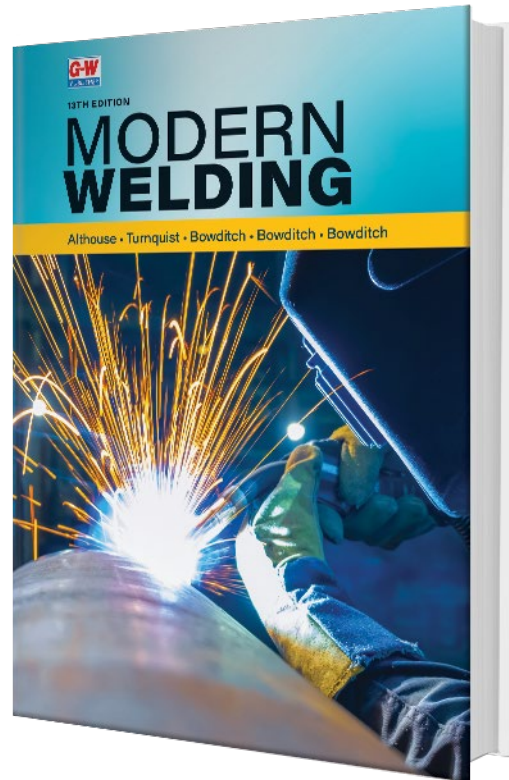




**Correlation of
Modern Welding**
by Althouse, Turnquist, W. Bowditch, K. Bowditch, and M. Bowditch
(Goodheart-Willcox Publisher ©2024)
to
AWS SENSE Level II—Advanced Welder

The following chart correlates the *Modern Welding* textbook and lab workbook to the American Welding Society’s AWS SENSE Level II—Advanced Welder guide. The chart lists each of the Key Indicators in the guide, the page numbers where applicable information can be found in the *Modern Welding* textbook, and the numbers of applicable Lessons and Jobs in the lab workbook. The organization of the correlation chart allows you to easily gear your curriculum to the AWS SENSE training standards for advanced-level personnel.

The AWS SENSE standards were created in accordance with the rules of the American National Standards Institute. They were created as a means of conveying the knowledge and skills identified by industry as essential to the job performance of advanced-level welders. The standards listed are intended to assist instructors in developing and implementing curriculum and training content that will provide students with the welding skills and competencies needed to gain employment and to advance within the field.



| Key Indicators | G-W Content |
|--|--|
| MODULE 1: Trade Math | |
| 1. Performs basic mathematical functions with fractions and mixed numbers. | Textbook: pg. 32–33 Lab Workbook Lessons: Lesson 2, Print Reading; Lesson 34, Technical Data |
| 2. Converts fractions to decimals and performs basic mathematical functions with decimals. | Textbook: pg. 32–33 Lab Workbook Lessons: Lesson 2, Print Reading; Lesson 34, Technical Data |
| 3. Reads a rule in U.S. Customary and Metric units, performs linear measurements, and calculates the area of shapes. | Textbook: pg. 32–33, 875 Lab Workbook Lessons: Lesson 2, Print Reading; Lesson 34, Technical Data |

Correlation of *Modern Welding* to AWS SENSE Level II—page 2

| Key Indicators | G-W Content |
|--|---|
| 4. Calculates volume and weight associated with different shapes. | Textbook: pg. 846–847 Lab Workbook Lessons: Lesson 2, Print Reading; Lesson 32, The Welding Shop |
| 5. Converts U.S. Customary units to Metric units, and vice versa. | Textbook: pg. 872 Lab Workbook Lessons: Lesson 34, Technical Data |
| MODULE 2: Welding Metallurgy | |
| 1. Exhibits a working knowledge of the metallurgy and weldability of carbon steel. | Textbook: pg. 575–577, 735–753, 761–772 Lab Workbook Lessons: Lesson 21, Special Ferrous Welding Applications; Lesson 28, Metal Production, Properties, and Identification; Lesson 29, Heat Treatment of Metals Lab Workbook Jobs: Job 28-1, Identification of Metals; Job 29-1, Heat Treating a Cold Chisel |
| 2. Exhibits a working knowledge of the metallurgy and weldability of stainless steel. | Textbook: pg. 580–590, 753–754 Lab Workbook Lessons: Lesson 21, Special Ferrous Welding Applications; Lesson 28, Metal Production, Properties, and Identification; Lesson 29, Heat Treatment of Metals Lab Workbook Jobs: Job 28-1, Identification of Metals |
| 3. Exhibits a working knowledge of the metallurgy and weldability of aluminum. | Textbook: pg. 597–604, 755–756, 774–775 Lab Workbook Lessons: Lesson 22, Special Nonferrous Welding Applications; Lesson 28, Metal Production, Properties, and Identification; Lesson 29, Heat Treatment of Metals Lab Workbook Jobs: Job 28-1, Identification of Metals |
| 4. Exhibits a working knowledge of the principles related to residual stress and distortion control. | Textbook: pg. 761–779, 868–869 Lab Workbook Lessons: Lesson 29, Heat Treatment of Metals Lab Workbook Jobs: Job 29-1, Heat Treating a Cold Chisel |
| MODULE 3: Documents Governing Welding and Welding Inspection | |
| 1. Possesses a working knowledge of the major welding codes. | Textbook: pg. 809–813 Lab Workbook Lessons: Lesson 31A, Procedure and Welder Qualifications |
| 2. Possesses a working knowledge of documents related to welding specifications and qualifications. | Textbook: pg. 813–816 Lab Workbook Lessons: Lesson 31A, Procedure and Welder Qualification; Lesson 31B, Reading a Welding Procedure Specification; Lesson 31C, Reading a Welder Performance Qualification Test Record Lab Workbook Jobs: Job 31-1, Writing a Welding Procedure Specification and Qualifying the WPS |

| Key Indicators | G-W Content |
|--|---|
| 3. Possesses a working knowledge of documents related to standard symbols for welding and nondestructive examination, nondestructive inspection of welds, visual inspection of welds, and mechanical testing of welds. | Textbook: pg. 48–62 Lab Workbook Lessons: Lesson 3B, Reading Welding Symbols |
| 4. Possesses a working knowledge of the major base metal designation systems, filler metal specifications, and a material test report. | Textbook: pg. 114–120, 186–192, 262–265, 750–757 Lab Workbook Lessons: Lesson 5B, SMAW Electrodes; Lesson 7, GMAW and FCAW Equipment and Supplies; Lesson 9, GTAW Equipment and Supplies; Lesson 28, Metal Production, Properties, and Identification |
| MODULE 4: Welding Inspection and Testing Methods | |
| 1. Possesses a working knowledge of commonly used destructive testing methods. | Textbook: pg. 793–800 Lab Workbook Lessons: Lesson 30, Inspecting and Testing Welds; Lesson 31C, Reading a Welder Performance Qualification Test Record Lab Workbook Jobs: Job 30-3, Guided Bend Tests; Job 30-4, Tensile Testing; Job 30-5, Fillet Weld Bend |
| 2. Possesses a working knowledge of commonly used nondestructive examination methods. | Textbook: pg. 783–793 Lab Workbook Lessons: Lesson 30, Inspecting and Testing Welds Lab Workbook Jobs: Job 30-1, Magnetic Particle Inspection; Job 30-2, Liquid Penetrant Inspection |
| 3. Performs a dye penetrant test. | Textbook: pg. 789–790 Lab Workbook Lessons: Lesson 30, Inspecting and Testing Welds Lab Workbook Jobs: Job 30-2, Liquid Penetrant Test |
| 4. Performs a macroetch test (optional). | Textbook: pg. 804–805, 821 Lab Workbook Lessons: Lesson 30, Inspecting and Testing Welds Lab Workbook Jobs: Job 31-2, Fillet Weld Performance Test |
| 5. Performs a fillet break test. | Textbook: pg. 796, 821 Lab Workbook Lessons: Lesson 30, Inspecting and Testing Welds Lab Workbook Jobs: Job 30-5, Fillet Weld Bend Tests; Job 31-2, Fillet Weld Performance Test |
| 6. Performs a visual examination of cut surfaces and edges of prepared base metal parts according to applicable fitup and preparation tolerances. | Textbook: pg. 46–48, 784–786 Lab Workbook Lessons: Lesson 30, Inspecting and Testing Welds Lab Workbook Jobs: All welding jobs. |
| 7. Performs a visual examination of tack welds, root pass, intermediate layers, and completed welds according to applicable acceptance criteria. | Textbook: pg. 150–152, 819 Lab Workbook Lessons: Lesson 30, Inspecting and Testing Welds Lab Workbook Jobs: All welding jobs. |

| Key Indicators | G-W Content |
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| MODULE 5: Thermal Cutting Processes | |
| Unit 1: Manual Oxyfuel Gas Cutting (OFC) | |
| 1. Performs safety inspection, operator maintenance, sets up, and operates manual OFC equipment on carbon steel. | Textbook: pg. 371–380, 422–729 Lab Workbook Lessons: Lesson 12B, Oxyfuel Gas Welding and Cutting Safety; Lesson 13A, Oxyfuel Gas Welding—Turning the Outfit On and Off; Lesson 14, Oxyfuel Gas Cutting Equipment and Supplies Lab Workbook Jobs: Job 13A-1, Turning On, Lighting, and Shutting Down an Oxyacetylene Welding Outfit |
| 2. Performs straight, square edge cutting operations in the horizontal and vertical positions on carbon steel plate. | Textbook: pg. 430–436 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-3, Cutting in the Horizontal and Vertical Positions to Produce Square and Beveled Edges |
| 3. Performs straight, bevel edge cutting operations in the horizontal and vertical positions on carbon steel plate. | Textbook: pg. 436 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-3, Cutting in the Horizontal and Vertical Positions to Produce Square and Beveled Edges |
| 4. Performs straight, structural shape cutting operations on angle, channel, and square or rectangular carbon steel tubing, in the horizontal and vertical positions. | Textbook: pg. 436, 620–621 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-4, Cutting and Piercing Shapes in the Horizontal and Vertical Positions; Job 15-5, Piercing and Cutting Round Holes in Pipe in the Horizontal and Vertical Positions |
| 5. Performs straight, square edge cutting operations on carbon steel pipe, with the pipe axis in the horizontal and vertical positions. | Textbook: pg. 436 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-7, Making Square and Beveled Cuts on Pipe |
| 6. Performs straight, bevel edge cutting operations on carbon steel pipe, with the pipe axis in the horizontal and vertical positions. | Textbook: pg. 436 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-7, Making Square and Beveled Cuts on Pipe |
| Unit 2: Mechanized Oxyfuel Gas Cutting (OFC) [Pipe Beveller] | |

| Key Indicators | G-W Content |
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| <p>1. Performs mechanized OFC equipment safety inspection, operator maintenance, sets up, and operates mechanized OFC equipment on carbon steel pipe.</p> | <p>Textbook: pg. 439–441 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-8, Setting Up and Inspecting a Semiautomatic Oxyfuel Gas Cutting Torch</p> |
| <p>2. Performs straight, square edge cutting operations in the flat position on carbon steel pipe using a pipe beveller.</p> | <p>Textbook: pg. 439–441 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-9, Using a Motorized Carriage to Make Square and Beveled Edges on Plate and Pipe</p> |
| <p>3. Performs straight, bevel edge cutting operations in the flat position on carbon steel pipe using a pipe beveller.</p> | <p>Textbook: pg. 439–441 Lab Workbook Lessons: Lesson 15, Oxyfuel Gas Cutting—Cutting Steel Lab Workbook Jobs: Job 15-9, Using a Motorized Carriage to Make Square and Beveled Edges on Plate and Pipe</p> |
| <p>Unit 3: Plasma Arc Cutting (PAC)</p> | |
| <p>1. Performs PAC equipment safety inspection, operator maintenance, sets up, and operates manual PAC equipment on carbon steel, stainless steel, and aluminum.</p> | <p>Textbook: pg. 318–320 Lab Workbook Lessons: Lesson 11, Plasma Arc Cutting Lab Workbook Jobs: Job 11-1, Inspecting and Setting Up a PAC Station</p> |
| <p>2. Performs straight, square edge cutting operations in the horizontal and vertical positions on carbon steel, stainless steel, and aluminum.</p> | <p>Textbook: pg. 321–328 Lab Workbook Lessons: Lesson 11, Plasma Arc Cutting Lab Workbook Jobs: Job 11-2, Piercing and Cutting Using the Plasma Arc Cutting Process</p> |
| <p>3. Performs straight, bevel edge cutting operations in the horizontal and vertical positions on carbon steel, stainless steel, and aluminum.</p> | <p>Textbook: pg. 321–328 Lab Workbook Lessons: Lesson 11, Plasma Arc Cutting Lab Workbook Jobs: Job 11-3, Flat, Horizontal, and Vertical Bevel Edge Cuts Using the Plasma Arc Cutting Process</p> |
| <p>4. Performs straight, structural shape cutting operations on angle, channel, and square or rectangular tubing in the horizontal and vertical positions, on carbon steel, stainless steel, and aluminum.</p> | <p>Textbook: pg. 321–328, 620–621 Lab Workbook Lessons: Lesson 11, Plasma Arc Cutting Lab Workbook Jobs: Job 11-4, Cutting a Shape Using the Plasma Arc Cutting Process</p> |
| <p>5. Performs straight, square edge cutting operations on carbon steel pipe, with the pipe axis in the horizontal and vertical positions.</p> | <p>Textbook: pg. 321–328 Lab Workbook Lessons: Lesson 11, Plasma Arc Cutting Lab Workbook Jobs: Job 11-5, Making Square and Beveled Cuts on Pipe</p> |

| Key Indicators | G-W Content |
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| <p>6. Performs straight, bevel edge cutting operations on carbon steel pipe, with the pipe axis in the horizontal and vertical positions.</p> | <p>Textbook: pg. 321–328 Lab Workbook Lessons: Lesson 11, Plasma Arc Cutting Lab Workbook Jobs: Job 11-5, Making Square and Beveled Cuts on Pipe</p> |
| <p>Unit 4: Air Carbon Arc Cutting (CAC-A)</p> | |
| <p>1. Performs CAC-A equipment safety inspection, operator maintenance, sets up, and operates manual CAC-A equipment on carbon steel plate.</p> | <p>Textbook: pg. 653–655 Lab Workbook Lessons: Lesson 24A, Special Cutting Safety; Lesson 24B, Special Cutting Processes Lab Workbook Jobs: Job 24B-1, Inspecting a CAC-A Station</p> |
| <p>2. Performs straight, square edge cutting operations in the horizontal and vertical positions on carbon steel plate.</p> | <p>Textbook: pg. 653–655 Lab Workbook Lessons: Lesson 24A, Special Cutting Safety; Lesson 24B, Special Cutting Processes Lab Workbook Jobs: Job 24B-2, Cutting and Piercing Using CAC-A</p> |
| <p>3. Performs straight, bevel edge cutting operations in the flat, horizontal, and vertical positions on carbon steel plate.</p> | <p>Textbook: pg. 653–655 Lab Workbook Lessons: Lesson 24A, Special Cutting Safety; Lesson 24B, Special Cutting Processes Lab Workbook Jobs: Job 24B-2, Cutting and Piercing Using CAC-A</p> |
| <p>4. Performs gouging operations to remove base and weld metal in the vertical position on carbon steel plate.</p> | <p>Textbook: pg. 653–658 Lab Workbook Lessons: Lesson 24A, Special Cutting Safety; Lesson 24B, Special Cutting Processes Lab Workbook Jobs: Job 24B-3, Removing Weld Reinforcement Using CAC-A</p> |
| <p>5. Performs straight, structural shape cutting operations on carbon steel angle, channel, and square or rectangular tubing in the flat, horizontal, and vertical positions.</p> | <p>Textbook: pg. 653–658 Lab Workbook Lessons: Lesson 24A, Special Cutting Safety; Lesson 24B, Special Cutting Processes Lab Workbook Jobs: Job 24B-2, Cutting and Piercing Using CAC-A</p> |
| <p>6. Performs straight, square edge cutting operations on carbon steel pipe, with the pipe axis in the horizontal and vertical positions.</p> | <p>Textbook: pg. 653–655 Lab Workbook Lessons: Lesson 24A, Special Cutting Safety; Lesson 24B, Special Cutting Processes Lab Workbook Jobs: Job 24B-2, Cutting and Piercing Using CAC-A</p> |
| <p>7. Performs straight, bevel edge cutting operations on carbon steel pipe with the pipe axis in the horizontal and vertical positions.</p> | <p>Textbook: pg. 653–655 Lab Workbook Lessons: Lesson 24A, Special Cutting Safety; Lesson 24B, Special Cutting Processes Lab Workbook Jobs: Job 24B-2, Cutting and Piercing Using CAC-A</p> |

| Key Indicators | G-W Content |
|--|--|
| MODULE 6: Shielded Metal Arc Welding (SMAW)—Plate | |
| <p>1. Performs safety inspection, operator maintenance, sets up, and operates SMAW equipment.</p> | <p>Textbook: pg. 136–147</p> <p>Lab Workbook Lessons: Lesson 6A, Shielded Metal Arc Welding Safety; Lesson 6B, Shielded Metal Arc Welding Fundamentals</p> <p>Lab Workbook Jobs: Job 6B-1, Inspecting and Setting Up an SMAW Station; Job 6B-2, Striking an Arc and Running Short Beads; Job 6B-3, Running Stringer Beads; Job 6B-4, Running Weave Beads; Job 6B-5, Running Stringer Beads</p> |
| <p>2. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on carbon steel plate using stainless steel electrodes.</p> | <p>Textbook: pg. 158–159, 162–164</p> <p>Lab Workbook Lessons: Lesson 6D, SMAW in the Horizontal Position; Lesson 6E, SMAW in the Vertical and Overhead Positions</p> <p>Lab Workbook Jobs: Job 6D-1, Fillet Welds on Lap Joints in the Horizontal Welding Position; Job 6D-2, Fillet Welds on T-Joints in the Horizontal Welding Position; Job 6E-1, Fillet Welds on Lap Joints in the Vertical Welding Position; Job 6E-2, Fillet Welds on T-Joints in the Vertical Welding Position; Job 6E-4, Fillet Welds on Lap Joints in the Overhead Welding Position; Job 6E-5, Fillet Welds on T-Joints in the Overhead Welding Position</p> |
| <p>3. Makes multiple pass groove welds in the 3G and 4G positions on carbon steel plate using stainless steel electrodes, with and without backing.</p> | <p>Textbook: pg. 162–167</p> <p>Lab Workbook Lessons: Lesson 6E, SMAW in the Vertical and Overhead Positions</p> <p>Lab Workbook Jobs: Job 6E-3, Groove Welds on V-Groove Butt Joints in the Vertical Welding Position; Job 6E-6, Groove Welds on Bevel-Groove Butt Joints in the Overhead Welding Position</p> |
| <p>4. Passes 3G and 4G position unlimited thickness welder performance qualification tests on carbon steel plate with stainless steel electrodes, with or without backing.</p> | <p>Textbook: pg. 119–120, 162–164</p> <p>Lab Workbook Lessons: Lesson 6E, SMAW in the Vertical and Overhead Positions</p> <p>Lab Workbook Jobs: Job 6E-3, Groove Welds on V-Groove Butt Joints in the Vertical Welding Position; Job 6E-6, Groove Welds on Bevel-Groove Butt Joints in the Overhead Welding Position; Job 6E-7, Structural Welding: Groove Weld in Thick Plate—Out of Position</p> |

| Key Indicators | G-W Content |
|---|---|
| MODULE 7: Shielded Metal Arc Welding (SMAW)—Pipe | |
| <p>1. Performs safety inspection, operator maintenance, sets up, and operates SMAW equipment.</p> | <p>Textbook: pg. 136–147 Lab Workbook Lessons: Lesson 6A, Shielded Metal Arc Welding Safety; Lesson 6B, Shielded Metal Arc Welding Fundamentals Lab Workbook Jobs: Job 6B-1, Inspecting and Setting Up an SMAW Station; Job 6B-2, Striking an Arc and Running Short Beads; Job 6B-3, Running Stringer Beads; Job 6B-4, Running Weave Beads; Job 6B-5, Running Stringer Beads</p> |
| <p>2. Makes multiple pass fillet welds in the 2F, 4F, and 5F positions on carbon steel pipe to plate.</p> | <p>Textbook: pg. 158–159, 162–164, 624 Lab Workbook Lessons: Lesson 23A, Welding Pipe and Tube Joints—SMAW Lab Workbook Jobs: Job 23A-6, Welding Carbon Steel Pipe to Plate</p> |
| <p>3. Makes multiple pass groove welds in the 2G, 5G, and 6G positions on carbon steel pipe, with and without backing ring.</p> | <p>Textbook: pg. 629–637 Lab Workbook Lessons: Lesson 23A, Welding Pipe and Tube Joints—SMAW Lab Workbook Jobs: Job 23A-2, Welding Carbon Steel Pipe in the 2G Position—SMAW; Job 23A-3, Welding Carbon Pipe Uphill in the 5G Position—SMAW; Job 23A-4, Welding Carbon Steel Pipe Downhill in the 5G Position—SMAW; Job 23A-5, Welding Carbon Steel Pipe in the 6G Position—SMAW</p> |
| <p>4. Passes a 6G welder performance qualification test on carbon steel pipe with or without backing ring.</p> | <p>Textbook: pg. 629–637 Lab Workbook Lessons: Lesson 23A, Welding Pipe and Tube Joints—SMAW Lab Workbook Jobs: Job 23A-5, Welding Carbon Steel Pipe in the 6G Position—SMAW</p> |
| MODULE 8: Gas Metal Arc Welding (GMAW)—Plate | |
| Spray Transfer (carbon steel) | |
| <p>1. Performs GMAW equipment safety inspection, operator maintenance, sets up, and operates GMAW equipment in spray transfer mode on carbon steel plate.</p> | <p>Textbook: pg. 173–190, 206–224 Lab Workbook Lessons: Lesson 7, GMAW and FCAW Equipment and Supplies; Lesson 8A, Gas Metal and Flux Cored Arc Welding Safety; Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C Setting Up a Gas Metal or Flux Cored Arc Welding Station Lab Workbook Jobs: Job 8D-1, Inspecting and Setting Up an GMAW/FCAW Station; Job 8D-2, Adjusting GMAW and FCAW Welding Machines and Guns</p> |

Correlation of *Modern Welding* to AWS SENSE Level II—page 9

| Key Indicators | G-W Content |
|--|--|
| 2. Makes multiple pass groove welds in the 1G position on carbon steel plate with backing, using GMAW spray transfer. | Textbook: pg. 224–225, 228–230 Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds Lab Workbook Jobs: Job 8D-5, Groove Welds on Square-Groove Butt Joints in the Flat Welding Position |
| 3. Passes a 1G position unlimited thickness welder performance qualification test on carbon steel plate with backing, using GMAW spray transfer. | Textbook: pg. 228–230 Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds Lab Workbook Jobs: Job 8D-5, Groove Welds on Square-Groove Butt Joints in the Flat Welding Position |
| Pulsed Spray Transfer (carbon steel) | |
| 4. Sets up for GMAW-P and operates GMAW equipment on carbon steel plate in pulsed spray transfer mode. | Textbook: pg. 173–190, 206–224 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 5. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on carbon steel plate using GMAW-P. | Textbook: pg. 231–236 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 6. Makes multiple pass groove welds in the 3G and 4G position on carbon steel plate with and without backing, using GMAW-P. | Textbook: pg. 233–236 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 7. Passes 3G and 4G position unlimited thickness welder performance qualification tests on carbon steel plate with or without backing, using GMAW-P. | Textbook: pg. 233–236 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| Pulsed Spray Transfer (stainless steel) | |
| 8. Sets up for GMAW-P and operates GMAW equipment on carbon steel plate with stainless steel electrode in pulsed spray transfer mode. | Textbook: pg. 173–190, 206–224, 580–591 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 9. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on carbon steel plate with stainless steel electrode, using GMAW-P. | Textbook: pg. 231–236 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 10. Makes multiple pass groove welds in the 3G and 4G position on carbon steel plate with stainless steel electrode, with and without backing, using GMAW-P. | Textbook: pg. 233–236 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| Spray Transfer (aluminum) | |

Correlation of *Modern Welding* to AWS SENSE Level II—page 10

| Key Indicators | G-W Content |
|--|--|
| 11. Sets up for GMAW spray transfer and operates GMAW equipment in spray transfer mode on aluminum plate. | Textbook: pg. 173–190, 206–224, 598–604 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 12. Makes multiple pass fillet welds in the 1F and 2F positions on aluminum plate using GMAW spray transfer. | Textbook: pg. 228–233 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 13. Makes multiple pass groove welds in the 1G position on aluminum plate with backing using GMAW spray transfer. | Textbook: pg. 230–231, 598–604 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| 14. Passes a 1G position welder performance qualification test on aluminum plate with backing, using GMAW spray transfer. | Textbook: pg. 230–231, 598–604 Lab Workbook Lessons: Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station; Lesson 8D, GMAW and FCAW Procedures for Flat and Horizontal Welds |
| MODULE 9: Gas Metal Arc Welding (GMAW)—Pipe | |
| Short Circuiting Transfer | |
| 1. Performs a GMAW equipment safety inspection, operator maintenance, sets up, and operates GMAW equipment in short circuiting transfer mode on carbon steel pipe. | Textbook: pg. 173–190, 201–224 Lab Workbook Lessons: Lesson 7, GMAW and FCAW Equipment and Supplies; Lesson 8A, Gas Metal and Flux Cored Arc Welding Safety; Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C Setting Up a Gas Metal or Flux Cored Arc Welding Station Lab Workbook Jobs: Job 8D-1, Inspecting and Setting Up an GMAW/FCAW Station; Job 8D-2, Adjusting GMAW and FCAW Welding Machines and Guns |
| 2. Makes multiple pass fillet welds in the 2F, 4F, and 5F positions on carbon steel pipe to plate using GMAW-S. | Textbook: pg. 603, 637–640, 645–646 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-3, Welding Carbon Steel Pipe to Plate—GMAW |

Correlation of *Modern Welding* to AWS SENSE Level II—page 11

| Key Indicators | G-W Content |
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| <p>3. Makes multiple pass groove welds in the 2G, 5G, and 6G positions on carbon steel pipe with and without backing ring, using GMAW-S.</p> | <p>Textbook: pg. 635–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-1, Welding Carbon Steel Pipe in the 2G and 5G Positions—GMAW; Job 23B-2, Welding Carbon Steel Pipe in the 6G Position—GMAW</p> |
| <p>4. Passes a 6G position welder performance qualification test on carbon steel pipe, with or without backing ring, using GMAW-S.</p> | <p>Textbook: pg. 634–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-2, Welding Carbon Steel Pipe in the 6G Position—GMAW</p> |
| <p>Spray Transfer</p> | |
| <p>5. Sets up for GMAW spray transfer and operates GMAW equipment in spray transfer mode on carbon steel pipe.</p> | <p>Textbook: pg. 173–190, 205–224 Lab Workbook Lessons: Lesson 7, GMAW and FCAW Equipment and Supplies; Lesson 8A, Gas Metal and Flux Cored Arc Welding Safety; Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C Setting Up a Gas Metal or Flux Cored Arc Welding Station Lab Workbook Jobs: Job 8D-1, Inspecting and Setting Up an GMAW/FCAW Station; Job 8D-2, Adjusting GMAW and FCAW Welding Machines and Guns</p> |
| <p>6. Makes multiple pass fillet welds in the 2F position on carbon steel pipe to plate using GMAW spray transfer.</p> | <p>Textbook: pg. 637–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-5, Welding Carbon Steel Pipe to Plate—GMAW</p> |
| <p>7. Makes multiple pass groove welds in the 1G position on carbon steel pipe with GMAW-S root and remainder with GMAW spray transfer.</p> | <p>Textbook: pg. 634–637 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW</p> |
| <p>8. Passes a 1G position welder performance qualification test on carbon steel pipe with GMAW-S root and remainder with GMAW spray transfer.</p> | <p>Textbook: pg. 634–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW</p> |
| <p>Pulsed Spray Transfer</p> | |
| <p>9. Sets up for GMAW-P and operates GMAW equipment in pulsed spray transfer mode on carbon steel pipe.</p> | <p>Textbook: pg. 173–190, 206–224 Lab Workbook Lessons: Lesson 8A, Gas Metal and Flux Cored Arc Welding Safety; Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station Lab Workbook Jobs: Job 8D-1, Inspecting and Setting Up an GMAW/FCAW Station; Job 8D-2, Adjusting GMAW and FCAW Welding Machines and Guns</p> |

| Key Indicators | G-W Content |
|--|---|
| <p>10. Makes multiple pass fillet welds in the 2F, 4F, and 5F positions on carbon steel pipe to plate using GMAW-P.</p> | <p>Textbook: pg. 603, 637–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-5, Welding Carbon Steel Pipe to Plate—GMAW</p> |
| <p>11. Makes multiple pass groove welds in the 2G, 5G, and 6G positions on carbon steel pipe, with and without backing ring, using GMAW-P.</p> | <p>Textbook: pg. 632–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-1, Welding Carbon Steel Pipe in the 2G and 5G Positions—GMAW; Job 23B-2, Welding Carbon Steel Pipe in the 6G Position—GMAW</p> |
| <p>12. Passes a 6G position welder performance qualification test on carbon steel pipe, with or without backing ring, using GMAW-P.</p> | <p>Textbook: pg. 632–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-2, Welding Carbon Steel Pipe in the 6G Position—GMAW</p> |
| <p>MODULE 10: Flux Cored Arc Welding (FCAW)—Plate</p> | |
| <p>FCAW-G</p> | |
| <p>1. Performs FCAW equipment safety inspection, operator maintenance, sets up, and operates FCAW equipment with shielding gas (FCAW-G) on carbon steel plate.</p> | <p>Textbook: pg. 174–181, 184–195, 205–206 Lab Workbook Lessons: Lesson 8A, Gas Metal and Flux Cored Arc Welding Safety; Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station Lab Workbook Jobs: Job 8D-1, Inspecting and Setting Up an GMAW/FCAW Station; Job 8D-2, Adjusting GMAW and FCAW Welding Machines and Guns</p> |
| <p>2. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on carbon steel plate using FCAW-G.</p> | <p>Textbook: pg. 231–236 Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for the Flat and Horizontal Welds; Lesson 8E, GMAW and FCAW Procedures for Vertical and Overhead Welds Lab Workbook Jobs: Job 8D-8, Fillet Welds on T-Joints in the Horizontal Welding Position—FCAW; Job 8E-3, Fillet Welds on T-Joints in the Vertical Welding Position—FCAW; Job 8E-7, Fillet Welds on T-Joints in the Overhead Welding Position—FCAW</p> |
| <p>3. Makes multiple pass groove welds in the 3G and 4G positions on carbon steel plate using FCAW-G with and without backing.</p> | <p>Textbook: pg. 233–236 Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for the Flat and Horizontal Welds; Lesson 8E, GMAW and FCAW Procedures for Vertical and Overhead Welds Lab Workbook Jobs: Job 8E-4, Groove Welds on Square-Groove Butt Joints in the Vertical Welding Position</p> |

| Key Indicators | G-W Content |
|--|---|
| <p>4. Passes 3G and 4G position, unlimited thickness FCAW-G welder performance qualification test on carbon steel plate with or without backing.</p> | <p>Textbook: pg. 233–236</p> <p>Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for the Flat and Horizontal Welds; Lesson 8E, GMAW and FCAW Procedures for Vertical and Overhead Welds</p> <p>Lab Workbook Jobs: Job 8E-4, Groove Welds on Square-Groove Butt Joints in the Vertical Welding Position</p> |
| FCAW-S | |
| <p>1. Sets up for FCAW-S and performs FCAW-S operations on carbon steel plate.</p> | <p>Textbook: pg. 174–181, 184–195, 205–206</p> <p>Lab Workbook Lessons: Lesson 8A, Gas Metal and Flux Cored Arc Welding Safety; Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station</p> <p>Lab Workbook Jobs: Job 8D-1, Inspecting and Setting Up an GMAW/FCAW Station; Job 8D-2, Adjusting GMAW and FCAW Welding Machines and Guns</p> |
| <p>2. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on carbon steel plate using FCAW-S.</p> | <p>Textbook: pg. 231–236</p> <p>Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for the Flat and Horizontal Welds; Lesson 8E, GMAW and FCAW Procedures for Vertical and Overhead Welds</p> <p>Lab Workbook Jobs: Job 8D-8, Fillet Welds on T-Joints in the Horizontal Welding Position—FCAW; Job 8E-3, Fillet Welds on T-Joints in the Vertical Welding Position—FCAW; Job 8E-7, Fillet Welds on T-Joints in the Overhead Welding Position—FCAW</p> |
| <p>3. Makes multiple pass groove welds in the 3G & 4G positions on carbon steel using FCAW-S with and without backing.</p> | <p>Textbook: pg. 233–236</p> <p>Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for the Flat and Horizontal Welds; Lesson 8E, GMAW and FCAW Procedures for Vertical and Overhead Welds</p> <p>Lab Workbook Jobs: Job 8E-4, Groove Welds on Square-Groove Butt Joints in the Vertical Welding Position</p> |
| <p>4. Passes 3G & 4G position unlimited thickness FCAW-S welder performance qualification tests on carbon steel plate with or without backing.</p> | <p>Textbook: pg. 233–236</p> <p>Lab Workbook Lessons: Lesson 8D, GMAW and FCAW Procedures for the Flat and Horizontal Welds; Lesson 8E, GMAW and FCAW Procedures for Vertical and Overhead Welds</p> <p>Lab Workbook Jobs: Job 8E-4, Groove Welds on Square-Groove Butt Joints in the Vertical Welding Position</p> |
| MODULE 11: Flux Cored Arc Welding (FCAW)—Pipe | |

Correlation of *Modern Welding* to AWS SENSE Level II—page 14

| Key Indicators | G-W Content |
|--|---|
| <p>1. Performs FCAW equipment safety inspection, operator maintenance, sets up, and operates FCAW equipment with shielding gas (FCAW-G) on carbon steel pipe.</p> | <p>Textbook: pg. 174–181, 184–195, 205–206 Lab Workbook Lessons: Lesson 8A, Gas Metal and Flux Cored Arc Welding Safety; Lesson 8B, Gas Metal and Flux Cored Arc Welding Principles; Lesson 8C, Setting Up a Gas Metal or Flux Cored Arc Welding Station Lab Workbook Jobs: Job 8D-1, Inspecting and Setting Up an GMAW/FCAW Station; Job 8D-2, Adjusting GMAW and FCAW Welding Machines and Guns</p> |
| <p>2. Makes multiple pass fillet welds in the 2F, 4F, and 5F positions on carbon steel pipe to plate using FCAW-G.</p> | <p>Textbook: pg. 638–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-5, Welding Carbon Steel Pipe to Plate—FCAW-G</p> |
| <p>3. Makes multiple pass groove welds in the 2G, 5G, and 6G positions on carbon steel pipe with and without backing ring, using FCAW-G.</p> | <p>Textbook: pg. 632–640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-4, Welding Carbon Steel Pipe in the 2G and 5G Positions—FCAW-G</p> |
| <p>4. Passes a 6G welder performance qualification test on carbon steel pipe with GMAW-S or GTAW root with or without backing ring and remainder using FCAW-G.</p> | <p>Textbook: pg. 632-640 Lab Workbook Lessons: Lesson 23B, Welding Pipe and Tube Joints—GMAW and FCAW Lab Workbook Jobs: Job 23B-4, Welding Carbon Steel Pipe in the 2G and 5G Positions—FCAW-G</p> |
| <p>MODULE 12: Gas Tungsten Arc Welding (GTAW)—Plate</p> | |
| <p>Carbon Steel</p> | |
| <p>1. Performs GTAW equipment safety inspection, operator maintenance, sets up, and operates GTAW equipment on carbon steel plate.</p> | <p>Textbook: pg. 247–266, 277–292 Lab Workbook Lessons: Lesson 9, GTAW Equipment and Supplies; Lesson 10A, Gas Tungsten Arc Welding Safety; Lesson 10B, Gas Tungsten Arc Welding Principles; Lesson 10-C, Gas Tungsten Arc Welding Procedures Lab Workbook Jobs: Job 10C-1, Inspecting and Setting Up a GTAW Station; Job 10C-2, Bead on Plate—Carbon Steel</p> |
| <p>2. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on carbon steel plate.</p> | <p>Textbook: pg. 294–300 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures Lab Workbook Jobs: Job 10C-6, Fillet Welds on Lap Joints in the Horizontal Welding Position; Job 10C-7, Fillet Welds on Inside Corner Joints in the Horizontal Welding Position; Job 10C-9, Fillet Welds on Lap Joints in the Vertical Welding Position; Job 10C-10, Fillet Welds on T-Joints in the Vertical Welding Position; Job 10C-12, Fillet Welds on Lap Joints in the Overhead Welding Position; Job 10C-13, Fillet Welds on T-Joints in the Overhead Welding Position</p> |

Correlation of *Modern Welding* to AWS SENSE Level II—page 15

| Key Indicators | G-W Content |
|---|---|
| <p>3. Makes multiple pass groove welds in the 3G and 4G positions on carbon steel plate with and without backing.</p> | <p>Textbook: pg. 299–300 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures Lab Workbook Jobs: Job 10C-11, Groove Welds on Square-Groove Butt Joints in the Vertical Welding Position; Job 10C-14, Groove Welds on Square-Groove Butt Joints in the Overhead Welding Position</p> |
| <p>4. Passes 3G and 4G position welder performance qualification tests on carbon steel plate with or without backing.</p> | <p>Textbook: pg. 299–300 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures Lab Workbook Jobs: Job 10C-11, Groove Welds on Square-Groove Butt Joints in the Vertical Welding Position; Job 10C-14, Groove Welds on Square-Groove Butt Joints in the Overhead Welding Position</p> |
| Stainless Steel | |
| <p>5. Sets up and operates GTAW equipment on carbon steel plate using stainless steel filler metal.</p> | <p>Textbook: pg. 247–266, 277–292, 302 Lab Workbook Lessons: Lesson 9, GTAW Equipment and Supplies; Lesson 10A, Gas Tungsten Arc Welding Safety; Lesson 10B, Gas Tungsten Arc Welding Principles; Lesson 10-C, Gas Tungsten Arc Welding Procedures; Lesson 21, Special Ferrous Welding Applications Lab Workbook Jobs: Job 10D-1, Bead on Plate—Stainless Steel</p> |
| <p>6. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on carbon steel plate using stainless steel filler metal.</p> | <p>Textbook: pg. 296–302, 580–590 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures; Lesson 21, Special Ferrous Welding Applications Lab Workbook Jobs: Job 10D-2, Fillet Welds on Lap Joints—Stainless Steel; Job 10D-3, Fillet Welds on T-Joints—Stainless Steel</p> |
| <p>7. Makes multiple pass groove welds in the 3G and 4G positions on carbon steel plate using stainless steel filler metal, with and without backing.</p> | <p>Textbook: pg. 299–302, 580–590 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures; Lesson 21, Special Ferrous Welding Applications Lab Workbook Jobs: Job 10D-4, Groove Welds on Square-Groove Butt Joints—Stainless Steel; Job 10D-5, V-Groove Weld on Plate—Stainless Steel</p> |
| <p>8. Passes 3G and 4G position welder performance qualification tests on carbon steel plate using stainless steel filler metal, with or without backing.</p> | <p>Textbook: pg. 299–302, 580–590 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures; Lesson 21, Special Ferrous Welding Applications Lab Workbook Jobs: Job 10D-4, Groove Welds on Square-Groove Butt Joints—Stainless Steel; Job 10D-5, V-Groove Weld on Plate—Stainless Steel</p> |
| Aluminum | |

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| Key Indicators | G-W Content |
|--|---|
| 9. Sets up and operates GTAW equipment on aluminum plate. | Textbook: pg. 247–266, 277–292, 302 Lab Workbook Lessons: Lesson 9, GTAW Equipment and Supplies; Lesson 10A, Gas Tungsten Arc Welding Safety; Lesson 10B, Gas Tungsten Arc Welding Principles; Lesson 10-C, Gas Tungsten Arc Welding Procedures; Lesson 22, Nonferrous Welding Applications Lab Workbook Jobs: Job 10E-1, Bead on Plate—Aluminum |
| 10. Makes multiple pass fillet welds in the 2F, 3F, and 4F positions on aluminum plate. | Textbook: pg. 296–302, 598–604 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures; Lesson 22, Nonferrous Welding Applications Lab Workbook Jobs: Job 10E-2, Fillet Welds on Lap Joints—Aluminum; Job 10E-3, Fillet Welds on T-Joints—Aluminum; Job 22-1, Groove Welds and Fillet Welds on Aluminum—GTAW |
| 11. Makes multiple pass groove welds in the 3G and 4G positions on aluminum plate, with and without backing. | Textbook: pg. 299–302, 598–604 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures; Lesson 22, Nonferrous Welding Applications Lab Workbook Jobs: Job 10E-4, Groove Welds on Square-Groove Butt Joints—Aluminum; Job 22-1, Groove Welds and Fillet Welds on Aluminum—GTAW |
| 12. Passes 3G and 4G position welder performance qualification tests on aluminum plate, with or without backing. | Textbook: pg. 299–302, 598–604 Lab Workbook Lessons: Lesson 10C, Gas Tungsten Arc Welding Procedures; Lesson 22, Nonferrous Welding Applications Lab Workbook Jobs: Job 10E-4, Groove Welds on Square-Groove Butt Joints—Aluminum; Job 22-1, Groove Welds and Fillet Welds on Aluminum—GTAW |
| MODULE 13: Gas Tungsten Arc Welding (GTAW)—Pipe | |
| Carbon Steel | |
| 1. Performs GTAW equipment safety inspection, operator maintenance, sets up, and operates GTAW equipment on carbon steel pipe. | Textbook: pg. 247–266, 277–292 Lab Workbook Lessons: Lesson 9, GTAW Equipment and Supplies; Lesson 10A, Gas Tungsten Arc Welding Safety; Lesson 10B, Gas Tungsten Arc Welding Principles; Lesson 10-C, Gas Tungsten Arc Welding Procedures; Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 10C-1, Inspecting and Setting Up a GTAW Station |
| 2. Makes multiple pass fillet welds in the 2F, 4F, and 5F positions on carbon steel pipe to plate. | Textbook: pg. 293–300, 623–624 Lab Workbook Lessons: Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 23C-2, Welding Carbon Steel Pipe to Plate—GTAW |

Correlation of *Modern Welding* to AWS SENSE Level II—page 17

| Key Indicators | G-W Content |
|---|---|
| <p>3. Makes multiple pass groove welds in the 2G, 5G, and 6G position on carbon steel pipe, with and without backing ring.</p> | <p>Textbook: pg. 634–637, 640–644 Lab Workbook Lessons: Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 23C-1, Welding Carbon Steel Pipe in the 2G and 5G Welding Positions—GTAW</p> |
| <p>4. Passes a 6G position multiple pass welder performance qualification test on carbon steel pipe, with or without backing ring.</p> | <p>Textbook: pg. 634–637, 640–644 Lab Workbook Lessons: Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 23C-1, Welding Carbon Steel Pipe in the 2G and 5G Welding Positions—GTAW</p> |
| <p>Stainless Steel</p> | |
| <p>5. Sets up and operates GTAW equipment on carbon steel pipe using stainless steel filler metal.</p> | <p>Textbook: pg. 247–266, 277–292 Lab Workbook Lessons: Lesson 9, GTAW Equipment and Supplies; Lesson 10A, Gas Tungsten Arc Welding Safety; Lesson 10B, Gas Tungsten Arc Welding Principles; Lesson 10-C, Gas Tungsten Arc Welding Procedures; Lesson 21, Special Ferrous Welding Applications; Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 10C-1, Inspecting and Setting Up a GTAW Station</p> |
| <p>6. Makes multiple fillet welds in the 2F, 4F, and 5F position on carbon steel pipe to plate, with stainless steel filler metal.</p> | <p>Textbook: pg. 293–300, 580–590, 623–624 Lab Workbook Lessons: Lesson 21, Special Ferrous Welding Applications; Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 23C-2, Welding Carbon Steel Pipe to Plate—GTAW</p> |
| <p>7. Makes multiple pass groove welds 2G, 5G, and 6G positions on carbon steel pipe using stainless steel filler, with and without backing ring.</p> | <p>Textbook: pg. 580–590, 634–637, 640–644 Lab Workbook Lessons: Lesson 21, Special Ferrous Welding Applications; Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 23C-1, Welding Carbon Steel Pipe in the 2G and 5G Welding Positions—GTAW</p> |
| <p>8. Passes a 6G position welder performance qualification test on carbon steel pipe using stainless steel filler metal, with or without backing ring.</p> | <p>Textbook: pg. 580–590, 634–637, 640–644 Lab Workbook Lessons: Lesson 21, Special Ferrous Welding Applications; Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 23C-1, Welding Carbon Steel Pipe in the 2G and 5G Welding Positions—GTAW</p> |
| <p>Optional Welder Performance Qualification</p> | |
| <p>9. Passes a 6G welder performance qualification test on 2.75 in diameter schedule 180 carbon steel pipe with GTAW root and optional first intermediate pass, and SMAW intermediate and cover passes.</p> | <p>Textbook: pg. 580–590, 633–637, 640–644 Lab Workbook Lessons: Lesson 23C, Welding Pipe and Tube Joints with GTAW Lab Workbook Jobs: Job 23C-1, Welding Carbon Steel Pipe in the 2G and 5G Welding Positions—GTAW</p> |

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| Key Indicators | G-W Content |
|---|---|
| MODULE 14: Welding Fabrication | |
| Unit 1: Introduction to Shop Equipment | |
| 1. Follows safe operating procedures. | Textbook: pg. 3–24, 838–842, 847–848 Lab Workbook Lessons: Lesson 1A, General Shop Safety; Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 2. Selects shop equipment. | Textbook: pg. 833–842 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 3. Sets up shop equipment. | Textbook: pg. 833–842 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 4. Selects layout tools. | Textbook: pg. 626–631, 843 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 5. Operates shop equipment. | Textbook: pg. 834–843 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 6. Operates lifting equipment. | Textbook: pg. 840–841 Lab Workbook Lessons: Lesson 32, The Welding Shop |
| Unit 2: Layout Principles and Practice | |
| 1. Performs calculations related to parts preparation and component assembly. | Textbook: pg. 32–33, 838 Lab Workbook Lessons: Lesson 3A, Welding Joints and Positions; Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 2. Possesses a working knowledge of fixtures and positioners used in welding fabrication. | Textbook: pg. 841 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 3. Prepares material lists. | Textbook: pg. 843–847 Lab Workbook Lessons: Lesson 32, The Welding Shop |
| 4. Selects materials. | Textbook: pg. 843–845 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |

| Key Indicators | G-W Content |
|--|--|
| 5. Lays out materials. | Textbook: pg. 28, 838 Lab Workbook Lessons: Lesson 2, Print Reading; Lesson 3A, Welding Joints and Positions; Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| Unit 3: Preparation, Fitup and Fabrication | |
| 1. Performs bending or forming operations. | Textbook: pg. 837–838 Lab Workbook Lessons: Lesson 32, The Welding Shop |
| 2. Performs drilling, punching, or boring operations. | Textbook: pg. 837–838, 842–843 Lab Workbook Lessons: Lesson 32, The Welding Shop |
| 3. Performs shearing and cutting operations. | Textbook: pg. 836–837 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 4. Fits up parts or accessories. | Textbook: pg. 46–47, 223–224, 290, 626–633 Lab Workbook Lessons: Lesson 32, The Welding Shop Lab Workbook Jobs: All welding jobs. |
| 5. Passes a welding fabrication workmanship performance qualification test on carbon steel with or without pipe. | Textbook: pg. 46–47, 223–224, 290, 626–633, 834–840 Lab Workbook Lessons: Lesson 32, The Welding Shop |