

WE118
Wire Process Theory

3 Credits

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WE118 Version: 3



Wire Process Theory

Calendar Description

This course follows the Alberta Apprenticeship and Industry Training Welder Curriculum. Students are introduced to the principles and practices of Gas Metal Arc Welding, Flux Core Arc Welding, Metal Core Arc Welding and Submerged Arc Welding; proper equipment set-up, and safety of each process are taught. Students will also learn about the uses of various filler metals and shielding gasses.

Rationale

This is a required course for Pre-employment Welding students. Pre-employment programs provide students with an opportunity to obtain both practical and theoretical experience in a trade and thus an avenue of entry into the workforce.

Prerequisites

None

Co-Requisites

MA116, SA120, WE115, WE117, WE119, and WE135

Course Learning Outcomes

Upon successful completion of this course, students will be able to

- A. **Select wire feed welding equipment.**
 1. Describe the principles of operation of wire feed welding equipment.
 2. Identify the components of a wire feed welding equipment set-up.
 3. Describe wire process welding equipment power sources and wire feeders.
 4. Identify advantages and disadvantages of wire feed processes.
- B. **Select wire feed welding consumables.**
 1. Identify wire feed welding equipment filler metals.
 2. Describe the modes of metal transfer.
 3. Describe wire feed drive systems and gun and cable accessories.
 4. Describe wire feed operating variables.

- C. **Select shielding gases for the wire feed process.**
 - 1. Identify shielding gases for wire feed processes.
 - 2. Identify shielding gas supply systems.
- D. **Set up, maintain and troubleshoot wire welding equipment.**
 - 1. Demonstrate the set-up and maintenance required for wire drive systems and gun assemblies.
 - 2. Perform corrective measures for malfunctioning wire process equipment.
- E. **Perform fillet and groove welds on mild steel.**
 - 1. Weld stringer and weave beads in the flat and horizontal positions.
 - 2. Weld in the 1F, 2F and 3F positions.
 - 3. Weld in the 1G, 2G, 3G and 4G positions.
 - 4. Weld a 1GR.
 - 5. Use CWB test procedures.
 - 6. Weld the 1GF, 2G, 3GF and 4GF joint configurations with a 1/4" backing plate.
 - 7. Weld on structural shapes.
- F. **Perform FCAW and MCAW operations in multiple positions.**
 - 1. Weld stringer and weave beads in the flat and horizontal positions on mild steel plate.
 - 2. Weld in the 1F, 2F and 3F positions using the FCAW process.
 - 3. Weld using the MCAW process.
 - 4. Use CWB testing procedures.
 - 5. Weld in the 1GF, 2G, 3GF and 4GF joint configurations using the FCAW process with a 1/4" backing plate.
 - 6. Weld on structural shapes.
- G. **Perform GMAW, FCAW and MCAW welds on mild steel.**
 - 1. Weld butt joints in the 1G, 2G and 3G positions on mild steel using GMAW for the root bead and FCAW or MCAW fill and cap.
 - 2. Weld with MCAW on various joint configurations.
- H. **Explain aluminum properties and principles.**
 - 1. Explain the physical and chemical properties of aluminum and steel.
 - 2. Explain how physical and chemical properties affect the welding of aluminum.
 - 3. Explain the Aluminum Association numerical designation for casting alloys and wrought aluminum.
 - 4. Explain the effects of welding on heat treatable and non-heat treatable alloys.
 - 5. Weld aluminum and its alloys.
 - 6. List the filler metals used for welding aluminum with GMAW.
- I. **Perform welds on aluminum.**
 - 1. Weld stringer/weave beads in the flat and horizontal positions on 3.2 mm (1/8") or greater aluminum material.
 - 2. Weld in the 1F, 2F, and 3F on 3.2 mm (1/8") or greater aluminum material.
- J. **Perform GMAW, FCAW and MCAW on mild steel pipe.**
 - 1. Weld in the 2G position on pipe using GMAW.
 - 2. Weld in the 1G-rotated position on pipe using a GMAW root pass and FCAW or MCAW fill and cap.
 - 3. Weld in the 2G position on pipe using GMAW root pass and FCAW fill and cap.

4. Weld with GMAW in the 5G position on pipe root pass downhill, fill and cap uphill.
- K. Describe the components and operation of the SAW process.**
1. Describe the principles of operation of SAW.
 2. Identify the components of a SAW set-up.
 3. Describe SAW power sources, wire feeders, flux feed systems, welding head assemblies and control systems.
 4. Describe SAW operating variables.
 5. Identify SAW filler metals and fluxes.
 6. Describe SAW equipment maintenance and troubleshooting.
 7. Identify advantages and disadvantages of SAW.

Resource Materials

Modules for First Period Welder program from Alberta Learning, Apprenticeship and Industry Training Division.

120103A, 120103B, 120103C, 120103D, 120103E, 120103F, 120103G, 120103H, 120103I, 120103J and 120103K

Conduct of Course

Welding Technology consists of 50 hours of interactive learning within specific modules, utilizing power point presentations, smart board technology; as well as numerous props that are used to support the literature discussed. Specific objectives are stated in each class and information resulting from the lectures is introduced and further enhanced while performing practical shop assignments. Students are given the opportunity to complete a variety of exercises and evaluations to assist in learning. The instructor is available for individual and/or group help during class and scheduled office hours.

Lakeland College is committed to the highest academic standards. Students are expected to be familiar with Lakeland College lab policies and to maintain respect for shop equipment and environment and to abide by these policies. Violations of these policies are considered to be serious and may result in suspension or expulsion from the College.

Evaluation Procedures

Students are expected to complete multiple choice exams after the completion of each module lectured. At the conclusion of this section, a final evaluation will be issued and consist of 50% of the final mark for Welding Technology. Students are required to have a 65% passing grade at the end of the 4th week of attendance to continue on in the program. At the conclusion of the course, a minimum of 65% average is required to write the 1st period Apprenticeship & Industry Training exam.

Module Exams	50%
Final Exam	50%

Grade Equivalents and Course Pass Requirements

A minimum grade of C+ is required to pass this course.

Letter	F	C+	B-	B	B+	A-	A	A+
Percent Range	0-64	65-69	70-74	75-79	80-84	85-89	90-94	95-100
Points	0.00	2.30	2.70	3.00	3.30	3.70	4.00	4.0

Attendance

Regular attendance is essential for success in any course. Absence for any reason does not relieve a student of the responsibility of completing course work and assignments to the satisfaction of the instructor. Poor attendance may result in the termination of a student from a course. The instructor will recommend that any student who does not meet the established attendance requirements to withdraw from the course. In cases of repeated absences due to illness, the student may be requested to submit a medical certificate. Students that miss a total of 27 hours within the duration of the pre-employment program, will be scheduled to appear before the college chair to review their status, at which time dismissal from the program may be an option. Instructors have the authority to require attendance at classes.

Course Units/Topics

Section III

1. Module - 120103a - Wire feed welding equipment power sources
2. Module - 120103b - Wire feed welding filler metals and feeders
3. Module – 120103c - Wire feed welding shielding gas
4. Module – 120103d - Wire welding maintenance and troubleshooting
5. Module – 120103e - GMAW on mild steel
6. Module – 120103f - FCAW and MCAW on mild steel
7. Module – 120103g - GMAW, FCAW and MCAW groove welds on mild steel
8. Module – 120103h - Aluminum and aluminum welding
9. Module – 120103i - GMAW on aluminum
10. Module – 120103j - GMAW, FCAW and MCAW on mild steel pipe
11. Module – 102103k - Submerged Arc Welding



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