



Western Technical College

## 31442325 Welding - Tungsten Inert Gas 2 (TIG)

### Course Outcome Summary

#### Course Information

<b>Description</b>	Instruction in tungsten inert gas welding of ferrous and non ferrous metals in the flat, vertical and overhead positions as well as on pipe. ASME and AWS requirements are used as guidelines.
<b>Career Cluster</b>	Manufacturing
<b>Instructional Level</b>	Technical Diploma Courses
<b>Total Credits</b>	2
<b>Total Hours</b>	72

#### Pre/Corequisites

Prerequisite 31442315 Welding - TIG 1

#### Textbooks

No textbook required.

#### Learner Supplies

Welding sateen jacket, welding work gloves (long leather gauntlet, short leather work gloves, TIG welding gloves), welding helmet, leather cape and sleeves. **Vendor:** To be discussed in class. Required.

Tools: 25' steel tape measure, metal combination square, and scribe. **Vendor:** To be discussed in class. Required.

Six-inch leather steel toed work boots - \$75.00-150.00. **Vendor:** To be discussed in class. Required.

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** Campus Shop. Required.

## Success Abilities

1. Cultivate Passion: Enhance Personal Connections
2. Cultivate Passion: Expand a Growth-Mindset
3. Cultivate Passion: Increase Self-Awareness
4. Live Responsibly: Develop Resilience
5. Live Responsibly: Embrace Sustainability
6. Live Responsibly: Foster Accountability
7. Refine Professionalism: Act Ethically
8. Refine Professionalism: Improve Critical Thinking
9. Refine Professionalism: Participate Collaboratively
10. Refine Professionalism: Practice Effective Communication

## Program Outcomes

1. Demonstrate industry recognized safety practices
2. Interpret welding drawings
3. Produce gas tungsten arc welds (GTAW)
4. Perform thermal cutting

## Course Competencies

### 1. Explore Weld Procedures Specifications (WPS) specific to TIG welding.

#### Assessment Strategies

- 1.1. Demonstration

#### Criteria

*You will know you are successful when*

- 1.1. you describe the weld joint specified.
- 1.2. you describe the material, filler wire, and shielding gas to be used.
- 1.3. you determine the welding process to be used.
- 1.4. You set up the welding machine to produce the weld following the specifications.

#### Learning Objectives

- 1.a. Explore the different sections of a Weld Procedure Specification
- 1.b. Identify materials used for weld coupons
- 1.c. Determine the weld joint being designated
- 1.d. Interpret weld symbol
- 1.e. Identify anatomy of fillet weld
- 1.f. Identify anatomy of a groove weld
- 1.g. Determine the shielding being used for the weld
- 1.h. Determine the filler wire used for the weld
- 1.i. Determine welding process and electrical characteristics of the weld
- 1.j. Set welding process parameters

### 2. Prepare welding station for TIG welding on stainless steel with DC Electrode Negative.

## **Assessment Strategies**

### **2.1. Demonstration**

#### **Criteria**

*You will know you are successful when*

- 2.1. you select the program and/or settings that will allow you to TIG weld with Direct Current Electrode negative.
- 2.2. you connect ground and torch to the correct lugs.
- 2.3. you select, turn on, and set the correct flow rate of the shielding gas.
- 2.4. you connect foot pedal (if applicable).
- 2.5. you set Amperage, High Frequency, and Balance (if applicable).
- 2.6. you assemble torch with the correct consumables and electrodes.
- 2.7. you troubleshoot any equipment malfunction and take corrective action.

#### **Learning Objectives**

- 2.a. Identify different types of materials used for weld coupons
- 2.b. Identify the characteristics of fillet welds and groove welds on stainless steel.
- 2.c. Determine how the applicable weld joints could be fit up to weld fillet welds
- 2.d. Determine how the applicable weld joints could be fit up to weld groove welds
- 2.e. Tack welding technique
- 2.f. Fit up tolerance specifications

## **3. Produce fillet welds on stainless steel using TIG process in all positions for applicable joints.**

### **Assessment Strategies**

#### **3.1. Demonstration**

#### **Criteria**

*You will know you are successful when*

- 3.1. You produce fillet welds meet the minimum acceptance criteria on 1F on various joints.
- 3.2. You produce fillet welds that meet the minimum weld standard on 2F on various joints.
- 3.3. You produce fillet welds that meet the minimum acceptance criteria on 3F vertical up joints.
- 3.4. You produce fillet welds that meet the minimum acceptance criteria on 4F overhead on joints.
- 3.5. You perform weld inspections.

#### **Learning Objectives**

- 3.a. Explore hand motion and weld puddle manipulation technique for TIG welding.
- 3.b. Identify how work and travel angles influence the shape of the weld.
- 3.c. Describe how work and travel angles change depending on weld position and joint design.
- 3.d. Identify the effect of gas flow rate on the weld puddle.
- 3.e. Adjust gas flow rate for different positions and joint designs.
- 3.f. Practice a variety of fillet welds.

## **4. Produce groove welds on stainless steel using TIG process in all positions for applicable joints.**

### **Assessment Strategies**

#### **4.1. Demonstration**

#### **Criteria**

*You will know you are successful when*

- 4.1. You produce welds that meet the minimum acceptance criteria of 1G on various joints.
- 4.2. You produce welds that meet the minimum acceptance criteria of 2G on various joints.
- 4.3. You produce welds that meet the minimum acceptance criteria of 3G vertical up on various joints.
- 4.4. you produce welds that meet the minimum acceptance criteria of 4g overhead on various joints.
- 4.5. you perform weld inspection.

#### **Learning Objectives**

- 4.a. Set up pulsed TIG welding.
- 4.b. Explore hand motion and weld puddle manipulation technique for TIG welding.
- 4.c. Describe how work and travel angles influence the shape of the weld.

- 4.d. Identify how work and travel angles change depending on weld position and joint design.
- 4.e. Practice a variety of groove welds on stainless steel.

## **5. Perform autogenous welds on stainless steel.**

### **Assessment Strategies**

- 5.1. Demonstration

### **Criteria**

*You will know you are successful when*

- 5.1. You produce welds that meet the minimum acceptance criteria without using filler wire in 1F position on various joints.
- 5.2. You produce welds that meet the minimum acceptance criteria without using filler wire in 2F position on various joints.
- 5.3. You produce welds that meet the minimum acceptance criteria without using filler wire in 1G position on various joints.
- 5.4. You produce welds that meet the minimum acceptance criteria without using filler wire in 3F vertical down position on various joints.

### **Learning Objectives**

- 5.a. Apply the differences between an autogenous weld and non-autogenous.
- 5.b. Explore the different joint configurations which will produce a satisfactory autogenous weld
- 5.c. Identify characteristics of a satisfactory autogenous weld
- 5.d. Determine when it is appropriate to perform an autogenous weld

## **6. Produce groove welds on stainless tubing with a gas back purge.**

### **Assessment Strategies**

- 6.1. Demonstration

### **Criteria**

*You will know you are successful when*

- 6.1. you produce a rotated flat autogenous groove weld on stainless steel tubing of various diameters.
- 6.2. you produce a 2G autogenous weld on stainless steel tubing of various diameters.
- 6.3. you produce a 5G autogenous weld on stainless steel tubing of various diameters.
- 6.4. you demonstrate the ability to "walk the cup".
- 6.5. you identify visually satisfactory welds inside and outside of tubing.

### **Learning Objectives**

- 6.a. Explore differences between free-hand welding and "walk the cup".
- 6.b. Set up pulsed TIG welding.
- 6.c. Practice a variety of groove welds on stainless steel tubing.

## **7. Perform weld inspection on purge welds.**

### **Assessment Strategies**

- 7.1. Demonstration

### **Criteria**

*You will know you are successful when*

- 7.1. You identify visual weld defects.
- 7.2. You identify visually satisfactory welds inside and outside of tubing.
- 7.3. You check groove weld reinforcement using a bridge cam gauge.
- 7.4. You perform the applicable destructive testing method.

### **Learning Objectives**

- 7.a. Find and interpret visual acceptance criteria in the code book
- 7.b. Read a bridge cam gauge
- 7.c. Find and interpret destructive testing acceptance criteria in the code book
- 7.d. Identify common weld defects
- 7.e. Explain causes of common weld defects and how to correct them
- 7.f. Repair visual weld defects

