Indiana CTE

Advanced Manufacturing Welding

Advanced Manufacturing Welding Technology

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

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 the2G 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