Welding 801D
Flux Cored Arc Welding (FCAW)
Welding Technology
Flux Cored Arc Welding (FCAW) (WEL801D)

Course Description
Flux cored arc welding is recognized as a high-production process for welded fabrication projects. During this course students will learn to select and safely use the correct FCAW equipment, shielding gases, and filler metals; perform FCAW welds in all positions, and combine the GMAW and FCAW welding processes.

Classroom Component—Suggested time: 9 hours
This component of the curriculum is required to teach the knowledge and skills associated with the learning outcomes of the curriculum.

Skill Development Component—Suggested time: 101 hours
This component of the curriculum is required by the student to apply the knowledge and develop the skills related to the learning outcomes of the curriculum.

<table>
<thead>
<tr>
<th>SCO - Identifies the Specific Curriculum Outcome (SCO)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Column 1</strong></td>
</tr>
<tr>
<td><strong>SCO - Delineations</strong></td>
</tr>
<tr>
<td>Describes what the students are expected to know, be able to do, and value in order to achieve the SCO. The teacher is responsible for the planning and facilitation of learning as well as the assessment of each SCO - Delineation.</td>
</tr>
<tr>
<td><strong>Column 2</strong></td>
</tr>
<tr>
<td><strong>Student Knowledge, Abilities and Competencies</strong></td>
</tr>
<tr>
<td>Provides clarity to the SCO by describing the knowledge, abilities, and competencies that the students develop. This column is designed to indicate the depth and breadth of the SCO. It is not necessary to use all of these suggestions or that all of the students be engaged in the same learning activity.</td>
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<tr>
<td><strong>Column 3</strong></td>
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<tr>
<td><strong>Teacher Lessons / Demonstrations</strong></td>
</tr>
<tr>
<td>Provides suggestions for developing and delivering the content for student learning.</td>
</tr>
<tr>
<td><strong>Column 4</strong></td>
</tr>
<tr>
<td><strong>Resources</strong></td>
</tr>
<tr>
<td>Lists a variety of resources that support the teaching and learning related to the SCO. These resources are suggested to support the teacher in developing an effective instructional package for delivery to the students.</td>
</tr>
</tbody>
</table>
Module 1: Flux Cored Arc Welding (FCAW) (~4 hours Classroom Component)

24. Students will be able to select and use FCAW equipment and consumables.

Students will be expected to
24.1 describe the principles of operation of FCAW
24.2 identify the components of a basic FCAW set-up
24.3 describe FCAW power sources, wire feeders, and gun and cable assemblies
24.4 describe FCAW operating variables
24.5 identify shielding gases for FCAW
24.6 describe FCAW filler metals
24.7 describe FCAW equipment maintenance and troubleshooting
24.8 identify advantages and disadvantages of FCAW

Module 2: Shop/Lab Practices: FCAW Welds on Mild Steel (~14 hours Skill Development Component)

25. Students will be able to: Perform surface welds in the flat and horizontal positions and perform 1F, 2F, 3F, 1G, 2G, and 3G position welds on mild steel.

Students will be expected to
25.1 demonstrate the ability to weld stringer/weave beads in the flat and horizontal positions on mild steel plate
25.2 demonstrate the ability to weld 1F welds on mild steel plate
25.3 demonstrate the ability to weld fillet welds in the horizontal (2F) position on mild steel plate
25.4 demonstrate the ability to weld fillet welds in the vertical (3F) position on mild steel plate
25.5 prepare and fit up butt joints with backing
25.6 demonstrate the ability to weld butt joints in the 1G position
25.7 demonstrate the ability to weld butt joints in the 2G position
25.8 demonstrate the ability to weld butt joints in the 3G position
Module 3: Shop/Lab Practices: Combined GMAW and FCAW Welds on Mild Steel (~5 of 101 hours Skill Development Component)

26. Students will be able to perform 1G, 2G, and 3G position welds on mild steel.

Students will be expected to
26.1 demonstrate the ability to weld butt joints in the 1G position on mild steel using GMAW for the root bead and FCAW fill and cap
26.2 demonstrate the ability to weld butt joints in the 2G position on mild steel using GMAW for the root bead and FCAW fill and cap
26.3 demonstrate the ability to weld butt joints in the 3G position on mild steel using GMAW for the root bead and FCAW fill and cap

Module 4: Metric and Imperial Measurement (~5 hours Classroom Component)

27. Students will be able to solve problems involving metric and imperial measures.

Students will be expected to
27.1 identify commonly used metric units of measurement
27.2 convert between units of measurement
27.3 convert imperial feet to inches, square inches to square feet, and cubic measures to gallons
**Flux Cored Arc Welding (FCAW)**

(≈4 hours Classroom Component)

**Introduction**

FCAW is a welding process which has high weld metal deposition rates and is used as a high-production process for welded fabrication projects. Prior to performing a weld, an apprentice is required to select the specified welding process and filler metals for the job. Being familiar with FCAW and the consumables used with it will allow the apprentice to make informed choices.

**Specific Curriculum Outcome**

24. Students will be able to select and use FCAW equipment and consumables.

**SCO - Delineations**

Students will be expected to

- 24.1 describe the principles of operation of FCAW
- 24.2 identify the components of a basic FCAW set-up
- 24.3 describe FCAW power sources, wire feeders, and gun and cable assemblies
- 24.4 describe FCAW operating variables
- 24.5 identify shielding gases for FCAW
- 24.6 describe FCAW filler metals
- 24.7 describe FCAW equipment maintenance and troubleshooting
- 24.8 identify advantages and disadvantages of FCAW

**Assessment Strategies**

- Paper/Pencil
- Self/Peer-Assessments
- Skills Performance
- Teacher Observation
- Career Portfolio

**Resources**

- Alberta Module 120103d, *Flux Cored Arc Welding (FCAW)*
- National Occupational Analysis (NOA), Human Resources and Skills Development Canada (HRSDC): Occupational Analyses Series - *Welder*
- Wall Mountain Company Video Series: *FCAW Welding*
- StudentsAchieve (http://sas.edu.pe.ca)
Flux Cored Arc Welding (FCAW) (~4 hours Classroom Component)

SCO 24. Students will be expected to

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
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<tr>
<td>Students will be expected to</td>
<td><strong>Topic: Principles of Operation</strong></td>
</tr>
<tr>
<td>24.1 describe the principles of operation of FCAW</td>
<td></td>
</tr>
<tr>
<td>24.2 identify the components of a basic FCAW set-up</td>
<td></td>
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<tr>
<td>24.3 describe FCAW power sources, wire feeders, and gun and cable assemblies</td>
<td></td>
</tr>
<tr>
<td>24.4 describe FCAW operating variables</td>
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</table>

**Student Knowledge, Abilities, and Competencies**

**Topic: Principles of Operation**
- Demonstrate an understanding of the history of FCAW.
- State typical applications of FCAW.
- Explain the principles of operation of FCAW.
- Compare gas-shielded FCAW and self-shielded FCAW.

**Topic: FCAW Set-up**
- Explain the function of each piece of basic equipment required for FCAW.

**Topic: FCAW Equipment**
- Discuss the characteristics and guidelines to consider when selecting an FCAW power source.
- Compare and contrast constant current (CC) and constant voltage (CV) power sources for FCAW.
- Identify the control features typically found on wire feeders.
- Compare constant speed wire feeders and voltage sensing wire feeders.
- Identify typical wire drive roll profiles.
- Discuss the variety of styles of welding guns used for FCAW.
- Explain the functions of the contact tube, gas diffuser, and nozzle.
- Explain the functions of the components of the cable assembly.

**Topic: Operating Variables**
- Discuss the effects of the following operating variables on the FCAW process: voltage, amperage, polarity, and electrode extension.
Flux Cored Arc Welding (FCAW) (~4 hours Classroom Component)

SCO 24. Students will be able to select and use FCAW equipment and consumables.

Student Lessons / Demonstrations

**Topic: Principles of Operation**
- Show chapters 6-10 (approx. 10 min.) of *FCAW Welding* (video).
- Create visuals from the ILM graphic CD (of the FCAW process).
- Discuss the difference between gas-shielded and self-shielded FCAW processes.

**Topic: FCAW Set-up**
- Demonstrate how to set up a power source for FCAW processes.
- Demonstrate safe work habits and procedures, and personal protective equipment, for FCAW.

**Topic: FCAW Equipment**
- Have an FCAW set-up in front of the class and review the function of each component of the set-up.
- Discuss the difference between constant feed wire feeders and voltage sensing wire feeders.

**Topic: Operating Variables**
- Explain the effects of voltage, amperage, polarity, and electrode extension related to FCAW.
- Relate these effects to other processes that have previously been covered.

**Literacy**
- *Anticipation Guide*: Develop an anticipation guide to support the reading of the first 15 pages of the ILM.

**CBL**
- *Guest Speaker*: Invite a local sales representative to discuss the various types of FCAW welders available on the market.

Student Activities / Assessments

- Label diagrams of the following:
  - self-shielded FCAW process, and gas-shielded FCAW process
  - FCAW equipment set-up
  - cable assemblies, welding guns, wire feeders
  - electrode extension, self-shielded electrode nozzle
- Illustrate typical drive roll assemblies.
- Properly set up FCAW equipment.
- Complete a worksheet on FCAW operating variables.

**Literacy**
- *Free writing*: Complete a 3-min. free writing activity on welding power sources, wire feed systems, welding guns, and cable assemblies.
- *Free writing*: Complete a 3-min. free write on operating parameters related to wire feed welding.

**Numeracy**
- Calculate the duty cycle of various FCAW machines in the shop.

Resources

**Texts / Teacher Resources**
- Alberta Module 120103d
- *Flux Cored Arc Welding (FCAW)*
  - pp. 2-19

**Cross-Curricular Reading Tools**
- NOA, HRSDC: Occupational Analyses Series - *Welder*
- StudentsAchieve (SAS)

**Software / Databases**
- Wall Moutain Company Video Series: *FCAW Welding*
- Alberta ILM Graphics CD
  - *Welding Period 1*
### SCO - Delineations

*Students will be expected to*

| 24.5 | identify shielding gases for FCAW |

| 24.6 | describe FCAW filler metals |

### Student Knowledge, Abilities, and Competencies

#### Topic: FCAW Shielding Gases
- Demonstrate an understanding of the function of the shielding gases used for FCAW.
- Identify common shielding gases.
- Interpret MDS sheets for common shielding gases.
- Explain advantages and disadvantages of various shielding gases on different metals.
- Describe factors that influence effective gas shielding.

#### Topic: FCAW Filler Materials
- Define the terminology listed on p. 22 of the ILM.
- Describe how flux cored wires are manufactured.
- Demonstrate an understanding of the operating characteristics of filler metals and the sub-categories of FCAW wires.
  - rutile-core wires
  - basic-core wires
  - metal-core wires
  - self-shielded wires
- Describe the function of the flux.
- Demonstrate an understanding of factors to consider when selecting correct wire size.
- State available FCAW wire packaging options.
- Identify AWS specifications and CSA standards related to FCAW.
- Interpret the AWS filler metal classification system.
- Interpret the CSA filler metal classification system.
- Properly store and handle FCAW wires.
- Demonstrate an ability to select the appropriate FCAW electrode wire for a particular application.
Flux Cored Arc Welding (FCAW) (~4 hours Classroom Component)

SCO 24. Students will be able to select and use FCAW equipment and consumables.

**Student Lessons / Demonstrations**

*Topic: FCAW Shielding Gases*
- Lead a class discussion on the applications of shielding gases.
- Have examples of welds with good and bad applications of shielding gases.
- Demonstrate how various factors can influence effective gas shielding.

*Topic: FCAW Filler Materials*
- Show chapters 10 and 22 of *FCAW Welding* (video).

**Literacy**
- *Think Aloud:* Use as a pre-reading strategy, modelling how to interpret information found in tables.

**Numeracy**
- Develop a math-enhanced lesson on metric/imperial conversions related to wire size and metal thickness (gauge and heavy metals).

**Student Activities / Assessments**
- Complete a worksheet on the identification and application of FCAW electrode wires.

**Literacy**
- *Say Something:* Use as a pre-reading strategy. Take time to model the strategy with a student or colleague and review the rules that will make for a successful Say Something. It is a good idea to post these rules so everyone can see them and be reminded of them during the activity:
  - With your partner, decide who will say something first.
  - When you say something, you should make a prediction, ask a question, clarify something you had misunderstood, or make a connection.
  - If you cannot do one or more of the above things, then you need to reread.

**Numeracy**
- Measure and identify wire sizes and metal thicknesses.

**Resources**

**Texts / Teacher Resources**
- Alberta Module 120103d
- *Flux Cored Arc Welding (FCAW)*
  pp. 20-35

**Software / Databases**
- NOA, HRSDC: Occupational Analyses Series - *Welder*
- StudentsAchieve (SAS)

**Visuals / Handouts / Tests**
- Wall Mountain Company Video Series: *FCAW Welding*
Flux Cored Arc Welding (FCAW) (~4 hours Classroom Component)

SCO 24. Students will be able to select and use FCAW equipment and consumables.

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<th>Student Knowledge, Abilities, and Competencies</th>
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<tbody>
<tr>
<td><strong>Students will be expected to</strong></td>
<td><strong>Topic: FCAW Maintenance and Troubleshooting</strong></td>
</tr>
<tr>
<td>24.7 describe FCAW equipment maintenance and troubleshooting</td>
<td>• Demonstrate an understanding of the proper maintenance of FCAW equipment.</td>
</tr>
<tr>
<td>24.8 identify advantages and disadvantages of FCAW</td>
<td>• Describe and troubleshoot FCAW problems related to the following categories</td>
</tr>
<tr>
<td></td>
<td>- process</td>
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<tr>
<td></td>
<td>- electrical</td>
</tr>
<tr>
<td></td>
<td>- mechanical.</td>
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<tr>
<td></td>
<td><strong>Topic: Advantages and Disadvantages</strong></td>
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<tr>
<td></td>
<td>• Demonstrate an understanding of the advantages and disadvantages of the FCAW process.</td>
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</tbody>
</table>
Flux Cored Arc Welding (FCAW) (~4 hours Classroom Component)  
SCO 24. Students will be able to select and use FCAW equipment and consumables.

**Student Lessons / Demonstrations**

*Topic: FCAW Maintenance and Troubleshooting*
- Have a variety of weld examples or pictures that the class can use to identify process-related problems.
- Stage some mechanical and electrical problems and troubleshoot the problems with the class.

*Topic: Advantages and Disadvantages*
- Review the table on p. 23 of *Flux Cored Arc Welding*.

**Student Activities / Assessments**

- Set up a routine maintenance schedule for the welding shop.

**Literacy**
- Develop checklists and procedure sheets to follow when performing routine maintenance on the FCAW equipment.

**Numeracy**
- Determine the cost of a particular welding job.

**CBL**
- Create a list of welding suppliers in your local area and welding equipment that they carry.

**Resources**

**Texts / Teacher Resources**
- Alberta Module 120103d
- *Flux Cored Arc Welding (FCAW)* pp. 36-39

**Software / Databases**
- NOA, HRSDC: Occupational Analyses Series - *Welder*
- StudentsAchieve (SAS)

**Visuals / Handouts / Tests**
- Wall Mountain Company Video Series: *FCAW Welding*
Shop/Lab Practices: FCAW Welds on Mild Steel
(~14 of 101 hours Skill Development Component)

Introduction

A welder apprentice must be able to perform FCAW welds to an acceptable standard. This module is a hands-on, practical module that will develop students’ ability to perform FCAW welds on mild steel plate.

Specific Curriculum Outcome

25. Students will be able to perform surface welds in the flat and horizontal positions and perform 1F, 2F, 3F, 1G, 2G, and 3G position welds on mild steel.

SCO - Delineations

Students will be expected to
25.1 demonstrate the knowledge to weld stringer/weave beads in the flat and horizontal positions on mild steel plate
25.2 demonstrate the ability to weld 1F welds on mild steel plate
25.3 demonstrate the knowledge to weld fillet welds in the horizontal (2F) position on mild steel plate
25.4 demonstrate the knowledge to weld fillet welds in the vertical (3F) position on mild steel plate
25.5 prepare and fit up butt joints with backing
25.6 demonstrate the knowledge to weld butt joints in the 1G position
25.7 demonstrate the knowledge to weld butt joints in the 2G position
25.8 demonstrate the knowledge to weld butt joints in the 3G position

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 120103g, Shop/Lab Practices: FCAW Welds on Mild Steel
National Occupational Analysis (NOA), Human Resources and Skills Development Canada (HRSDC): Occupational Analyses Series - Welder
Wall Mountain Company Video Series: FCAW Welding
StudentsAchieve (http://sas.edu.pe.ca)
Shop/Lab Practices: FCAW Welds on Mild Steel (~14 of 101 hours Skill Development Component)

SCO 25. Students will be able to: Perform surface welds in the flat and horizontal positions and perform 1F, 2F, 3F, 1GF, 2GF, and 3GF position welds on mild steel.

<table>
<thead>
<tr>
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<th>Student Knowledge, Abilities, and Competencies</th>
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</thead>
<tbody>
<tr>
<td>Students will be expected to</td>
<td>• For each of the exercises in the ILM that relate to outcomes 25.1–25.8, demonstrate the ability to</td>
</tr>
<tr>
<td>25.1 demonstrate the ability to weld stringer/weave beads in the flat and horizontal positions on mild steel plate</td>
<td>- select/prepare and identify correct materials</td>
</tr>
<tr>
<td>25.2 demonstrate the ability to weld 1F welds on mild steel plate</td>
<td>- prepare work area</td>
</tr>
<tr>
<td>25.3 demonstrate the ability to weld fillet welds in the horizontal (2F) position on mild steel plate</td>
<td>- interpret welding parameters</td>
</tr>
<tr>
<td>25.4 demonstrate the ability to weld fillet welds in the vertical (3F) position on mild steel plate</td>
<td>- evaluate the quality of the final weld.</td>
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<tr>
<td>25.5 prepare and fit up butt joint with backing</td>
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<tr>
<td>25.6 demonstrate the ability to weld butt joints in the 1G position</td>
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<tr>
<td>25.8 demonstrate the ability to weld butt joints in the 3G position</td>
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Shop/Lab Practices: FCAW Welds on Mild Steel (14 of 101 hours Skill Development Component)  
SCO 25. Students will be able to: Perform surface welds in the flat and horizontal positions and perform 1F, 2F, 3F, 1GF, 2GF, and 3GF position welds on mild steel.

Teacher Lessons / Demonstrations
- Review and demonstrate proper safety procedures.
- Demonstrate set-up of FCAW welding parameters.
- Review FCAW checklist, and make a visual of this for students (p. 6 of Shop/Lab Practices: FCAW Welds on Mild Steel).
- Perform a class demonstration for each of the exercises.

Literacy
- Anticipation Guide: Use as a pre-reading strategy for the first six pages of the ILM.

Student Activities / Assessments
- Complete each of the exercises in the ILM.

Literacy
- Summarizing: Use as a post-reading strategy after you have read the exercise.

Enrichment/Research Activities
- Participate in Skills Canada competitions.

Resources

Texts / Teacher Resources
Alberta Module 120103g  
Shop/Lab Practices: FCAW Welds on Mild Steel  
PP.

Software / Databases
NOA, HRSDC: Occupational Analyses Series - Welder

StudentsAchieve (SAS)

Visuals / Handouts / Tests
Wall Mountain Company Video Series: FCAW Welding

FCAW Checklist  
Shop/Lab Practices: FCAW Welds on Mild Steel (p. 6)
Shop/Lab Practices: Combined GMAW and FCAW Welds on Mild Steel
(~5 of 101 hours Skill Development Component)

Introduction
The ability to produce highly effective welds in an efficient and cost-effective manner is an essential skill in the welding trades. Combining GMAW and FCAW welds is common practice to help achieve this result. This module is a hands-on, practical module that will develop students’ ability to perform combined welds using GMAW and FCAW on mild steel plate.

Specific Curriculum Outcome

26. Students will be able to perform 1G, 2G, and 3G position welds on mild steel.

SCO - Delineations
Students will be expected to
26.1 demonstrate the ability to weld butt joints in the 1G position on mild steel using GMAW for the root bead and FCAW fill and cap
26.2 demonstrate the ability to weld butt joints in the 2G position on mild steel using GMAW for the root bead and FCAW fill and cap
26.3 demonstrate the ability to weld butt joints in the 3G position on mild steel using GMAW for the root bead and FCAW fill and cap

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 120103h, Shop/Lab Practices: Combined GMAW and FCAW Welds
National Occupational Analysis (NOA), Human Resources and Skills Development Canada (HRSDC): Occupational Analyses Series - Welder
Wall Mountain Company Video Series: FCAW Welding
StudentsAchieve (http://sas.edu.pe.ca)
Shop/Lab Practices: Combined GMAW and FCAW Welds on Mild Steel  
(*5 of 101 hours Skill Development Component*)

SCO 26. Students will be expected to perform 1G, 2G, and 3G position welds on mild steel.

### SCO - Delineations

**Students will be expected to**

<table>
<thead>
<tr>
<th></th>
<th>Demonstrate the ability to weld butt joints in the position on mild steel using GMAW for the root bead and FCAW fill and cap</th>
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</thead>
<tbody>
<tr>
<td>26.1</td>
<td>1G</td>
</tr>
<tr>
<td>26.2</td>
<td>2G</td>
</tr>
<tr>
<td>26.3</td>
<td>3G</td>
</tr>
</tbody>
</table>

### Student Knowledge, Abilities, and Competencies

- For each of the exercises in the ILM that relate to outcomes 26.1–26.3, demonstrate the ability to:
  - select/prepare and identify correct materials.
  - prepare work area.
  - interpret welding parameters.
  - evaluate the quality of the final weld.
Shop/Lab Practices: Combined GMAW and FCAW Welds on Mild Steel
(~5 of 101 hours Skill Development Component)
SCO 26. Students will be able to perform 1G, 2G, and 3G position welds on mild steel.

Teacher Lessons / Demonstrations

- Review and demonstrate proper safety procedures.
- Explain the rationale for using two processes to complete one weld.
- Demonstrate set-up of combined welding parameters.
- Review GMAW and FCAW checklist, and make a visual of this for students (p. 4 of Shop/Lab Practices: Combined GMA and FCAW Welds on Mild Steel).
- Perform a class demonstration for each of the exercises.

Literacy
- *Anticipation Guide:* Use as a pre-reading strategy for the first four pages of the ILM.
- *KWL:* Use as a pre-reading strategy. Students can reflect on what they already know about the GMAW and FCAW welding processes.

Student Activities / Assessments

- Complete each of the exercises in the ILM.

Literacy
- *Summarizing:* Use as a post-reading strategy after you have read the exercise.

Enrichment/Research Activities

- Participate in Skills Canada competitions.

Resources

**Texts / Teacher Resources**
Alberta Module 120103h
*Shop/Lab Practices: Combined GMA and FCAW Welds on Mild Steel* pp.

**Software / Databases**
NOA, HRSDC: Occupational Analyses Series - *Welder*
StudentsAchieve (SAS)

**Visuals / Handouts / Tests**
Wall Moutain Company Video Series: *FCAW Welding*
FMAW/FCAW Checklist
*Shop/Lab Practices: Combined GMA and FCAW Welds on Mild Steel* (p.4)
Metric and Imperial Measurement
(~5 hours Classroom Component)

Introduction
The metric system is the dominant measuring system used in Canada and around the world. However, the imperial system is still used to a significant degree in industry, particularly for ordering consumables and equipment or during fabrication and manufacturing. An apprentice must have a working knowledge of both the metric and imperial systems, knowing how they relate to each other and how to convert between them.

Specific Curriculum Outcome

27. Students will be able to solve problems involving metric and imperial measure.

SCO - Delineations
Students will be expected to

27.1 identify commonly used metric units of measurement
27.2 convert between units of measurement
27.3 convert imperial feet to inches, square inches to square feet, and cubic measures to gallons

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 120104h, Metric and Imperial Measurement
National Occupational Analysis (NOA), Human Resources and Skills Development Canada (HRSDC): Occupational Analyses Series - Welder
Wall Mountain Company Video Series: FCAW Welding
StudentsAchieve (http://sas.edu.pe.ca)
Metric and Imperial Measurement Steel (−5 hours Classroom Component)
SCO 27. Students will be able to solve problems involving metric and imperial measures.

**SCO - Delineations**

*Students will be expected to*

27.1 identify commonly used metric units of measurement

27.2 convert between units of measurement

27.3 convert imperial feet to inches, square inches to square feet, and cubic measures to gallons

**Student Knowledge, Abilities, and Competencies**

*Topic: Metric System*

- Identify the base units for length (distance), volume (capacity), and mass (weight) in the metric system.
- Define the following terms:
  - length
  - area
  - volume
  - capacity
  - mass
  - weight
- Explain the difference between capacity and volume.
- Explain the difference between mass and weight.

*Topic: Conversion*

- Convert metric and imperial measures of length.
- Convert between metric measurements of area.
- Convert between metric measurements of volume.
- Convert between metric and imperial measures of weight.
- Convert between metric and imperial measures of temperature.
- Convert between metric and imperial measures of tensile strength.
- Convert between metric and imperial measures of notch toughness.

- Convert between feet and inches.
- Convert between square feet and square inches.
- Convert between cubic feet and cubic inches.
- Convert cubic measures to gallons.
Metric and Imperial Measurement Steel (~5 hours Classroom Component)
SCO 27. Students will be able to solve problems involving metric and imperial measures.

**Teacher Lessons / Demonstrations**

*Topic: Metric System*
- Have a variety of trade-related items/resources that use each of the units of measure (e.g., various thicknesses of metal, gas cylinders, project specifications) on display.

*Topic: Conversions*
- Have common conversion factors displayed in the shop area/classroom.

**Literacy**
- *KWL*: Use as a pre-reading strategy. Students identify what they know about metric and imperial measurements and how they relate to the welding industry.

**Numeracy**
- Develop a math-enhanced lesson (7-step model) that supports the practical welding exercises.
- Review how to round off numbers.

**Student Activities / Assessments**
- Complete the exercises in the ILM.
- Generate a list of common conversions and examples of how to mathematically solve for the conversion.

**Literacy**
- *Free Writing*: Use as a pre-reading strategy to help activate prior knowledge of metric and imperial measures.

**Resources**

**Texts / Teacher Resources**
- Alberta Module 120104e
  *Metric and Imperial Measurement Steel* pp. 2-24
- PEI Department of Education and Early Childhood Development— *Applied Mathematics* (MAT801A)

**Software / Databases**
- NOA, HRSDC: Occupational Analyses Series - *Welder*
- StudentsAchieve (SAS)

**Visuals / Handouts / Tests**
- Wall Moutain Company Video Series: *FCAW Welding*