



8503

APPLIED SPECIALTIES AND  
QUALIFICATIONS (12D)

40S/40E/40M

A Welding Technology Course



# 8503 APPLIED SPECIALTIES AND QUALIFICATIONS (12D) 40S/40E/40M

## Course Description

This course is intended for students who are intending to pursue a career in welding. The emphasis is on preparing for and performing the Manitoba Welder Practical Examination Structural Level 1 (Canadian Welding Bureau). Students are also introduced to hoisting, lifting, and rigging, as well as to access equipment.

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

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

- SLO 12D.1.1.1 Demonstrate adherence to safe practices and procedures for facilities, processes, tools, and equipment.
- SLO 12D.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 12D.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 12D.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 12D.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 12D.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 12D.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 12D.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 12D.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 12D.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 12D.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 12D.1.1.12 Read, interpret, and communicate safety information (e.g., MSDS, etc.).
- SLO 12D.1.1.13 Safely store and handle compressed gas tanks.
- SLO 12D.1.1.14 Discuss hazards related to compressed gas.
- SLO 12D.1.1.15 Demonstrate the safe use of compressed air.
- SLO 12D.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 12D.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 12D.1.1.18 Demonstrate an understanding of the worker's responsibility to refuse unsafe work.
- SLO 12D.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

- SLO 12D.1.1.20 Identify hazards and describe safe work practices pertaining to FCAW welding. (D11.2)
- personal
  - shop/facility
  - fire and explosion
  - equipment
  - ventilation/fumes
  - storage, handling, and transportation
- SLO 12D.1.1.21 Identify hazards and describe safe work practices pertaining to MCAW welding. (D11.b.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 12D.2.1.1 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 12D.3.1.1 Demonstrate the safe and appropriate operation and handling of equipment, tools, materials, products, and consumable items used in advanced specialties and qualifications.
- SLO 12D.3.1.2 Identify FCAW welding equipment, consumables, and accessories, and describe their applications. (D11.4)
- SLO 12D.3.1.3 Identify MCAW welding equipment, consumables, and accessories, and describe their applications. (D11.b.4)

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

- SLO 12D.3.2.1 Practise the cleaning, maintenance, and storage of equipment, tools, materials, products, and consumable items used in applied specialties and qualifications.
  - SLO 12D.3.2.2 Describe the procedures used to inspect, maintain, and troubleshoot FCAW welding equipment. (D11.7)
  - SLO 12D.3.2.3 Identify the requirements and describe the procedures to store consumables used for FCAW welding of plate. (D11.a.4)
  - SLO 12D.3.2.4 Describe the procedures used to assemble and disassemble MCAW welding equipment. (D11.b.5)
  - SLO 12D.3.2.5 Describe the procedures used to inspect, maintain, and troubleshoot MCAW welding equipment. (D11.b.7)
  - SLO 12D.3.2.6 Identify requirements and describe the procedures to store consumables used for MCAW welding. (D11.c.4)
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**GLO 3.3:** Demonstrate an awareness of **hoisting, lifting, and rigging** procedures.

- SLO 12D.3.3.1 Define terminology associated with hoisting, lifting, and rigging. (A3.b.1)
- SLO 12D.3.3.2 Identify hazards and describe safe work practices pertaining to hoisting, lifting, and rigging. (A3.b.2)
- SLO 12D.3.3.3 Identify regulations pertaining to hoisting, lifting, and rigging. (A3.b.3)
- SLO 12D.3.3.4 Identify types of rigging equipment and accessories, and describe their limitations, applications, and procedures for use. (A3.b.4)
- SLO 12D.3.3.5 Identify types of hoisting and lifting equipment and accessories, and describe their applications and procedures for use. (A3.b.5)
  - jacks
  - hoists
  - cranes
    - overhead travelling cranes (OTC)
    - gantry
- SLO 12D.3.3.6 Describe the procedures used to inspect, maintain, and store hoisting, lifting, and rigging equipment. (A3.b.6)
- SLO 12D.3.3.7 Describe the procedures used to rig material/equipment for lifting. (A3.b.7)

- SLO 12D.3.3.8 Describe the procedures used to attach and use tag lines. (A3.b.8)
- SLO 12D.3.3.9 Describe the procedures used to ensure the work area is safe for lifting. (A3.b.9)
- supervision of lift
  - securing work area
  - communication
- SLO 12D.3.3.10 Identify and describe the procedures used to communicate during hoisting, lifting, and rigging operations. (A3.b.10)
- hand signals
  - electronic communications
  - audible and visual warnings
- SLO 12D.3.3.11 Identify the factors to consider when selecting rigging equipment. (A3.b.11)
- load characteristics
  - sling angle
  - environment
    - chemical hazards
    - grounding requirements
    - weather conditions
  - working load limit
- SLO 12D.3.3.12 Describe the procedures used to perform a lift. (A3.b.12)
- pre-lift checks
  - lifting load
  - placement of load
  - post-lift inspection
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**GLO 3.4:** Demonstrate an awareness of **access equipment**.

- SLO 12D.3.4.1 Define terminology associated with access equipment. (A3.c.1)
- SLO 12D.3.4.2 Identify hazards and describe safe work practices pertaining to access equipment. (A3.c.2)
- SLO 12D.3.4.3 Identify regulations pertaining to access equipment. (A3.c.3)

- SLO 12D.3.4.4 Identify types of access equipment, and describe their characteristics and applications. (A3.c.4)
- scaffolding
  - ladders
  - man lifts
  - elevated work platforms
- SLO 12D.3.4.5 Identify types of fall protection and fall arrest equipment.
- SLO 12D.3.4.6 Erect and dismantle access equipment. (A3.c.5)
- SLO 12D.3.4.7 Describe the procedures used to erect and dismantle access equipment. (A3.c.6)
- SLO 12D.3.4.8 Describe the procedures used to inspect and maintain access equipment. (A3.c.7)

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

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

- SLO 12D.4.1.1 Prepare material for the Manitoba Welder Practical Examination Structural Level.
- SLO 12D.4.1.2 Describe the procedures used to assemble and disassemble FCAW welding equipment. (D11.5)
- SLO 12D.4.1.3 Identify the considerations when selecting consumables and determining equipment set-up for performing FCAW fillet and groove welds on plate. (D11.a.3)
- specification requirements
  - base metal
    - composition
    - thickness
  - shielding gas selection
  - power source
  - welding position
  - joint type and design
- SLO 12D.4.1.4 Describe the procedures used to prepare plate for FCAW fillet and groove welds. (D11.a.5)

- SLO 12D.4.1.5 Identify the considerations when selecting consumables and determining equipment set-up for performing MCAW fillet and groove welds. (D11.c.3)
- specification requirements
  - base metal
    - composition
    - thickness
  - shielding gas selection
  - power source
  - welding position
  - joint type and design
- SLO 12D.4.1.6 Describe the procedures used to prepare base metals and joints for MCAW fillet and groove welds. (D11.c.5)
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**GLO 4.2: Demonstrate *ability to weld*.**

- SLO 12D.4.2.1 Identify GTAW, stud welding, resistance welding, and SAW welding processes, and describe their characteristics and applications. (D1.5.e, f, g, & h)
- gas tungsten arc welding (GTAW)
  - stud welding
  - resistance welding (RW)
  - submerged arc welding (SAW)
- SLO 12D.4.2.2 Describe the procedures and techniques used to deposit a weld bead using FCAW welding equipment. (D11.6)
- electrode extension
  - travel speed
  - work and travel angles
  - flow rates
  - an arc
- SLO 12D.4.2.3 Describe the procedures used to perform fillet and groove welds on plate using the FCAW process. (D11.a.6)
- temperature measuring devices
  - pre-heating
  - interpass temperature
  - post-heating
  - performs welds on plate

- SLO 12D.4.2.4 Describe the procedures and techniques used to weld bead using MCAW equipment. (D11.b.6)
- electrode extension
  - travel speed
  - work and travel angles
  - flow rates
  - an arc
- SLO 12D.4.2.5 Perform the procedures used to perform fillet and groove welds using the MCAW process. (D11.c.6)
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**GLO 4.3:** Perform **post-welding** procedures.

- SLO 12D.4.3.1 Perform post-welding procedures for the Manitoba Welder Practical Examination Structural Level.
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**GLO 4.4:** **Inspect** and **troubleshoot** welding projects.

- SLO 12D.4.4.1 Inspect and troubleshoot Manitoba Welder Practical Examination Structural Level welds.
- SLO 12D.4.4.2 Describe the procedures used to prevent and correct weld faults. (D11.c.7)
- SLO 12D.4.4.3 Perform the procedures used to gouge using oxy-fuel equipment. (C3.10)
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**GLO 4.5:** Perform the **Manitoba Welder Practical Examinations**.

- SLO 12D.4.5.1 Identify welding test positions and describe their characteristics and restrictions. (D1.10)
- SLO 12D.4.5.2 Perform the Oxy/Acetylene Cutting Practical Examination. (E1A)
- SLO 12D.4.5.3 Successfully complete the Flat GMAW Practical 1F Examination. (E1B)
- SLO 12D.4.5.4 Successfully complete the Flat MCAW Practical 1F Examination. (E1C)
- SLO 12D.4.5.5 Successfully complete the Flat SMAW Practical 1F Examination. (E1D)
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**Goal 5:** Demonstrate an understanding of **metal design and fabrication**.

**GLO 5.1:** Design metal projects.

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| SLO 12D.5.1.1 | Interpret information pertaining to FCAW fillet and groove welds found on drawings and specifications. (D11.a.2)     |
| SLO 12D.5.1.2 | Interpret information pertaining to the MCAW fillet and groove welds found on drawings and specifications. (D11.c.2) |
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**GLO 5.2:** Fabricate metal projects.

No applicable SLOs.

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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**.

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| SLO 12D.6.1.1 | Define terminology associated with FCAW welding. (D11.1)                   |
| SLO 12D.6.1.2 | Define terminology associated with FCAW fillet and groove welds. (D11.a.1) |
| SLO 12D.6.1.3 | Define terminology associated with MCAW welding. (D11.b.1)                 |
| SLO 12D.6.1.4 | Define terminology associated with MCAW fillet and groove welds. (D11.c.1) |
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**GLO 6.2:** Demonstrate the **mathematics** skills related to welding.

No applicable SLOs.

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

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| SLO 12D.6.3.1 | Demonstrate an awareness of the use of information and communication technology in creating electronic portfolios and searching for employment. |
| SLO 12D.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 12D.7.1.1 Demonstrate an awareness of various types of welding certification.
- SLO 12D.7.1.2 Identify codes and standards pertaining to FCAW welding. (D11.3)
- Canadian Standards Association (CSA)
  - American Society of Mechanical Engineers (ASME)
  - American Welding Society (AWS)
- SLO 12D.7.1.3 Identify codes and standards pertaining to MCAW welding. (D11.b.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 12D.8.1.1 Demonstrate problem-solving skills.
- SLO 12D.8.1.2 Demonstrate critical thinking skills.
- SLO 12D.8.1.3 Demonstrate regular attendance and punctuality.
- SLO 12D.8.1.4 Demonstrate accountability for their actions.
- SLO 12D.8.1.5 Demonstrate adaptability, initiative, and effort.
- SLO 12D.8.1.6 Demonstrate the ability to accept and follow direction and feedback.
- SLO 12D.8.1.7 Demonstrate teamwork skills.
- SLO 12D.8.1.8 Demonstrate the ability to stay on task and effectively use time in class and shop environments.
- SLO 12D.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.

No applicable SLOs.

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

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

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

No applicable SLOs.

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

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

No applicable SLOs.

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

SLO 12D.10.2.1 Describe the Manitoba Welder Apprenticeship Program. (A2.2)

- concept and significance of skills stewardship
  - to the trade
  - to apprentices
  - to journeypersons
  - to employers
  - to the community
- 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)
- technical training (offsite)
- attendance requirements
- progression requirements
- reporting of grades
- trade regulation and its significance

- policies (e.g., re: personal conduct, “missed” units, fees, harassment, etc.)
    - Apprenticeship Manitoba
    - training provider(s)
- SLO 12D.10.2.2 Explain special challenges and opportunities regarding apprenticeship training. (A2.3)
- adapting personal learning goals to program contexts
    - characteristics and ‘domains’ (types) of adult learning
    - description/recognition of learning and teaching styles
    - work culture (including 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
  - 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
  - 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 regarding supplementals, re-tests, make-up assignments, etc.
- SLO 12D.10.2.3 Demonstrate an awareness of accommodation for apprentices with disabilities. (A2.4)
- technical training.
    - requirements.
    - roles and responsibilities.
    - services and information required by persons with disabilities.
  - on-the-job.
    - requirements.
    - roles and responsibilities.
    - services and information required by persons with disabilities.
- SLO 12D.10.2.4 Demonstrate an awareness of the advantages of certification for welders.
- SLO 12D.10.2.5 Demonstrate the skills required to obtain employment as a welder or in a related occupation.

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**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.

No applicable SLOs.

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