

# STATE OF WYOMING

## MANUFACTURING CLUSTER AND WELDING PATHWAY COMPETENCIES

### Manufacturing Cluster

#### *Cluster Level Core Competencies & Objectives*

#### COMPETENCY

**MFG1**        **The student will understand and apply safe practices and professional machine shop procedures**

#### OBJECTIVES

- MFG1-1    Understand and apply appropriate clothing protection appropriate to the task
- MFG1-2    Locate and properly use protective equipment
- MFG1-3    Identify hazardous and non-hazardous materials
- MFG1-4    Understand and apply appropriate handling, lifting and transport of materials (hazardous and non-hazardous)
- MFG1-5    Understand and apply proper storage, stacking and securing of materials (hazardous and non-hazardous)
- MFG1-6    Apply appropriate disposal of hazardous and non-hazardous materials
- MFG1-7    Demonstrate understanding of legal issues relating to disposal of materials
- MFG1-8    Identify the purposes and use of MSDS sheets

#### COMPETENCY

**MFG2**        **The student will demonstrate proper equipment safety practices**

#### OBJECTIVES

- MFG2-1    Maintain and use appropriate protective guards and equipment on machinery
- MFG2-2    Select appropriate tool for the task
- MFG2-3    Conduct pre-use inspection and set-up of tools
- MFG2-4    Apply proper use of the tool (hand placement, minimum and max material sizes, feed rates)
- MFG2-5    Demonstrate awareness of proper functioning during use of the tool
- MFG2-6    Demonstrate maintenance of the tool (cleaning, lubrication, sharpening)

## **COMPETENCY**

### **MFG 3      The student will demonstrate proper use of emergency equipment and procedures**

- MFG3-1      Demonstrate proper use of fire extinguisher
- MFG3-2      Understand purpose and meaning of fire triangle (covers all areas)
- MFG3-3      Understand and apply evacuation procedures
- MFG3-4      Understand basic first aid to cuts and burns, eye wash, and blood-borne pathogens

## **COMPETENCY**

### **MFG 4      The student will use basic math and measuring skills**

#### **OBJECTIVES**

- MFG4-1      Demonstrate proper use of measuring devices
  - Example: tape measure, rule and square
- MFG4-2      Identify and apply appropriate unit of measurement
- MFG4-3      Able to measure to a specified tolerance
- MFG4-4      Convert fractions/decimals/metric
- MFG4-5      Apply appropriate calculation to the task (add, subtract, multiply, divide)
- MFG4-6      Perform basic layout techniques

## **COMPETENCY**

### **MFG 5      The student will demonstrate knowledge and skills specific to the pathway**

#### **OBJECTIVES**

- MFG5-1      Student demonstrates an understanding of the different career paths and opportunities within a pathway
  - Example (Welding Pathway): Student will demonstrate knowledge of welding opportunities in the oil and natural gas, heavy equipment manufacturing and mining industries within Wyoming.
  - Example (Precision Machining Pathway): Student will demonstrate knowledge of precision machining in the industries within Wyoming
- MFG5-2      The student will be able to interpret drawings, plans and control documents specific to the pathway
- MFG5-3      The student will be able to identify generally used materials specific to the pathway
- MFG5-4      The student will demonstrate ability to complete core processes within the pathway
- MFG5-5      The student will demonstrate proper use of the tool in completing a specific process

## Manufacturing Cluster

### WELDING PATHWAY

#### *Pathway Core Competencies & Objectives*

##### COMPETENCY

**WDG1        The student will identify welding tools and equipment.**

##### OBJECTIVES

WDG1-1    Identify basic hand tools (chipping hammers, brushes, files, strikers)

WDG1-2    Identify basic power tools and equipment (grinders, drills, oxyfuel equipment, and electric arc welding equipment)

##### COMPETENCY

**WDG2        The student will demonstrate an understanding of welding processes.**

##### OBJECTIVES

WDG2-1    Identify and describe different welding processes (SMAW, GMAW, GTAW, OXYFUEL cutting, FCAW)

WDG2-2    Identify welding orientation (positioning (flat, vertical, horizontal, overhead, IG-4G, and 1G/F)

WDG2-3    Identify joint types (five types -- butt, lap, T, corner, edge)

WDG2-4    Identify cutting processes (plasma, oxyfuel, carbon-arc)

##### COMPETENCY

**WDG3        The student will be able to interpret drawings, plans and control documents.**

##### OBJECTIVES

WDG3-1    Interpret welding prints to determine tolerance dimensions in decimal, fractions, and degrees.

WDG3-2    Identify the basic components of a blueprint.

WDG3-3    Identify and interpret basic welding symbols

➤ EXAMPLES: Fillet Weld and Groove weld

## **COMPETENCY**

**WDG4      The student will be able to identify generally used welding materials.**

### **OBJECTIVES**

- WDG4-1    Identify key welding materials include ferrous and non-ferrous materials (steel, aluminum, stainless, high-carbon steel, low-carbon steel, cast iron)
- WDG4-2    identify welding structures (channel, angle, tubing, i-beam, h-beam, sheeting)
- WDG4-3    Select the material for the appropriate application

## **COMPETENCY**

**WDG5      The student will demonstrate ability to understand, plan and complete core welding processes.**

### **OBJECTIVES**

- WDG5-1    Select appropriate process and tooling for the specified thickness/gauge
- WDG5-2    Understand testing and inspection methods (non-destructive and destructive)
- WDG5-3    Identify appropriate electrodes and filler materials for the specific process (AWS standards)
- WDG5-4    Perform safety inspections of equipment and accessories used in process

## **COMPETENCY**

**WDG6      The student will demonstrate proper use of the tool to conduct shielded metal arc welding processes.**

### **OBJECTIVES**

- WDG6-1    Conduct set up for shielded metal arc welding operations on plain carbon steel
- WDG6-2    Start and restart an arc, crater, and backfill at the edge while running a bead on mild steel plate (performance application)
- WDG6-3    Complete a weld that meets these specifications: E6010, E7018, flat and horizontal positions)

## **COMPETENCY**

**WDG7      The student will demonstrate proper use of the tool to conduct manual oxyfuel gas cutting processes.**

### **OBJECTIVES**

- WDG7-1    Conduct set up for manual oxyfuel gas cutting operations on plain carbon steel
- WDG7-2    Operate manual oxyfuel gas cutting equipment
- WDG7-3    Perform straight cutting operations on plain carbon steel (within 1/8" tolerance)
- WDG7-4    Perform shape-cutting operations on plain carbon steel (within 1/8" tolerance)
- WDG7-5    Perform bevel-cutting operations on plain carbon steel (within 1/8" tolerance)

## **COMPETENCY**

**WDG8      The student will demonstrate proper use of equipment to conduct oxy fuel welding processes.**

### **OBJECTIVES**

- WDG8-1    Conduct set up for oxy fuel welding operations on plain carbon steel
- WDG8-2    Operate oxy fuel welding equipment
- WDG8-3    Perform a flat weld using mild steel filler rod on plain carbon steel (butt, lap and T and outside corner joints)
- WDG8-4    Perform a flat braze on mild steel (butt, lap, T, and outside corner joints.)

## **COMPETENCY**

**WDG9      The student will demonstrate proper use of the tool to conduct gas metal arc welding processes.**

### **OBJECTIVES**

- WDG9-1    Conduct set up for gas metal arc welding operations on plain carbon steel
- WDG9-2    Operate gas metal arc welding equipment
- WDG9-3    Use Short Circuit Transfer to make fillet welds in flat and horizontal position on plain carbon steel
- WDG9-4    Use Short Circuit Transfer to make groove welds in flat and horizontal position on plain carbon steel

***Note: The following are competencies that are NOT OFFERED STATEWIDE. Accordingly, these core competencies apply only to those programs that cover these topics.***

**COMPETENCY**

**WDG10      The student will demonstrate proper use of the tool to conduct flux cored arc welding processes**

**OBJECTIVE**

- WDG10-1      Conduct set up for flux core arc welding operations on plain carbon steel
- WDG10-2      Operate flux core arc welding equipment
- WDG10-3      Make fillet welds in flat and horizontal position on plain carbon steel

**COMPETENCY**

**WDG11      The student will demonstrate proper use of the tool to conduct gas tungsten arc welding processes.**

**OBJECTIVES**

- WDG11-1      Conduct set up for gas tungsten arc welding operations on plain carbon steel
- WDG11-2      Operate gas tungsten arc welding equipment
- WDG11-3      Make square groove and fillet joints in flat position

**COMPETENCY**

**WDG12      The student will demonstrate proper use of the tool to conduct air carbon arc welding processes.**

**OBJECTIVES**

- WDG12-1      Conduct set up for air carbon arc welding operations on plain carbon steel
- WDG12-2      Operate air carbon arc welding equipment
- WDG12-3      Perform straight cutting operations on plain carbon steel
- WDG12-4      Perform bevel-cutting operations on plain carbon steel
- WDG12-5      Perform gouging operations on plain carbon steel

## **COMPETENCY**

**WDG13**      **The student will demonstrate proper use of the tool to conduct plasma arc cutting processes.**

### **OBJECTIVES**

- WDG13-1      Conduct set up for plasma arc welding operations on plain carbon steel
- WDG13-2      Operate plasma arc welding equipment
- WDG13-3      Perform straight cutting operations on plain carbon steel
- WDG13-4      Perform shape cutting operations on plain carbon steel
- WDG13-5      Perform bevel-cutting operations on plain carbon steel

***Note: We would like to acknowledge that some schools within the state currently or will in the future offer the following. However, these topics are NOT OFFERED STATEWIDE due to size or time limitations and as such, competencies have not been identified at this time.***

- Plastic welding
- CNC cutting
- Plasma and oxy fuel
- Waterjet cutting
- Laser cutting and welding
- Hard surfacing