Oregon CTE

Manufacturing: Welding

Demonstrate an understanding of the Properties of Metallurgy FA-MNWL001	**A** Describe the mechanical properties of metals and their importance in the welding process including tensile, strength, hardness, elasticity, ductility, toughness, and brittleness FA-MNWL001.A
	B Demonstrate techniques to mitigate the effects of thermal expansion and contraction that occur during the welding process FA-MNWL001.B
	C Explain the effect that thermal conductivity and specific heat have on various metals such as steel and aluminum FA-MNWL001.C
Demonstrate an understanding of material removal techniques FA-MNWL002	**A** Demonstrate knowledge of angle grinder, die grinders and abrasives FA-MNWL002.A
	B Demonstrate knowledge of Oxy-fuel Cutting (OFC-A) FA-MNWL002.B
	C Demonstrate knowledge of Plasma Arc Cutting (PAC) FA-MNWL002.C
	D Demonstrate knowledge of Air Carbon Arc Cutting (CAC-A) FA-MNWL002.D
Demonstrate an understanding of safety hazards, protective devices used, and operations of Shielded Metal Arc Welding (SMAW) equipment FA-MNWL003	**A** Recognize the AWS filler metal specification system and various electrode characteristics FA-MNWL003.A
	B Describe characteristics of the four main electrode groups FA-MNWL003.B
	C Explain how to select electrodes and describe their proper care and handling FA-MNWL003.C
	D Select the proper electrodes for any given welding task FA-MNWL003.D
	E Perform multi-pass groove welds in all positions according to industry standards FA-MNWL003.E
	F Demonstrate the proper handling and storage of electrodes FA-MNWL003.F
Demonstrate understanding of set-up and procedure for Gas Metal Arc Welding (GMAW) FA-MNWL004	**A** Safely set up equipment for gas metal arc welding (GMAW) FA-MNWL004.A
	B Explain the advantages of GMAW over conventional electro-type arc (stick) welding FA-MNWL004.B
	C Explain factors that affect electrode selection for gas metal arc welding (GMAW) FA-MNWL004.C

	D Use the gas metal arc welding method and various metal transfer methods to demonstrate how to pad beads and make fillet welds on plain carbon steel in all feasible positions FA-MNWL004.D
	E Set-up and perform SMAW-S (short-circuit) multiple-pass V-groove welds on carbon steel plate coupons in multiple positions using solid or composite wire and shielding gas FA-MNWL004.E
	F Perform fillet and groove welds in all positions FA-MNWL004.F
Demonstrate proper set-up and procedure for Flux Cored Arc Welding (FCAW) FA-MNWL005	**A** Safely set up equipment for flux cored welding (FCAW) FA-MNWL005.A
	B Explain multiple factors that affect electrode and shielded gas selection for Flux Cored Arc Welding FA-MNWL005.B
	C Use various electrodes and the Flux Cored Arc Welding process to demonstrate how to pad beads and make filled welds on plain carbon steel in all feasible positions FA-MNWL005.C
	D Explain the distinctive features of Flux Cored Arc Welding FA-MNWL005.D
	E Demonstrate how metal transfer is affected by arc-control, self-shielded, and gas-shielded FCAW FA-MNWL005.E
Demonstrate proper set-up and procedure for Gas Tungsten Arc Welding (GTAW) FA-MNWL006	**A** Safely set up equipment for Gas Tungsten Arc Welding FA-MNWL006.A
	B Explain multiple factors that affect electrode selection for Gas Tungsten Arc Welding FA-MNWL006.B
	C Use various electrodes and the Gas Tungsten Arc Welding process to demonstrate hot to pad beads and make fillet welds on plain carbon steel, stainless steel, and aluminum in all feasible positions FA-MNWL006.C
	D Explain the distinctive features of Gas Tungsten Arc Welding FA-MNWL006.D
Successfully apply various quality control methods to the welding process FA-MNWL007	**A** Describe various defects found in welded products FA-MNWL007.A
	B Discuss the value of having clean material before starting a weld and the importance of doing it right the first time FA-MNWL007.B
	C Differentiate between destructive and nondestructive tests used as quality control techniques to prevent defects FA-MNWL007.C
	D (Measure and visually inspect welded products for acceptability to American Welding Society QC-10 standards FA-MNWL007.D

	E Record discontinuities and defects and compare data to given project specifications; recommend changes to reduce defects in the manufacturing process FA-MNWL007.E
	F Distinguish between the guided-bend test and the free-bend test; explain when it is most appropriate to apply each test; demonstrate the use of each test and properly document results conforming to AWS requirements FA-MNWL007.F
Demonstrate knowledge of math and blueprints that apply to welding design and layout FA-MNWL008	**A** Demonstrate good math skills including basic geometry, fractions, decimals, multiplication, and circle math (e.g., establish radius) FA-MNWL008.A
	B Interpret and demonstrate the planning and layout operations used in the welding process (e.g., interpret scaled welding blueprints, perform calculations, analyze welding symbols, drawings, and specifications) FA-MNWL008.B
	C Identify, sketch, and explain the five basic weld joint designs (i.e., butt, lap, tee, outside corner, and edge) FA-MNWL008.C
Demonstrate knowledge of welding standards and certifications FA-MNWL009	**A** Demonstrate an understanding of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) Development as specified by the American Welding Society FA-MNWL009.A
	B Demonstrate the ability to review a welding procedure specification and conduct a welding procedure test FA-MNWL009.B
	C Demonstrate knowledge of preferred Industry Certifications for welding and the requirements for successful examination FA-MNWL009.C
	D Describe what is required to achieve certification in the following American Welding Society modules: Shielded Metal Arc Welding (SMAW), Gas Metal Arc Welding (GMAW), Flux Cored Arc Welding (FCAW), and Gas Tungsten Arc Welding (GTAW) FA-MNWL009.D