

Gas Tungsten Arc Welding and Plasma Arc Cutting

Instructional/Task Analysis

**Related Information: What
the Student Should Know**

**Application: What the
Student Should Be Able to Do**

Unit 1: GTAW Orientation and Safety

1. Terms and definitions
2. Advantages of the GTAW process
3. Limitations of the GTAW process
4. Principles of GTAW
5. GTAW applications
6. Benefits from learning GTAW
7. Electrical safety guidelines for GTAW
8. Guidelines for duty cycle safety
9. Rules for handling welding cables and gas and coolant hoses
10. Rules for handling hollow castings and containers
11. Hazards associated with arc rays
12. Types of welding hoods
13. Guidelines for selecting a safe lens shade for GTAW
14. Protective clothing requirements for GTAW
15. Environmental safety requirements
16. Solve problems concerning GTAW safety

Unit 2: GTAW Equipment, Applications, and Techniques

1. Terms and definitions
2. GTAW machine controls and their functions
3. Concept of pulse current and its use in GTAW
4. Types of GTAW systems
5. Cooling system safety
6. Types of power cables and their characteristics
7. Parts of a GTAW torch
8. Gas lens and its uses

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Unit 2: GTAW Equipment, Applications, and Techniques (continued)

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| 9. Types of nozzles and their functions | 25. Set up a flow meter regulator for GTAW shielding gases |
| 10. Steps in GTAW nozzle selection | |
| 11. GTAW shielding gases and their characteristics | 26. Set up and shut down GTAW equipment for welding mild or stainless steel |
| 12. Flow meter design and use | 27. Prepare mild or stainless steel for GTAW |
| 13. Flow rates for GTAW shielding gases | 28. Prepare a tungsten electrode for welding mild or stainless steel |
| 14. Tungsten electrodes, their characteristics and applications | 29. Strike and maintain an arc to make stringer beads on mild or stainless steel without filler metal in the flat position |
| 15. Guidelines for preparing tungsten electrodes for DC welding | 30. Strike and maintain an arc to make stringer beads on mild or stainless steel with filler metal in the flat position |
| 16. Guidelines for grinding electrodes for DC welding | 31. Weld to specifications a fillet weld lap joint on mild or stainless steel in the flat position |
| 17. Guidelines for preparing electrodes for AC welding | 32. Weld to specifications a fillet weld T-joint on mild or stainless steel in the flat position |
| 18. Guidelines for GTAW electrode extension | 33. Weld to specifications an open-root square-groove butt joint on mild or stainless steel in the flat position |
| 19. Guidelines for filler metal selection and use | 34. Weld to specifications a fillet weld lap joint on mild or stainless steel in the horizontal position |
| 20. Requirements for base metal preparation | 35. Weld to specifications a fillet weld T-joint on mild or stainless steel in the horizontal position |
| 21. Special problems with contamination and air movement | 36. Weld to specifications a fillet weld lap joint on mild or stainless steel in the vertical position |
| 22. Steps for manual welding with a filler rod | 37. Weld to specifications a fillet weld T-joint on mild or stainless steel in the vertical position |
| 23. Backup bars and their use in GTAW | 38. Weld to specifications an open-root square-groove butt joint on mild or stainless steel in the vertical position |
| 24. Guidelines for troubleshooting GTAW problems | 39. Weld to specifications a fillet weld lap joint on mild or stainless steel in the overhead position |

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Unit 2: GTAW Equipment, Applications, and Techniques (continued)

40. Weld to specifications a fillet weld T-joint on mild or stainless steel in the overhead position
41. Set up and shut down GTAW equipment for welding aluminum
42. Prepare aluminum for GTAW
43. Prepare a tungsten electrode for welding aluminum
44. Strike and maintain an arc to make stringer beads on aluminum without filler metal in the flat position
45. Strike and maintain an arc to make stringer beads on aluminum with filler metal in the flat position
46. Weld to specifications a fillet weld lap joint on aluminum in the flat position
47. Weld to specifications a fillet weld T-joint on aluminum in the flat position
48. Weld to specifications a square-groove butt joint on aluminum in the flat position
49. Weld to specifications a fillet weld lap joint on aluminum in the horizontal position
50. Weld to specifications a fillet weld T-joint on aluminum in the horizontal position
51. Weld to specifications a fillet weld lap joint on aluminum in the vertical position
52. Weld to specifications a fillet weld T-joint on aluminum in the vertical position
53. Weld to specifications a square-groove butt joint on aluminum in the vertical position
54. Weld to specifications a fillet weld lap joint on aluminum in the overhead position
55. Weld to specifications a fillet weld T-joint on aluminum in the overhead position

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Unit 3: Plasma Arc Cutting

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| 1. Terms and definitions | 23. Prepare a PAC machine for operation |
| 2. Basic characteristics of plasma arc cutting | 24. Complete a contact cut on selected metal |
| 3. Basic components and their functions in an air cut PAC system | 25. Complete a stand-off cut on selected metal |
| 4. Plasma arc electrical safety | 26. Gouge mild steel plate with a PAC unit |
| 5. Plasma arc environmental safety | |
| 6. Plasma arc workplace safety | |
| 7. Advantages of plasma arc cutting | |
| 8. Characteristics of plasma arc transfer modes | |
| 9. Guidelines for PAC electrode selection | |
| 10. Guidelines for cutting nozzle selection and installation | |
| 11. Shielding cups, their design and uses | |
| 12. Plasma air and secondary air used with PAC | |
| 13. PAC consumables, their characteristics and maintenance | |
| 14. PAC system duty cycles | |
| 15. Guidelines for setting PAC flow rate and flow pressure | |
| 16. Guidelines for using compressed air with a PAC system | |
| 17. Factors affecting cutting speeds | |
| 18. Techniques for contact and stand-off cutting | |
| 19. Techniques for cutting expanded metal | |
| 20. Techniques for gouging metal | |
| 21. Techniques for piercing and beveling metal | |
| 22. Cutting problems and their probable causes | |