consumables used for FCAW welding of plate.	3%
5. Describe the procedures used to prepare plate for FCAW fillet and groove welds.	3%
6. Describe the procedures used to perform fillet and groove welds on plate using the FCAW process.	10%
a. Temperature measuring devices	
b. Pre-heating	
c. Interpass temperature	
d. Post-heating	
e. Performs welds on plate	

D11. b Metal Core Arc Welding (MCAW)

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with MCAW welding.	2%
2. Identify hazards and describe safe work practices pertaining to MCAW welding.	3%
a. Personal	
b. Shop/facility	
c. Fire and explosion	
d. Equipment	
e. Ventilation/fumes	
f. Storage, handling, and transportation	
3. Identify codes and standards pertaining to MCAW welding.	3%
a. Canadian Standards Association (CSA)	

- b. American Society of Mechanical Engineers (ASME)
 - c. American Welding Society (AWS)
4. **Identify MCAW welding equipment, consumables and accessories and describe their applications.** 3%
 5. **Describe the procedures used to assemble and disassemble MCAW welding equipment.** 3%
 6. **Describe the procedures and techniques used to weld bead using MCAW equipment.** 7%
 - a. Electrode extension
 - b. Travel speed
 - c. Work and travel angles
 - d. Flow rates
 - e. An arc
 7. **Describe the procedures used to inspect, maintain and troubleshoot MCAW welding equipment.** 5%

D11.c Metal Core Arc Welding (MCAW)

Objectives and Content:	Percent of <u>Unit Mark (%)</u>
1. Define terminology associated with MCAW fillet and groove welds.	3%
2. Interpret information pertaining to the MCAW fillet and groove welds found on drawings and specifications.	3%
3. Identify the considerations when selecting consumables and determining equipment set-up for performing MCAW fillet and groove welds. 2% <ul style="list-style-type: none"> a. Specification requirements b. Base metal <ul style="list-style-type: none"> • Composition • Thickness c. Shielding gas selection d. Power source e. Welding position f. Joint type and design 	
4. Identify requirements and describe the procedures to store consumables used for MCAW welding.	3%
5. Describe the procedures used to prepare base metals and joints for MCAW fillet and groove welds.	3%
6. Perform the procedures used to perform fillet and groove welds using the MCAW process.	10%
7. Describe the procedures used to prevent and correct weld faults.	3%

Welder

Unit: C3 Oxy-fuel Welding

Level: One

Duration: 10 hours

Theory: 3 hours

Practical: 7 hours

Overview:

This unit is designed to introduce knowledge of oxy-fuel equipment and accessories. It also introduces knowledge of the procedures used cut with oxy-fuel equipment, used to gouge with oxy-fuel equipment, used to weld with oxy-fuel equipment and braze with oxy-fuel equipment.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with oxy-fuel cutting, gouging welding.	5%
2. Identify hazards and describe safe work practices pertaining to oxy-fuel cutting, gouging and welding. <ul style="list-style-type: none"> a. Personal b. Shop/facility c. Fire and explosion d. Equipment e. Ventilation/fumes f. Storage, handling, and transportation 	5%
3. Identify and interpret codes and regulations pertaining to oxy-fuel cutting, gouging and welding equipment and operations.	5%
4. Identify oxy-fuel equipment and accessories and describe their applications and limitations. <ul style="list-style-type: none"> a. Cutting b. Gouging c. Welding d. Brazing/braze-welding e. Heating 	15%
5. Identify types of flames and describe their application and the procedures for flame adjustment. <ul style="list-style-type: none"> a. Oxidizing b. Carburizing c. Neutral 	5%
6. Perform the procedures used to set up, adjust and shut down oxy-fuel equipment.	5%

- a. Manufacturers' recommendations
- 7. **Describe the procedures used to inspect and maintain oxy-fuel equipment.** 5%
- 8. **Perform the procedures used to inspect, maintain and troubleshoot OFW welding equipment.** 10%
 - a. Free hand
 - b. Guided
 - Straight edge
 - Pattern
 - c. Automated/semi-automated
- 9. **Perform the procedures used to inspect, maintain and troubleshoot OFW welding equipment.** 10%
- 10. **Perform the procedures used to gouge using oxy-fuel equipment.** 15%
- 11. **Perform the procedures used to weld using oxy-fuel equipment.** 5%
- 12. **Perform the procedures used to braze/weld using oxy-fuel equipment.** 5%
- 13. **Set up, operate and shut down oxy-fuel equipment.** 10%

Welder

Unit: B3 Trade Problems

Level: One

Duration: 28 hours

Theory: 28 hours

Practical: 0 hours

Overview:

This unit is designed to provide the Welder Apprentice with the knowledge and understanding of trade problems.

Material covered includes:

- Fractions
- Decimals
- Percentages and ratios
- Metric and imperial measurement
- Geometric formulas

Objectives and Content:

Percent of Unit Mark (%)

- | | |
|---|------------|
| 1. Solve problems involving fractions: | 20% |
| a. Key terms and concepts used in working with fractions <ul style="list-style-type: none">• terminology | |
| b. Fractions to a common denominator. <ul style="list-style-type: none">• Finding the common denominator | |
| c. Problems using whole numbers and fractions <ul style="list-style-type: none">• Change fractions to higher terms• Change fractions to lowest terms• Changing mixed numbers to improper fractions• Changing improper fractions to mixed numbers• Multiply fractions• Divide fractions• Add fractions• Subtract fractions<ul style="list-style-type: none">- Subtraction of fractions with common denominators- Subtraction of fractions without common denominators- Subtraction of mixed numbers without common denominators | |
| d. Problems using whole numbers and fractions in practical applications <ul style="list-style-type: none">• Practical applications using whole numbers and fractions<ul style="list-style-type: none">- Holes and spaces• Scientific calculators | |
| 2. Solve problems involving decimals. | 20% |
| a. Decimal fractions <ul style="list-style-type: none">• Knowledge of reading and writing decimals<ul style="list-style-type: none">- Expression of decimals in words- Conversion of decimals in word format to a written decimal | |
| b. Rounding decimal fractions to specified place values | |

- Rounding decimal fractions
 - c. Converting decimals to fractions
 - d. Converting fractions to decimals
 - Converting mixed numbers to equivalent decimal fractions
 - e. Adding and subtracting decimals
 - f. Multiplying and dividing decimal fractions
 - g. Converting decimal inches to fractions with a practical denominator
 - h. Converting decimal feet to feet and inches with a practical denominator
- 3. Solve problems involving percentage and ratios. 20%**
- a. Ratio problems
 - Express two quantities in the form of a ratio
 - b. Express two ratios in the form of a proportion
 - c. Converting between fractions and percents
 - Converting a fraction to a percent
 - Converting a percent to a fraction
 - d. Converting decimals and percents
 - Converting decimals to percents
 - Converting a percent to a decimal
 - e. Percent problems
 - Solving percent problems
- 4. Solve problems involving metric and imperial measure. 20%**
- a. Commonly used metric units of measurement
 - Length
 - Area
 - Volume and capacity
 - Mass and weight
 - b. Converting between units of measurement:
 - Converting metric and imperial measurements of length
 - Converting between metric measurements of area
 - Converting between metric measurements of volume
 - Converting metric and imperial measurements of weight
 - Converting other welding-related measurements
 - Temperatures
 - Tensile strength
 - Notch toughness
 - c. Converting imperial: feet to inches, square inches to square feet and cubic measures to gallons
 - Converting feet and inches
 - Converting square inches and square feet
 - Converting cubic inches and cubic feet
 - Converting cubic measures to gallons
- 5. Solving problems involving geometric formulas. 20%**
- a. Problems involving geometric formulas
 - Key terminology
 - Equation
 - Formula
 - Constant
 - Variable
 - Term
 - Solution
 - Order of operations in solving equations
 - Solving equations
 - b. Common formulas and solve problems for perimeter.
 - Perimeter
 - Perimeter of a rectangle
 - Perimeter of a square
 - Perimeter of a triangle
 - Circumference of a circle
 - Perimeter of a combined geometric figure

- c. Common formulas and solve problems for area
 - Area of a rectangle
 - Area of a square
 - Area of a triangle
 - Area of a circle
 - Area of a trapezoid
 - Area of a parallelogram
 - Lateral surface area of a cylinder
 - Total surface area of a closed cylinder
 - Lateral surface area of a right rectangular solid
 - Total surface area of a right rectangular solid
- d. Common formulas and solve problems for volume
 - Volume of a right rectangular solid
 - Volume of a cylinder
 - Volume of any regular shaped object
 - Calculating the capacity of a container in gallons
- e. Calculate the weight of a solid
- f. Calculate the capacity of a container in gallons
