

Grade 12B Advanced SMAW (ARC) Procedures (40S)

Course Code: 8488

Credit: 1.0 Credit

Program: Senior Years Technology Education Program (SYTEP)

School: Swan Valley Regional Secondary School

Program Cluster: Welding Technology

Course Length: Approximately 110 instructional hours (one semester)

Instructor: Mr. Jeremy Hicks

Course Description

Advanced SMAW (ARC) Procedures (40S) builds on foundational shielded metal arc welding through positional, multi-pass, open-root, inspection, and testing activities.

Students refine electrode selection, amperage, polarity, joint preparation, and arc control while completing vertical and overhead fillet welds followed by open-root groove-weld procedures. Practical testing develops the consistency, self-assessment, problem solving, and workmanship expected in apprenticeship and industry settings.

Instruction reflects the updated Manitoba curriculum and Apprenticeship Manitoba Level 1 outcomes for weld processes, quality inspection, and shielded metal arc welding.

Course Goals

Upon successful completion of this course, students will:

- Consistently apply advanced SMAW safety, equipment-inspection, ventilation, and housekeeping practices.
- Select electrodes, polarity, and amperage for assigned materials, joints, positions, and passes.
- Prepare, fit, tack, and assemble joints to specified root openings, landings, and alignment tolerances.
- Produce sound vertical-position fillet welds using appropriate progression and manipulation.
- Produce sound overhead-position fillet welds using controlled arc length and bead placement.
- Complete open-root groove welds using E6010/E6011 root procedures and E7018 fill and cap passes.
- Apply interpass cleaning, sequencing, heat control, and repair procedures.

- Inspect welds and demonstrate quality through visual inspection and destructive bend testing.

Course Content

Advanced SMAW Safety and Equipment Inspection (6 Hours)

Students review electrical, fume, arc-radiation, fire, hot-metal, slag, grinding, and positional-welding hazards. Independent equipment inspection, cable management, ventilation, PPE, and safe body position are emphasized.

Electrode Selection, Polarity and Parameters (8 Hours)

Students compare electrodes and coverings, interpret classifications, select current and polarity, establish amperage ranges, manage low-hydrogen electrodes, and relate settings and technique to penetration and bead shape.

Joint Preparation, Fit-Up and Welding Sequence (10 Hours)

Students prepare bevels, root faces and root openings; align and tack coupons; use backing where assigned; plan bead sequences; and apply distortion-control and interpass-cleaning procedures.

Vertical-Position Fillet Welds (18 Hours)

Students complete vertical-up fillet welds using appropriate electrode angles, manipulation, travel speed, arc length, heat control, restarts, cleaning, and multi-pass bead placement.

Overhead-Position Fillet Welds (18 Hours)

Students complete overhead fillet welds while controlling the puddle, arc length, work and travel angles, bead size, slag, undercut, overlap, and safe working position.

Open-Root Groove Welds (24 Hours)

Students prepare and weld open-root groove joints using E6010 or E6011 for the root and E7018 for fill and cap passes. Emphasis is placed on root penetration, keyhole control, hot-pass cleaning, sidewall fusion, cap profile, and restart quality.

Weld Quality, Discontinuities and Repair (8 Hours)

Students inspect root, fill, and cap quality; identify discontinuities; determine likely causes; remove defects using approved methods; and complete controlled repairs while maintaining joint integrity.

Bend Testing and Practical Qualification (12 Hours)

Students prepare test coupons, remove reinforcement as directed, produce bend specimens, complete guided bend tests where equipment permits, interpret results, and document strengths and areas for improvement.

Fabrication Proficiency and Final Assessment (6 Hours)

Students apply advanced SMAW skills in an assigned joint assembly, mock qualification, or small fabrication task and demonstrate consistent setup, welding, inspection, and workplace professionalism.

Assessment

Student achievement will be evaluated using the following categories:

- **Classwork:** 20%
- **Practical Skill Demonstrations:** 30%
- **Tests and Quizzes:** 30%
- **Projects:** 20%

Assessment emphasizes both theoretical knowledge and practical skill development. Students are expected to demonstrate safe work habits, active participation, improving technical skill, and quality workmanship throughout the course.

Required Personal Protective Equipment

Students are required to wear appropriate PPE during all shop activities. If a student does not have the following PPE, it will be provided to them.

- CSA-approved steel-toe boots or toe caps
- Safety glasses
- Hearing protection
- Welding gloves
- Appropriate protective clothing and welding helmet as required

Students who do not wear the required PPE may not be permitted to participate in shop activities.

Student Expectations

Students are expected to:

- Attend class regularly and arrive on time.
- Follow all shop safety rules, safe work procedures, and teacher instructions.
- Wear required PPE before entering the shop.
- Respect classmates, instructors, equipment, materials, and facilities.
- Maintain a clean and organized work area.
- Participate fully in classroom and shop activities.
- Demonstrate responsibility, teamwork, communication, and professionalism.
- Complete assignments, weld samples, tests, and projects to the best of their ability.

Unsafe behavior may result in removal from shop activities until safety expectations have been met.

Cell Phone Policy

To maintain a safe and focused learning environment, students are required to place their cell phones in the classroom phone lockbox at the beginning of each class. Phones will remain securely stored for the duration of the class and will be returned at the end of the class period.

Students do not require personal cell phones during Welding Technology. School-issued laptops and classroom resources will be provided for online learning, research, quizzes, drawings, documentation, or other educational tasks.

This policy minimizes distractions, promotes engagement, and supports a safe working environment in the welding shop.

Curriculum Alignment

This course addresses learning outcomes from the updated Manitoba Grade 12B Advanced SMAW (ARC) Procedures curriculum and is aligned with selected Apprenticeship Manitoba Level 1 technical-training outcomes.

Primary Apprenticeship Manitoba units addressed include:

- A8 Weld Process and Quality Inspection I
- A11 Shielded Metal Arc Welding I

Supporting outcomes related to trade safety, career education, trade communication, trade mathematics, tools and equipment, materials and consumables, and workplace professionalism are integrated throughout the course.