

Advanced Manufacturing Welding

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A Principles of Welding Technology 7110

a Domain: Welding Fundamentals 7110.D1

- 1 Understand and identify welding symbols and blueprints. 7110.D1.1
- 2 Discuss the need for workplace safety and workplace safety training programs as covered by the OSHA 10 Hour program 7110.D1.2
- 3 Demonstrate basic welding techniques using virtual welding simulator. 7110.D1.3
- 4 Learn proper AWS Standard Welding Terms and Definitions. 7110.D1.4
- 5 Effectively analyze and apply Metallurgy fundamentals to welding processes. 7110.D1.5
- 6 Identify the five basic welding joints. 7110.D1.6
- 7 Understand and identify welding defects and discontinuities. 7110.D1.7
- 8 Understand how to interpret Weld Procedure Specifications (WPSs) and their purpose. 7110.D1.8
- 9 Demonstrate the use of oxy fuel welding and cutting. 7110.D1.9
- 10 Demonstrate the use of plasma arc cutting. 7110.D1.10
- 11 Discuss the current trends and opportunities in the welding field. 7110.D1.11
- 12 Attain readiness to take OSHA 10 Hour General Industry Certification exam 7110.D1.12
- 13 Demonstrate ability to read and interpret technical documents. Apply that knowledge to steel fabrication. 7110.D1.13
- 14 Utilize welding symbols to make appropriate welds according to code. 7110.D1.14
- 15 Understand the basic concepts of sketching and drawing blueprints. 7110.D1.15
- 16 Understand and apply welding symbol terminology and theory to industry applications 7110.D1.16
- 17 Demonstrate ability to use various types of software applicable to course. 7110.D1.17

b Domain: Plasma Arc Cutting 7110.D2

- 1 Understand and apply learned skills to be able to operate CNC plasma cutting equipment 7110.D2.1
 - 2 Use CAD software to design parts 7110.D2.2
 - 3 Perform basic maintenance on all required equipment 7110.D2.3
 - 4 Utilize equipment to its full capability 7110.D2.4
 - 5 Use proper terminology as it applies to Plasma Arc Cutting 7110.D2.5
 - 6 Show they understand safe work practices 7110.D2.6
 - 7 Apply learned skills to cut and fabricate a project 7110.D2.7
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B Shielded Metal Arc Welding 7111

a Domain: Shielded Metal Arc Welding 7111.D1

- 1 Demonstrate electric welding equipment safety. 7111.D1.1
- 2 Understand and apply all shielded metal arc welding safety rules. 7111.D1.2
- 3 Identify the five basic welding joints. 7111.D1.3
- 4 Identify heat input and metal distortion. 7111.D1.4
- 5 Describe the capabilities of electric welding equipment. 7111.D1.5
- 6 Weld with A.C. and D.C. current. 7111.D1.6
- 7 Prepare and tack weld coupons. 7111.D1.7
- 8 Make single and multi-pass welds. 7111.D1.8
- 9 Weld in the flat, horizontal, vertical, and the overhead position. 7111.D1.9
- 10 Identify SMAW electrodes and AWS electrode classification. 7111.D1.10
- 11 Describe D.C. straight and reverse polarity. 7111.D1.11
- 12 Describe proper electrode manipulation for each type of electrode. 7111.D1.12
- 13 Describe proper correct technique for each welding position and electrode type. 7111.D1.13
- 14 Demonstrate ability to read and interpret technical documents. 7111.D1.14
- 15 Demonstrate ability to use various types of software applicable to course. 7111.D1.15

b Domain: Advanced Shielded Metal Arc Welding 7111.D2

- 1 Describe differences in currents and polarities; AC, DC Reverse and DC Straight. 7111.D2.1
- 2 Explain how to safely use SMAW equipment. 7111.D2.2
- 3 Describe the AWS electrode identification system for SMA process. 7111.D2.3
- 4 Perform fillet welds on .5" to 1" plate (21-bead multi-pass) in horizontal, vertical, .3and overhead positions. 7111.D2.4
- 5 Describe how to control magnetic arc blow in DC welding of groove welds. 7111.D2.5
- 6 Prepare and tack groove welds as to AWS D1.1 Structural Steel Code. 7111.D2.6
- 7 Perform 3/8"and 1" groove welds as per AWS and ASME Code, in all positions. 7111.D2.7
- 8 Perform air carbon arc gouging on steel groove welds. 7111.D2.8
- 9 Describe heat input and metal warpage and distortion. 7111.D2.9
- 10 Describe methods of destructive and non-destructive testing. 7111.D2.10
- 11 Attain readiness to take American Welding Society certification exam 7111.D2.11
- 12 Demonstrate ability to read and interpret technical documents. 7111.D2.12
- 13 Demonstrate ability to use various types of software applicable to course. 7111.D2.13

C Gas Welding Processes 7101

a Domain: Gas Metal Arc Welding 7101.D1

- 1 Employ safety practices involved in gas metal arc welding. 7101.D1.1
- 2 Describe constant voltage and wire feed welding processes. 7101.D1.2
- 3 Weld with hard wire using short circuit and spray method welding. 7101.D1.3
- 4 Weld with flux-core tubular wires. 7101.D1.4
- 5 Weld aluminum with spray. 7101.D1.5
- 6 Identify the gases used in gas metal arc welding. 7101.D1.6
- 7 Perform routine maintenance on gas metal arc welding equipment. 7101.D1.7
- 8 Identify and weld five (5) basic types of joints. 7101.D1.8
- 9 Demonstrate ability to read and interpret technical documents. 7101.D1.9
- 10 Demonstrate ability to use various types of software applicable to course. 7101.D1.10

b Domain: Advanced Gas Metal Arc Welding 7101.D2

- 1 Demonstrate the proper safety procedures in Gas Metal Arc welding. 7101.D2.1
- 2 Learn proper AWS Standard Welding Terms and Definition. 7101.D2.2
- 3 Perform weld restarts that are smooth and even with GMAW using short circuiting transfer equipment on mild steel. 7101.D2.3
- 4 Perform lap and tee joint welds with GMAW using short circuiting transfer equipment on mild steel in the vertical up, vertical down and overhead position. 7101.D2.4
- 5 Perform square groove welds with GMAW using short circuiting transfer equipment on mildsteel in the vertical up, vertical down and overhead position. 7101.D2.5
- 6 Perform lap and tee joint welds with GMAW using spray equipment on thick mild steel in the flat and horizontal position. 7101.D2.6
- 7 Perform V-Groove welds with GMAW using spray equipment on thick mild steel in the flat position. 7101.D2.7
- 8 Perform lap, tee, and groove welds with GMAW equipment on aluminum. 7101.D2.8
- 9 Understand welding procedure specifications (WPS) and be able to follow them. 7101.D2.9
- 10 Understand the basic metallurgical properties of steel and aluminum and how they are affected by welding. 7101.D2.10
- 11 Understand the significance of the suffix in GMAW electrode selection. 7101.D2.11
- 12 Prepare to create a workmanship sample weldment for GMAW following the AWS provided prints. 7101.D2.12
- 13 Gain insight into the Certification for AWS welders 7101.D2.13
- 14 Attain readiness to take American Welding Society certification exam 7101.D2.14
- 15 Demonstrate ability to read and interpret technical documents. 7101.D2.15
- 16 Demonstrate ability to use various types of software applicable to course. 7101.D2.16

D Welding Technology Capstone 7226

a Domain: Gas Tungsten Arc Welding 7226.D1

- 1** Interpret welding symbols and demonstrate how they apply to shop drawings. 7226.D1.1
- 2** Identify the various joint configurations and explain how they affect weld strength. 7226.D1.2
- 3** Employ and practice safety procedures and practices used in the welding industry. 7226.D1.3
- 4** Identify and describe the function of each component of a GTAW station. 7226.D1.4
- 5** Identify and specify GTAW electrodes using the AWS electrode classification system. 7226.D1.5
- 6** Identify and specify GTAW filler metals using the AWS filler metal classification system. 7226.D1.6
- 7** Explain the effects of DCEN, DCEP, and AC current on electrode life, surface cleaning, and weld characteristics. 7226.D1.7
- 8** Describe the shielding gases used for GTAW, describe their characteristics and their uses. 7226.D1.8
- 9** Select the proper power source, current type, shielding gas, flow rate, electrode type and diameter, nozzle size, and filler metal. 7226.D1.9
- 10** Properly assemble and adjust all variables required to produce acceptable GTA welds. 7226.D1.10
- 11** Properly prepare tungsten electrodes for welding with AC or DC current. 7226.D1.11
- 12** Demonstrate the use of square wave and pulse welding technology and how it applies to GTAW. 7226.D1.12
- 13** Properly prepare metals for welding. 7226.D1.13
- 14** Identify different types of weld defects and describe steps to prevent them. 7226.D1.14
- 15** Describe welding characteristics for Mild Steel, Stainless Steel, and Aluminum and other weldable metals. 7226.D1.15
- 16** Demonstrate welding on various types of metals. 7226.D1.16

b Domain: Advanced Gas Tungsten Arc Welding 7226.D2

- 1 Demonstrate the proper safety procedures in Gas Tungsten Arc welding. 7226.D2.1
- 2 Learn proper AWS Standard Welding Terms and Definition. 7226.D2.2
- 3 Setup and shut down of a Gas Tungsten Arc station properly and safely. 7226.D2.3
- 4 Select and determine the proper electrode and nozzle size for a job. 7226.D2.4
- 5 Understand welding procedure specifications (WPS) and be able to follow them. 7226.D2.5
- 6 Perform destruction testing with appropriate welds. 7226.D2.6
- 7 Perform proper techniques of preparation of tungsten electrodes. 7226.D2.7
- 8 Perform balling of tungsten electrodes in preparation for aluminum welding. 7226.D2.8
- 9 Gain insight into the Certification for AWS welders. 7226.D2.9
- 10 Practice welding, following WPS and instructor's guidelines. 7226.D2.10
- 11 Lap/T/Square groove/w/wire on 10ga.steel. 7226.D2.11
- 12 Lap/T/Square groove on 10ga. Stainless Steel. 7226.D2.12
- 13 Lap/T on 10ga. Aluminum. 7226.D2.13
- 14 Workmanship sample prints; steel, stainless steel, aluminum. 7226.D2.14
- 15 Attain readiness to take American Welding Society certification exam. 7226.D2.15
- 16 Demonstrate ability to read and interpret technical documents. 7226.D2.16

c Domain: Pipe Welding 7226.D3

- 1 Understand and apply all shielded metal arc pipe welding and gas tungsten arc welding safety rules. 7226.D3.1
- 2 Apply American Welding Society D1.1 code welding criteria to guided bend tests. 7226.D3.2
- 3 Utilize and apply shielded metal arc pipe welding process and gas tungsten arc welding fundamentals to pass AWS welding certifications. 7226.D3.3
- 4 Apply all appropriate equipment settings and adjustments. 7226.D3.4
- 5 Understand and apply the basic principles and terminology involved in destructive weld testing. 7226.D3.5
- 6 Employ safety procedures in preparation of and welding of pipe. 7226.D3.6
- 7 Perform the proper technique for preparing the pipe for welding. 7226.D3.7
- 8 Tack pipe in 2G and 5G position. 7226.D3.8
- 9 Weld pipe in the 2G position with the stringer bead method. 7226.D3.9
- 10 Weld pipe in the 5G position with the stringer or weave bead method. 7226.D3.10
- 11 Prepare pipe for weld test. 7226.D3.11
- 12 Demonstrate ability to inspect weld joint before, during and after welding. 7226.D3.12
- 13 Demonstrate ability to read and interpret technical documents. 7226.D3.13

d Domain: Fabrication 7226.D4

- 1 Describe equipment used in basic metal fabrication. 7226.D4.1
- 2 Use measuring equipment. 7226.D4.2
- 3 Prepare a bill of materials from a print chosen for project. 7226.D4.3
- 4 Prepare a list of fabrication steps necessary to fabricate this project. 7226.D4.4
- 5 Layout the various tolerances, fits and allowances related to this project. 7226.D4.5
- 6 Layout the assigned project. 7226.D4.6
- 7 Fabricate the assigned project. 7226.D4.7
- 8 Perform visual inspection of project. 7226.D4.8
- 9 Produce a detailed drawing of project with welding symbols. 7226.D4.9
- 10 Demonstrate ability to read and interpret technical documents. 7226.D4.10