



8486

BASIC SMAW (ARC)
PROCEDURES (11C)

30S/30E/30M

A Welding Technology Course

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Course Description

This course is intended for students who are considering a career in welding. The emphasis is on hands-on basic flat SMAW (ARC) welding procedures.

Goal 1: Describe and apply **health and safety** practices.

GLO 1.1: Demonstrate adherence to **safe practices** and **procedures**.

- SLO 11C.1.1.1 Demonstrate adherence to safe practices and procedures for facilities, processes, tools, and equipment.
- SLO 11C.1.1.2 Identify safety and health requirements. (A1.1)
 - 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*
 - fourteen (14) regulations
 - codes of practice
 - guidelines
 - 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*
- SLO 11C.1.1.3 Identify personal protective equipment (PPE) and PPE procedures. (A1.2)
 - employer and employee responsibilities as related to PPE
 - standards: CSA, ANSI, and guidelines
 - work protective clothing and danger if it fits poorly
 - importance of selecting and using appropriate gloves to suit task (e.g., chemicals, cold/hot items, slivers, etc.)

- standards and requirements regarding selection/use of appropriate headwear
- eye protection—comparison/contrast eyeglasses, industrial safety glasses, and safety goggles
- foot protection—when required according to safety standards
- hearing protection
 - hazards of various noise levels (hearing protection must be worn)
 - laws
 - types of hearing protection
- respiratory protection—types; selection
- fall protection—Manitoba requirements Standards Guidelines
 - ANSI (U.S.A. standards), etc.
- ladders and scaffolding
- safety principles for working with or around industrial trucks site specific (forklifts, pallet trucks, etc.)

SLO 11C.1.1.4

Identify electrical safety. (A1.3)

- effects of electric current on the human body
- three factors that affect the severity of an electric shock
- the effects of electrical arcs/blasts on the human body and on equipment
- hazards/precautions regarding working with energized equipment

SLO 11C.1.1.5

Identify fire safety. (A1.4)

- types of fires
- types of firefighting equipment
- classifications of fire extinguishers (A, B, and C)
- location of fire extinguishers and fire exits
- fire alarms and drills

- SLO 11C.1.1.6 Identify ergonomics. (A1.5)
- definition of ergonomics and conditions that may affect the body
 - working postures
 - repetition
 - force
 - lifting
 - special hazards and precautions regarding materials handling
 - special hazards/precautions regarding lifting, carrying, and setting down a load
 - tools
 - identify tool and safety equipment
 - causes of hand tool accidents
 - equipment
- SLO 11C.1.1.7 Identify hazard recognition and control. (A1.6)
- safe-work practices
 - basic risk assessment
 - injury prevention and control measures
 - identification of hazards involved in pneumatic tool use and explanation of how to guard against them
- SLO 11C.1.1.8 Identify safety requirements as they apply to WHMIS. (A1.9)
- WHMIS as a system
 - provincial regulation under the *Safety and Health Act*
 - each province has a WHMIS regulation
 - *Federal Hazardous Products Act*
 - 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

- description of WHMIS (include varieties of WHMIS certification)
 - typology of WHMIS labels, symbols, and classifications
 - scope and use of Materials Safety Data Sheets (MSDS)
- SLO 11C.1.1.9 Describe the identification and control of specified hazards. (A1.10)
 - basic control measures (injury prevention)
 - safe work procedures
 - explanation on the importance of industrial housekeeping
 - employer responsibilities
 - how and where to store materials
 - safety measures related to walkways, stairs, and floor openings
 - traffic—pathway protection of workers and persons
- SLO 11C.1.1.10 Identify hazards and describe safe work practices pertaining to welding. (D1.3)
 - personal
 - shop/facility
 - fire and explosion
 - equipment
 - ventilation/fumes
 - storage, handling, and transportation
- SLO 11C.1.1.11 Read, interpret, and communicate safety information (e.g., MSDS sheets, etc.).
- SLO 11C.1.1.12 Safely store and handle compressed gas tanks.
- SLO 11C.1.1.13 Demonstrate an awareness of hazards related to compressed gas.
- SLO 11C.1.1.14 Demonstrate the safe use of compressed air.
- SLO 11C.1.1.15 Demonstrate an understanding of and adherence to *Safe Work Procedures/Job Hazards Analysis* documents for each piece of equipment used.
- SLO 11C.1.1.16 Demonstrate the safe use of a plasma arc cutter.

- SLO 11C.1.1.17 Identify first aid/cardiopulmonary resuscitation (CPR). (A1.8)
- overview of first-aid regulation
 - 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
 - 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)
 - describe basic CPR requirements and techniques
 - obtaining certification
 - scope and limits of CPR intervention (include varieties of CPR certification)
- SLO 11C.1.1.18 Describe the hazards of confined space entry. (A1.7)
- identification of a confined space
 - hazards of a confined space
 - physical
 - biological
 - working in a confined space
 - emergency response plan
 - self-contained breathing apparatus (SCBA)
- SLO 11C.1.1.19 Identify hazards and describe safe work practices pertaining to SMAW welding. (D3.2)
- personal
 - shop/facility
 - fire and explosion
 - equipment
 - ventilation/fumes
 - storage/handling
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GLO 1.2: Demonstrate knowledge of the *Trade Safety Awareness Curriculum for Level 1 Apprentices*.

No applicable SLOs.

Goal 2: Demonstrate an understanding of **metallurgy**.

GLO 2.1: Demonstrate an understanding of **metallurgy** as it applies to welding.

- SLO 11C.2.1.1 Demonstrate an understanding of metallurgy as it applies to basic SMAW welding.
- SLO 11C.2.1.2 Select appropriate filler materials to suit base metal.
- SLO 11C.2.1.3 Select appropriate electrode to suit base metal.

Goal 3: Demonstrate the **identification, operation, maintenance, and storage of equipment, materials, and consumable items**.

GLO 3.1: Demonstrate the **identification and operation** of equipment, materials, and consumable items.

- SLO 11C.3.1.1 Demonstrate the operation and handling of equipment, tools, materials, products, and consumable items.
- SLO 11C.3.1.2 Identify SMAW welding equipment, consumables, and accessories, and describe their applications. (D3.4)
- SLO 11C.3.1.3 Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW fillet welds in all positions. (D3.a.3)
 - specific requirements
 - base metal
 - composition
 - thickness
 - power source
 - welding position
 - joint type and design
- SLO 11C.3.1.4 Perform the procedures used to set up and adjust SMAW welding equipment. (D3.a.5)

GLO 3.2: Demonstrate the safe and appropriate **maintenance** and **storage** of equipment, materials, and consumable items.

- SLO 11C.3.2.1 Practise the appropriate cleaning, maintenance, and storage of SMAW equipment, tools, materials, products, and consumable items.
 - SLO 11C.3.2.2 Demonstrate the appropriate storage of low hydrogen electrodes.
 - SLO 11C.3.2.3 Describe the procedures used to inspect and maintain SMAW welding equipment. (D3.8)
 - SLO 11C.3.2.4 Identify the requirements and describe the procedures to store consumables used for SMAW fillet welds on low carbon steel. (D3.a.4)
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GLO 3.3: Demonstrate an awareness of **hoisting, lifting, and rigging** procedures.

No applicable SLOs.

GLO 3.4: Demonstrate an awareness of **access equipment**.

No applicable SLOs.

Goal 4: Demonstrate an understanding of **welding processes** and exhibit competence in those processes.

GLO 4.1: Demonstrate **pre-welding** procedures.

- SLO 11C.4.1.1 Identify SMAW welding processes, and describe their characteristics and applications. (D1.5.a)
 - shielded metal arc welding (SMAW)
 - SLO 11C.4.1.2 Prepare material for basic SMAW welding.
 - SLO 11C.4.1.3 Describe the procedures used to set up and adjust SMAW welding equipment. (D3.5)
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GLO 4.2: Demonstrate **ability to weld**.

- SLO 11C.4.2.1 Identify basic joint and weld types.
- SLO 11C.4.2.2 Describe the procedures and techniques used to deposit a weld bead using SMAW welding equipment. (D3.7)
 - arc length
 - travel speed
 - work and travel angles
- SLO 11C.4.2.3 Perform surface welds in the flat position.
- SLO 11C.4.2.4 Perform 1F welds using SMAW.

SLO 11C.4.2.5 Perform the procedures used to perform fillet welds on low carbon steel in all positions using the SMAW process. (D3.a.6)

GLO 4.3: Perform **post-welding** procedures.

SLO 11C.4.3.1 Perform cleaning procedures (i.e., chipping, grinding) on SMAW welds.

GLO 4.4: Inspect and **troubleshoot** welding projects.

SLO 11C.4.4.1 Inspect and troubleshoot welding projects.

GLO 4.5: Perform the **Manitoba Welder Practical Examinations**.

No applicable SLOs.

Goal 5: Demonstrate an understanding of **metal design and fabrication**.

GLO 5.1: Design metal projects.

No applicable SLOs.

GLO 5.2: Fabricate metal projects.

SLO 11C.5.2.1 Cut material for intermediate project, following specific measurements, angles, etc.

SLO 11C.5.2.2 Perform accurate material preparation and fit-up for intermediate project.

Goal 6: Describe and apply the transferable **cross-curricular** knowledge and skills.

GLO 6.1: Apply knowledge and skills from the **language arts**.

SLO 11C.6.1.1 Define terminology associated with SMAW fillet welds. (D3.a.1)

SLO 11C.6.1.2 Interpret information pertaining to SMAW fillet welds found on drawings and specifications. (D3.a.2)

SLO 11C.6.1.3 Define terminology associated with SMAW welding. (D3.1)

GLO 6.2: Demonstrate the **mathematics** skills related to welding.

- SLO 11C.6.2.1 Read, interpret, and communicate welding terminology.
 - SLO 11C.6.2.2 Read, interpret, and communicate information found on welding materials (e.g., filler rods, electrodes, etc.).
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GLO 6.3: Demonstrate knowledge of **other subject areas**.

- SLO 11C.6.3.1 Demonstrate an understanding of the uses of electricity in welding (i.e., conductivity, current, voltage, amperage, polarity, AC versus DC).
 - SLO 11C.6.3.2 Demonstrate an understanding of the states of matter.
 - SLO 11C.6.3.3 Demonstrate an awareness of welding symbols.
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Goal 7: Follow the **ethical** and **legal standards** that pertain to the welding industry.

GLO 7.1: Demonstrate an awareness of the **ethical** and **legal expectations** of welders.

- SLO 11C.7.1.1 Demonstrate an understanding of the legal requirements related to specialized welding, such as the welding of pressure vessels and steering components.
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Goal 8: Demonstrate **employability skills**.

GLO 8.1: Demonstrate **employability skills**.

- SLO 11C.8.1.1 Demonstrate problem-solving skills.
 - SLO 11C.8.1.2 Demonstrate regular attendance and punctuality.
 - SLO 11C.8.1.3 Demonstrate accountability for their actions.
 - SLO 11C.8.1.4 Demonstrate adaptability and effort.
 - SLO 11C.8.1.5 Demonstrate the ability to accept and follow direction and feedback.
 - SLO 11C.8.1.6 Demonstrate teamwork skills.
 - SLO 11C.8.1.7 Demonstrate the ability to stay on task and effectively use time.
 - SLO 11C.8.1.8 Describe effective verbal and non-verbal communication. (A1.a.1)
 - SLO 11C.8.1.9 Demonstrate critical thinking skills.
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Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the welding industry.

GLO 9.1: Describe the impact of **human sustainability** on the health and well-being of welders.

SLO 11C.9.1.1 Demonstrate an awareness of factors related to the sustainability of the welder's working conditions, including working hours, out-of-town travel, and shift work.

GLO 9.2: Describe the welding industry's **sustainability practices** and impact on the environment.

No applicable SLOs.

GLO 9.3: Describe the **sustainable business practices** within the welding industry.

No applicable SLOs.

Goal 10: Demonstrate an understanding of the **structure** and **scope** of welding.

GLO 10.1: Describe the **scope** of welding.

No applicable SLOs.

GLO 10.2: Describe **apprenticeship, post-secondary,** and **employment opportunities.**

SLO 11C.10.2.1 Demonstrate an awareness of career opportunities in SMAW welding.

Goal 11: Demonstrate an understanding of the **evolution, technological progression,** and **emerging trends** in welding.

GLO 11.1: Demonstrate an understanding of the **evolution, technological progression,** and **emerging trends** in welding.

SLO 11C.11.1.1 Demonstrate an awareness of emerging trends in metal fusion.
