



8487

ADVANCED GMAW (MIG)
WELDING PROCESSES AND
PROCEDURES (12A)

40S/40E/40M

A Welding Technology Course

8487 ADVANCED GMAW (MIG) WELDING PROCESSES AND PROCEDURES (12A) 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 GMAW (MIG) 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 12A.1.1.1 | Demonstrate adherence to safe practices and procedures for facilities, processes, tools, and equipment. |
| SLO 12A.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 12A.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 12A.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 12A.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 12A.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 12A.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 12A.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 12A.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 12A.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 12A.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 12A.1.1.12 Read, interpret, and communicate safety information (e.g., MSDS, etc.).
- SLO 12A.1.1.13 Safely store and handle compressed gas tanks.
- SLO 12A.1.1.14 Discuss hazards related to compressed gas.
- SLO 12A.1.1.15 Demonstrate the safe use of compressed air.
- SLO 12A.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 12A.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 12A.1.1.18 Demonstrate an understanding of the worker's responsibility to refuse unsafe work.
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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 12A.2.1.1 Select appropriate filler materials to suit base metal.

SLO 12A.2.1.2 Demonstrate an understanding of various metals.

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

SLO 12A.3.1.2 Identify GMAW welding equipment, consumables, and accessories, and describe their applications. (D6.a.4)

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

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

SLO 12A.3.2.2 Describe the requirements and describe the procedures to store consumables used for GMAW fillet welds on low carbon steel plate. (D6.a.5)

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 12A.4.1.1 Prepare material and equipment for advanced GMAW welding.

GLO 4.2: Demonstrate ability to weld.

- SLO 12A.4.2.1 Define terminology associated with FCAW welding. (D11.1)
 - SLO 12A.4.2.2 Perform GMAW, FCAW, and MCAW processes.
 - SLO 12A.4.2.3 Perform combined GMAW and FCAW welds on mild steel.
 - SLO 12A.4.2.4 Perform the procedures used to perform fillet and groove welds using the MCAW process. (D11.c.6)
 - SLO 12A.4.2.5 Identify the modes of transfer relating to GMAW welding, and describe their characteristics and applications. (D6.7)
 - SLO 12A.4.2.6 Describe the procedures used to perform fillet welds on low carbon steel plate in all positions using the GMAW process. (D6.a.6)
 - SLO 12A.4.2.7 Perform fillet welds on low carbon steel plate in all positions. (D6.a.8)
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GLO 4.3: Perform post-welding procedures.

- SLO 12A.4.3.1 Perform post-welding procedures for advanced GMAW welding.
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GLO 4.4: Inspect and troubleshoot welding projects.

- SLO 12A.4.4.1 Inspect and troubleshoot advanced GMAW welds.
 - SLO 12A.4.4.2 Describe the procedures used to prevent and correct weld faults. (D6.a.7)
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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.

- SLO 12A.5.1.1 Interpret information pertaining to GMAW fillet welds found on drawings and specifications. (D6.a.2)
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GLO 5.2: Fabricate metal projects.

- SLO 12A.5.2.1 Cut, prep, and tack the five basic weld joints.
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Goal 6: Describe and apply the transferable **cross-curricular** knowledge and skills.

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

SLO 12A.6.1.1 Define terminology associated with GMAW fillet welds. (D6.a.1)

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

SLO 12A.6.2.1 Solve problems involving percentage and ratios. (B3.3)

- ratio problems
 - express two quantities in the form of a ratio
- express two ratios in the form of a proportion
- converting between fractions and percents
 - converting a fraction to a percent
 - converting a percent to a fraction
- converting decimals and percents
 - converting decimals to percents
 - converting a percent to a decimal
- percent problems
 - solving percent problems

SLO 12A.6.2.2 Solve problems involving geometric formulas. (B3.5)

- problems involving geometric formulas
 - key terminology
 - ✓ equation
 - ✓ formula
 - ✓ constant
 - ✓ variable
 - ✓ term
 - ✓ solution
 - order of operations in solving equations
 - solving equations
- 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

- 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
 - 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
 - calculate the weight of a solid
 - calculate the capacity of a container in gallons
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GLO 6.3: Demonstrate knowledge of **other subject areas**.

- SLO 12A.6.3.1 Demonstrate an awareness of the use of information and communication technology in creating electronic portfolios and searching for employment.
 - SLO 12A.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 12A.7.1.1 Demonstrate an understanding of the history of welding certification as it relates to safety in the welding industry.
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Goal 8: Demonstrate employability skills.**GLO 8.1: Demonstrate employability skills.**

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

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 12A.9.1.1 Demonstrate an awareness of the long-term health concerns related to welding different types of materials, such as stainless galvanized steels.
- SLO 12A.9.1.2 Research safety concerns related to different types of filler materials.

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

- SLO 12A.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.

No applicable SLOs.

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

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

SLO 12A.10.1.1 Demonstrate an awareness of the scope of GMAW (MIG) 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 12A.11.1.1 Demonstrate an awareness of PULSE welding.

SLO 12A.11.1.2 Demonstrate an understanding of the use of lasers for cutting and welding.
