



8488

ADVANCED SMAW (ARC)
WELDING PROCESSES AND
PROCEDURES (12B)

40S/40E/40M

A Welding Technology Course

8488 ADVANCED SMAW (ARC) WELDING PROCESSES AND PROCEDURES (12B) 40S/40E/40M

Course Description

This course is intended for students who are intending to pursue a career in welding. The emphasis is on hands-on advanced positional SMAW (ARC) welding procedures.

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

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

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| SLO 12B.1.1.1 | Demonstrate adherence to safe practices and procedures for facilities, processes, tools, and equipment. |
| SLO 12B.1.1.2 | Identify safety and health requirements. (A1.1) <ul style="list-style-type: none">■ overview of the <i>Workplace Safety and Health Act</i><ul style="list-style-type: none">– rights and responsibilities of employees under the <i>Act</i>– rights and responsibilities of employers under the <i>Act</i>– rights and responsibilities of supervisors under the <i>Act</i>■ fourteen (14) regulations■ codes of practice■ guidelines■ 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 <i>Act</i> |
| SLO 12B.1.1.3 | Identify personal protective equipment (PPE) and PPE procedures. (A1.2) <ul style="list-style-type: none">■ 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 12B.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 12B.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 12B.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 12B.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 12B.1.1.8 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 12B.1.1.9 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 12B.1.1.10 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 12B.1.1.11 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 12B.1.1.12 Read, interpret, and communicate safety information (e.g., MSDS, etc.).
- SLO 12B.1.1.13 Safely store and handle compressed gas tanks.
- SLO 12B.1.1.14 Discuss hazards related to compressed gas.
- SLO 12B.1.1.15 Demonstrate the safe use of compressed air.
- SLO 12B.1.1.16 Demonstrate an understanding of and adherence to *Safe Work Procedures Job Hazards Analysis* documents for each piece of equipment that is used.
- SLO 12B.1.1.17 Identify hazards and describe safe work practices pertaining to GMAW welding. (D6.2)
- personal
 - shop/facility
 - fire and explosion
 - equipment
 - ventilation/fumes
 - storage, handling, and transportation
- SLO 12B.1.1.18 Demonstrate an understanding of the worker's responsibility to refuse unsafe work.
- SLO 12B.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 12B.2.1.1 Select appropriate filler materials to suit base metal.

SLO 12B.2.1.2 Demonstrate an awareness of carbon content in different types of steel.

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 12B.3.1.1 Demonstrate the safe and appropriate operation and handling of equipment, tools, materials, products, and consumable items used in advanced SMAW welding processes and procedures.

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

SLO 12B.3.2.1 Practise the cleaning, maintenance, and storage of SMAW equipment, tools, materials, products, and consumable items.

SLO 12B.3.2.2 Demonstrate the appropriate storage of low hydrogen electrodes.

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 12B.4.1.1 Prepare material and equipment for advanced SMAW welding.

GLO 4.2: Demonstrate **ability to weld**.

SLO 12B.4.2.1 Perform fillet welds on low carbon steel in all positions. (D3.a.8)

SLO 12B.4.2.2 Perform 1G welds using SMAW.

SLO 12B.4.2.3 Perform 1G 1F welds using SMAW.

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

SLO 12B.4.3.1 Perform post-welding procedures for advanced SMAW welding.

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

SLO 12B.4.4.1 Inspect and troubleshoot advanced SMAW welds.

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 12B.5.2.1 Cut, prep, and tack the five basic weld joints.

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

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

No applicable SLOs.

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

No applicable SLOs.

GLO 6.3: Demonstrate knowledge of **other subject areas**.

- SLO 12B.6.3.1 Demonstrate an awareness of the use of information and communication technology in creating electronic portfolios and searching for employment.
- SLO 12B.6.3.2 Read, interpret, and communicate 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 12B.7.1.1 Demonstrate an awareness of types of destructive and non-destructive welding inspections.
- SLO 12B.7.1.2 Identify codes and standards pertaining to SMAW welding. (D3.3)
- Canadian Standards Association (CSA)
 - American Society of Mechanical Engineers (ASME)
 - American Welding Society (AWS)
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Goal 8: Demonstrate **employability skills**.

GLO 8.1: Demonstrate **employability skills**.

- SLO 12B.8.1.1 Demonstrate problem-solving skills.
- SLO 12B.8.1.2 Demonstrate critical thinking skills.
- SLO 12B.8.1.3 Demonstrate regular attendance and punctuality.
- SLO 12B.8.1.4 Demonstrate accountability for their actions.
- SLO 12B.8.1.5 Demonstrate adaptability, initiative, and effort.
- SLO 12B.8.1.6 Demonstrate the ability to accept and follow direction and feedback.
- SLO 12B.8.1.7 Demonstrate teamwork skills.
- SLO 12B.8.1.8 Demonstrate the ability to stay on task and effectively use time in class and shop environments.
- SLO 12B.8.1.9 Demonstrate the ability to communicate respectfully and effectively with teachers and students.
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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 12B.9.1.1 Analyze the effect of welding on human long-term health and well-being.

SLO 12B.9.1.2 Demonstrate an awareness of short-term and long-term effects of welding, grinding, and metalwork on hearing, respiratory system, and eye health.

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

SLO 12B.9.2.1 Demonstrate an awareness of the impact of welding work sites on the environment.

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

SLO 12B.9.3.1 Demonstrate an awareness of how the welding industry and welding products can adapt to a changing economy.

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

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

SLO 12B.10.1.1 Demonstrate an awareness of the scope of SMAW (ARC) welding.

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

No applicable SLOs.

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 12B.11.1.1 Demonstrate an awareness of the welding of exotic materials.

SLO 12B.11.1.2 Research new technologies such as virtual welding devices used to teach welding.
