



8474
BASIC GMAW (MIG)
PROCEDURES (11B)

30S/30E/30M

A Welding Technology Course

8474 BASIC GMAW (MIG) PROCEDURES (11B) 30S/30E/30M

Course Description

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

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

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

- SLO 11B.1.1.1 Demonstrate adherence to safe practices and procedures for facilities, processes, tools, and equipment.
- SLO 11B.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 11B.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 11B.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 11B.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 11B.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 11B.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 11B.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 11B.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 11B.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 11B.1.1.11 Read, interpret, and communicate safety information (e.g., MSDS sheets, etc.).
- SLO 11B.1.1.12 Safely store and handle compressed gas tanks.
- SLO 11B.1.1.13 Demonstrate an awareness of hazards related to compressed gas.
- SLO 11B.1.1.14 Demonstrate the safe use of compressed air.
- SLO 11B.1.1.15 Demonstrate an understanding of and adherence to *Safe Work Procedures/Job Hazards Analysis* documents for each piece of equipment used.
- SLO 11B.1.1.16 Demonstrate the safe use of a plasma arc cutter.

- SLO 11B.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 11B.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 11B.1.1.19 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
-

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 11B.2.1.1 Demonstrate an understanding of metallurgy as it applies to basic GMAW welding.
- SLO 11B.2.1.2 Select appropriate filler materials 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 11B.3.1.1 Demonstrate the operation and handling of equipment, tools, materials, products, and consumable items.
- SLO 11B.3.1.2 Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW fillet welds in all positions. (D6.3)
- Canadian Standards Association (CSA)
 - American Society of Mechanical Engineers (ASME)
 - American Welding Society (AWS)
 - welding position
 - joint type and design
- SLO 11B.3.1.3 Identify GMAW equipment maintenance and troubleshooting.
- SLO 11B.3.1.4 Set up and operate GMAW equipment.
-

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

- SLO 11B.3.2.1 Practise the appropriate cleaning, maintenance, and storage of GMAW equipment, tools, materials, products, and consumable items.
-

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 11B.4.1.1 Identify GMAW welding processes, and describe their characteristics and applications. (D1.5.b)

- gas metal arc welding (GMAW)

SLO 11B.4.1.2 Prepare material for basic GMAW procedures.

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

SLO 11B.4.2.1 Define terminology associated with FCAW welding. (D11.1)

SLO 11B.4.2.2 Perform GMAW welds on mild steel.

SLO 11B.4.2.3 Perform FCAW welds on mild steel.

SLO 11B.4.2.4 Perform combined GMAW and FCAW welds on mild steel.

SLO 11B.4.2.5 Perform MCAW welds on mild steel.

SLO 11B.4.2.6 Identify GMAW welding equipment, consumables, and accessories, and describe their applications. (D6.4)

SLO 11B.4.2.7 Describe the procedures used to assemble and disassemble GMAW welding equipment. (D6.5)

SLO 11B.4.2.8 Describe the procedures used to establish and maintain an arc using GMAW welding equipment. (D6.6)

SLO 11B.4.2.9 Describe the procedures and techniques used to deposit a weld bead using GMAW welding equipment. (D6.8)

- electrode extension
 - travel speed
 - work and travel angles
 - flow rates
 - an arc
-

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

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

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

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

SLO 11B.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**.

No applicable SLOs.

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

- SLO 11B.6.2.1 Solve problems involving fractions. (B3.1)
- key terms and concepts used in working with fractions
 - terminology
 - fractions to a common denominator.
 - finding the common denominator
 - problems using whole numbers and fractions
 - 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
 - ✓ subtraction of fractions with common denominators
 - ✓ subtraction of fractions without common denominators
 - ✓ subtraction of mixed numbers without common denominators
- problems using whole numbers and fractions in practical applications
 - practical applications using whole numbers and fractions
 - ✓ holes and spaces
 - scientific calculators

SLO 11B.6.2.2 Solve problems involving decimals. (B3.2)

- decimal fractions
 - knowledge of reading and writing decimals
 - ✓ expression of decimals in words
 - ✓ conversion of decimals in word format to a written decimal
- rounding decimal fractions to specified place values
 - rounding decimal fractions
- converting decimals to fractions
- converting fractions to decimals
 - converting mixed numbers to equivalent decimal fractions
- adding and subtracting decimals
- multiplying and dividing decimal fractions
- converting decimal inches to fractions with a practical denominator
- converging decimal feet to feet and inches with a practical denominator

- SLO 11B.6.2.3 Solve problems involving metric and imperial measure. (B3.4)
- commonly used metric units of measurement
 - length
 - area
 - volume and capacity
 - mass and weight
 - 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
 - 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
- SLO 11B.6.2.4 Read, interpret, and communicate welding terminology.
- SLO 11B.6.2.5 Read, interpret, and communicate information found on welding materials (e.g., filler rods, electrodes, etc.).
-

GLO 6.3: Demonstrate knowledge of other subject areas.

- SLO 11B.6.3.1 Demonstrate an understanding of the uses of electricity in welding (i.e., conductivity, current, voltage, amperage, polarity, AC versus DC).
- SLO 11B.6.3.2 Demonstrate an understanding of the states of matter.
- SLO 11B.6.3.3 Demonstrate an awareness of welding symbols.
-

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 11B.7.1.1 Demonstrate an understanding of the relationship between ethics and employability skills such as creating a respectful workplace and demonstrating a strong work ethic.

Goal 8: Demonstrate **employability skills**.

GLO 8.1: Demonstrate **employability skills**.

SLO 11B.8.1.1 Demonstrate problem-solving skills.

SLO 11B.8.1.2 Demonstrate regular attendance and punctuality.

SLO 11B.8.1.3 Demonstrate accountability for their actions.

SLO 11B.8.1.4 Demonstrate adaptability and effort.

SLO 11B.8.1.5 Demonstrate the ability to accept and follow direction and feedback.

SLO 11B.8.1.6 Demonstrate teamwork skills.

SLO 11B.8.1.7 Demonstrate the ability to stay on task and effectively use time.

SLO 11B.8.1.8 Describe effective verbal and non-verbal communication. (A1.a.1)

SLO 11B.8.1.9 Demonstrate critical thinking skills.

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 11B.9.1.1 Identify sustainability factors that influence human health and well-being for welders.

SLO 11B.9.1.2 Demonstrate an understanding of sustainability factors in the welding industry that affect human health and well-being.

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

SLO 11B.9.2.1 Demonstrate an understanding of the appropriate reuse of materials in welding.

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

SLO 11B.9.3.1 Demonstrate an awareness of the importance of working conditions on employee retention.

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 11B.10.2.1 Demonstrate an awareness of career opportunities in GMAW welding.

SLO 11B.10.2.2 Demonstrate an awareness of career opportunities in robotic GMAW 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 11B.11.1.1 Research the use of robotics in GMAW welding.
