

HIGH LEVEL SUMMARY

**Florida Department of Education CTE Standards
for PSAV Welding Technology–Advanced Program (CIP #0648050806)
Aligned with American Welding Society National Standards
for Level II–Advanced Welders**

Advanced Welder 1 – Completion Point: A

Upon completion, student will be prepared to meet the following AWS Standards:

- 2.3.1 Prerequisite Knowledge and Skills
- 2.3.2 Layout/Fitup Practices
- 2.3.3 Arc Welding

Advanced Welder 1 – Completion Point: B

Upon completion, student will be prepared to meet the following AWS Standards:

- 2.3.2 Layout/Fitup Practices
- 2.3.3 Arc Welding
- 2.3.4 Oxyfuel Gas Cutting
- 2.3.5 Arc Cutting and Gouging
- 2.3.6 Welding Codes and Standards
- 2.3.7 Qualification and Certification
- 2.3.8 Inspection and Testing

Florida Department of Education
CTE Standards and Benchmarks for
Welding Technology PSAV Advanced Program (CIP #0648050806)
Aligned with American Welding Society National Standards for
Level II—Advanced Welders

Alignments by
Florida Advanced Technological Education Center (FLATE)
<http://www.fl-ate.org/>

July 2016



Partial funding for FLATE provided by the National Science Foundation

Opinions, findings, and conclusions or recommendations expressed in this material are those of the authors,
and do not necessarily reflect the views of the National Science Foundation.

The following framework is excerpted from the American Welding Society:

Guide for the Training of Welding Personnel: Level II—Advanced Welders.¹

Content from this Guide serves as a reference for understanding this alignment. See the full Guide for additional definitions, occupational conditions, and profile for Level II—Advanced Welders, as well as related competency-based modules and key indicators for welding technology education and training programs.

2.3 Level II—Advanced Welder Occupational Description

- **2.3.1 Prerequisite Knowledge and Skills.** Possesses the requisite knowledge and skill levels of an entry level welder as defined by AWS QC10, *Specification for Qualification and Certification for Entry Level Welders* and detailed in AWS EG2.0, *Guide for the Training and Qualification of Welding Personnel, Entry Level Welder*.
- **2.3.2 Layout/Fitup Practices.** Possesses the requisite drawing and welding symbol interpretation skills of an entry level welder. Demonstrates a fundamental knowledge of layout and fitup principles. Has a fundamental understanding of advanced measurement practices, design for welding and the use of fixtures and positioners. Works from drawings or sketches to prepare, form or cut multiple parts and assemble simple weldments. Recognizes welded joint and welding requirements based on welding symbol information.
- **2.3.3 Arc Welding.** Possesses the prerequisite arc welding skills of an entry level welder. Has a fundamental understanding of welding metallurgy including mechanical and chemical properties of metals, weld zone metallurgy, residual stress and control of distortion. Demonstrates knowledge of joint design and preparation, selection of material, arc welding application, weld quality and weld repairs (corrective actions). Sets up shielded metal arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate and pipe, and a limited thickness range of stainless steel plate. Sets up gas metal arc welding (short circuit transfer) operations, for all position fillet and groove welding on a limited thickness range of carbon steel plate, and limited position fillet and groove welding on pipe. Sets up gas metal arc welding (spray transfer) operations, for a limited position, unlimited thickness range of carbon steel plate, limited position fillet welding on pipe, and all positions fillet and groove welding a limited thickness range of aluminum plate. Sets up flux cored arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate, and limited position fillet and groove welding on carbon steel pipe. Sets up gas tungsten arc welding operations, for limited position, limited thickness fillet and groove welding of carbon steel, stainless steel and aluminum pipe or tubing. Performs minor external repairs to equipment and accessories.
- **2.3.4 Oxyfuel Gas Cutting.** Possess the prerequisite oxyfuel gas cutting skills of an entry level welder. Sets up and performs manual air carbon arc cutting operations that include gouging, beveling, and weld removal (weld washing) for various product forms including plate and pipe. Sets up and operates machine oxyfuel gas cutting equipment (track burner) to perform straight cutting and beveling operations. Demonstrates knowledge of preparation and selection of materials, cutting applications, cut quality and cut surface repairs (corrective actions). Performs minor external repairs to equipment and accessories.
- **2.3.5 Arc Cutting and Gouging.** Possesses the requisite arc cutting skills of an entry level welder. Sets up and performs manual air carbon arc cutting operations that include gouging, beveling, and weld removal on various product forms including plate and pipe. Sets up and

¹ From AWS Guide for the Training of Welding Personnel Level II—Advanced Welders; excerpted from section 2.3: Level II—Advanced Welders Occupational Description, pages 3-5.

performs machine plasma arc cutting equipment (track burner) to perform straight cutting and beveling operations. Demonstrates knowledge of preparation and selection of materials, arc cutting applications, cut quality and cut surface repairs (corrective actions). Performs minor external repairs to equipment and accessories.

- **2.3.6 Welding Codes and Standards.** Possesses a fundamental understanding of code/standard interpretation.
- **2.3.7 Qualification and Certification.** Recognizes the functions of qualification and certification, has a fundamental understanding of procedure specifications, procedure qualifications, welding procedures and performance qualification.
- **2.3.8 Inspection and Testing.** Possesses the prerequisite inspection skills of an entry level welder. Visually examines all personal welding and cutting assignments for unfavorable weld and cut edge surface discontinuities, before final inspection by a supervisor. Has a fundamental understanding of destructive/non-destructive testing principles and weld testing interpretation.

The following standards are all from **Level II—Advanced Welders**.

Advanced Welder 1

CTE Standards and Benchmarks	AWS National Standards
<p>01.0 Apply intermediate shielded metal arc welding (SMAW) pipe welding (B-Class Welder) skills--The student will be able to:</p>	<p>2.3.1 Prerequisite Knowledge and Skills. Possesses the requisite knowledge and skill levels of an entry level welder as defined by AWS QC10, <i>Specification for Qualification and Certification for Entry Level Welders</i> and detailed in AWS EG2.0, <i>Guide for the Training and Qualification of Welding Personnel, Entry Level Welder</i>.</p> <p>2.3.2 Layout/Fitup Practices. Possesses the requisite drawing and welding symbol interpretation skills of an entry level welder. Demonstrates a fundamental knowledge of layout and fitup principles. Has a fundamental understanding of advanced measurement practices, design for welding and the use of fixtures and positioners. Works from drawings or sketches to prepare, form or cut multiple parts and assemble simple weldments. Recognizes welded joint and welding requirements based on welding symbol information.</p> <p>2.3.3 Arc Welding. Possesses the prerequisite arc welding skills of an entry level welder. Has a fundamental understanding of welding metallurgy including mechanical and chemical properties of metals, weld zone metallurgy, residual stress and control of distortion. Demonstrates knowledge of joint design and preparation, selection of material, arc welding application, weld quality and weld repairs (corrective actions). Sets up shielded metal arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate and pipe, and a limited thickness range of stainless steel plate. Sets up gas metal arc welding (short circuit transfer) operations, for all position fillet and groove welding on a limited thickness range of carbon steel plate, and limited position fillet and groove welding on pipe. Sets up gas metal arc welding (spray transfer) operations, for a limited position, unlimited thickness range of carbon steel plate, limited position fillet welding on pipe, and all positions fillet and groove welding a limited thickness range of aluminum plate. Sets up flux cored arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate, and limited position fillet and groove welding on carbon steel pipe. Sets up gas tungsten arc welding operations, for</p>

CTE Standards and Benchmarks	AWS National Standards
	limited position, limited thickness fillet and groove welding of carbon steel, stainless steel and aluminum pipe or tubing. Performs minor external repairs to equipment and accessories.
01.01 Make SMAW equipment ready for open-root V-groove pipe welds.	2.3.1, 2.3.2, 2.3.3
01.02 Identify and explain open-root V-groove pipe welding techniques with SMAW equipment.	2.3.1, 2.3.2, 2.3.3
01.03 Perform open-root V-groove pipe welds in the following positions using SMAW equipment. 1-GR, 2-G, 5-G, 6-G, 6-GR	2.3.1, 2.3.2, 2.3.3
02.0 Apply and understand fabrication techniques using pipe fitting techniques--The student will be able to:	<p>2.3.1 Prerequisite Knowledge and Skills. Possesses the requisite knowledge and skill levels of an entry level welder as defined by AWS QC10, <i>Specification for Qualification and Certification for Entry Level Welders</i> and detailed in AWS EG2.0, <i>Guide for the Training and Qualification of Welding Personnel, Entry Level Welder.</i></p> <p>2.3.2 Layout/Fitup Practices. Possesses the requisite drawing and welding symbol interpretation skills of an entry level welder. Demonstrates a fundamental knowledge of layout and fitup principles. Has a fundamental understanding of advanced measurement practices, design for welding and the use of fixtures and positioners. Works from drawings or sketches to prepare, form or cut multiple parts and assemble simple weldments. Recognizes welded joint and welding requirements based on welding symbol information.</p> <p>2.3.3 Arc Welding. Possesses the prerequisite arc welding skills of an entry level welder. Has a fundamental understanding of welding metallurgy including mechanical and chemical properties of metals, weld zone metallurgy, residual stress and control of distortion. Demonstrates knowledge of joint design and preparation, selection of material, arc welding application, weld quality and weld repairs (corrective actions). Sets up shielded metal arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate and pipe, and a limited thickness range of stainless steel plate. Sets up gas metal arc welding (short circuit transfer) operations, for all position fillet and groove welding on a limited thickness range of carbon steel plate, and limited position</p>

CTE Standards and Benchmarks	AWS National Standards
	fillet and groove welding on pipe. Sets up gas metal arc welding (spray transfer) operations, for a limited position, unlimited thickness range of carbon steel plate, limited position fillet welding on pipe, and all positions fillet and groove welding a limited thickness range of aluminum plate. Sets up flux cored arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate, and limited position fillet and groove welding on carbon steel pipe. Sets up gas tungsten arc welding operations, for limited position, limited thickness fillet and groove welding of carbon steel, stainless steel and aluminum pipe or tubing. Performs minor external repairs to equipment and accessories.
02.01 Apply and understand pipe fitting take-outs for pipe fittings.	2.3.1, 2.3.2, 2.3.3
02.02 Identify and explain the different types of pipe fittings and their usage.	2.3.1, 2.3.2, 2.3.3
02.03 Identify and explain welding symbols and a standard legend on mechanical drawings.	2.3.1, 2.3.2, 2.3.3
02.04 Identify elevations and directions on a set of mechanical drawings.	2.3.1, 2.3.2, 2.3.3
03.0 Apply advanced gas-tungsten arc welding (GTAW) pipe skills--The student will be able to:	<p>2.3.3 Arc Welding. Possesses the prerequisite arc welding skills of an entry level welder. Has a fundamental understanding of welding metallurgy including mechanical and chemical properties of metals, weld zone metallurgy, residual stress and control of distortion. Demonstrates knowledge of joint design and preparation, selection of material, arc welding application, weld quality and weld repairs (corrective actions). Sets up shielded metal arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate and pipe, and a limited thickness range of stainless steel plate. Sets up gas metal arc welding (short circuit transfer) operations, for all position fillet and groove welding on a limited thickness range of carbon steel plate, and limited position fillet and groove welding on pipe. Sets up gas metal arc welding (spray transfer) operations, for a limited position, unlimited thickness range of carbon steel plate, limited position fillet welding on pipe, and all positions fillet and groove welding a limited thickness range of aluminum plate. Sets up flux cored arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate, and limited position fillet and groove welding on carbon steel pipe. Sets up gas tungsten arc welding operations, for limited position, limited thickness fillet and groove welding of carbon</p>

CTE Standards and Benchmarks	AWS National Standards
	steel, stainless steel and aluminum pipe or tubing. Performs minor external repairs to equipment and accessories.
03.01 Prepare GTAW equipment to create welds with low alloy (Carbon Steel), stainless steel pipe, and filler metal.	2.3.3
03.02 Identify and explain open-root V-groove pipe welding techniques with GTAW equipment.	2.3.3
03.03 Perform open-root V-groove welds on low alloy (carbon steel) and stainless steel pipe in the following positions using GTAW equipment. 1-GR, 2-G, 5-G, 6-G, 6G-R	2.3.3
04.0 Apply advanced gas-tungsten arc welding (GTAW) and shielded metal arc welding (SMAW) heavy-wall pipe skills --The student will be able to:	2.3.3 Arc Welding. Possesses the prerequisite arc welding skills of an entry level welder. Has a fundamental understanding of welding metallurgy including mechanical and chemical properties of metals, weld zone metallurgy, residual stress and control of distortion. Demonstrates knowledge of joint design and preparation, selection of material, arc welding application, weld quality and weld repairs (corrective actions). Sets up shielded metal arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate and pipe, and a limited thickness range of stainless steel plate. Sets up gas metal arc welding (short circuit transfer) operations, for all position fillet and groove welding on a limited thickness range of carbon steel plate, and limited position fillet and groove welding on pipe. Sets up gas metal arc welding (spray transfer) operations, for a limited position, unlimited thickness range of carbon steel plate, limited position fillet welding on pipe, and all positions fillet and groove welding a limited thickness range of aluminum plate. Sets up flux cored arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate, and limited position fillet and groove welding on carbon steel pipe. Sets up gas tungsten arc welding operations, for limited position, limited thickness fillet and groove welding of carbon steel, stainless steel and aluminum pipe or tubing. Performs minor external repairs to equipment and accessories.
04.01 Identify and explain open-root V-groove pipe welding techniques on heavy wall pipe with GTAW/SMAW equipment.	2.3.3
04.02 Identify and explain Pre and Post weld heat treatment on the different types of alloy metals.	2.3.3
04.03 Make open-root V-groove welds on heavy wall carbon steel	2.3.3

CTE Standards and Benchmarks	AWS National Standards
<p>pipe root and hot pass using different techniques and filler metals such as, Key holing, washing or soaking, back feeding in the 1-G, 2-G,5-G, 6-G positions with GTAW equipment.</p>	
<p>04.04 Make V-groove multi-pass welds on heavy wall pipe using the GTAW/SMAW welding processes in the 2-G, 5-G, 6-G positions.</p>	<p>2.3.3</p>

Advanced Welder 2

CTE Standards and Benchmarks	AWS National Standards
05.0 Apply emerging welding technologies--The student will be able to:	<p>2.3.2 Layout/Fitup Practices. Possesses the requisite drawing and welding symbol interpretation skills of an entry level welder. Demonstrates a fundamental knowledge of layout and fitup principles. Has a fundamental understanding of advanced measurement practices, design for welding and the use of fixtures and positioners. Works from drawings or sketches to prepare, form or cut multiple parts and assemble simple weldments. Recognizes welded joint and welding requirements based on welding symbol information.</p> <p>2.3.3 Arc Welding. Possesses the prerequisite arc welding skills of an entry level welder. Has a fundamental understanding of welding metallurgy including mechanical and chemical properties of metals, weld zone metallurgy, residual stress and control of distortion. Demonstrates knowledge of joint design and preparation, selection of material, arc welding application, weld quality and weld repairs (corrective actions). Sets up shielded metal arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate and pipe, and a limited thickness range of stainless steel plate. Sets up gas metal arc welding (short circuit transfer) operations, for all position fillet and groove welding on a limited thickness range of carbon steel plate, and limited position fillet and groove welding on pipe. Sets up gas metal arc welding (spray transfer) operations, for a limited position, unlimited thickness range of carbon steel plate, limited position fillet welding on pipe, and all positions fillet and groove welding a limited thickness range of aluminum plate. Sets up flux cored arc welding operations, for all position fillet and groove welding on an unlimited thickness range of carbon steel plate, and limited position fillet and groove welding on carbon steel pipe. Sets up gas tungsten arc welding operations, for limited position, limited thickness fillet and groove welding of carbon steel, stainless steel and aluminum pipe or tubing. Performs minor external repairs to equipment and accessories.</p> <p>2.3.4 Oxyfuel Gas Cutting. Possess the prerequisite oxyfuel gas cutting skills of an entry level welder. Sets up and performs manual air carbon arc cutting operations that include gouging, beveling, and weld removal (weld washing) for various product forms including</p>

CTE Standards and Benchmarks	AWS National Standards
	<p>plate and pipe. Sets up and operates machine oxyfuel gas cutting equipment (track burner) to perform straight cutting and beveling operations. Demonstrates knowledge of preparation and selection of materials, cutting applications, cut quality and cut surface repairs (corrective actions). Performs minor external repairs to equipment and accessories.</p> <p>2.3.5 Arc Cutting and Gouging. Possesses the requisite arc cutting skills of an entry level welder. Sets up and performs manual air carbon arc cutting operations that include gouging, beveling, and weld removal on various product forms including plate and pipe. Sets up and performs machine plasma arc cutting equipment (track burner) to perform straight cutting and beveling operations. Demonstrates knowledge of preparation and selection of materials, arc cutting applications, cut quality and cut surface repairs (corrective actions). Performs minor external repairs to equipment and accessories.</p> <p>2.3.6 Welding Codes and Standards. Possesses a fundamental understanding of code/standard interpretation.</p> <p>2.3.7 Qualification and Certification. Recognizes the functions of qualification and certification, has a fundamental understanding of procedure specifications, procedure qualifications, welding procedures and performance qualification.</p> <p>2.3.8 Inspection and Testing. Possesses the prerequisite inspection skills of an entry level welder. Visually examines all personal welding and cutting assignments for unfavorable weld and cut edge surface discontinuities, before final inspection by a supervisor. Has a fundamental understanding of destructive/non-destructive testing principles and weld testing interpretation.</p>
05.01 Research and identify careers and workforce needs that employ emerging welding technologies.	2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.3.6, 2.3.7, 2.3.8
05.02 Identify the skills required to work within careers that use emerging welding technologies.	2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.3.6, 2.3.7, 2.3.8
05.03 Apply skills and competencies needed to successfully use emerging welding technologies such as, but not limited to: Pulse Welding, Robotics, Submerged Welding, Adaptive	2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.3.6, 2.3.7, 2.3.8

CTE Standards and Benchmarks	AWS National Standards
Welding, Hybrid Laser-Arc Welding (HLAW), etc.	