

Instructional/Task Analysis

Related Information: What the Student Should Know

Application: What the Student Should Be Able to Do

Unit 1: Welding Orientation

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| 1. Terms and definitions | 12. Identify welding processes |
| 2. Welding processes | 13. Compare employment opportunities in welding |
| 3. Brazing and braze welding | |
| 4. Cutting processes | |
| 5. Where welders work | |
| 6. What welders earn | |
| 7. The job outlook for welders | |
| 8. What it takes to become a good welder | |
| 9. Career opportunities | |
| 10. Standards, codes, and specifications | |
| 11. Standards and their importance to the welding industry | |

Unit 2: General Safety

1. Terms and definitions
2. Guidelines for dressing safely on the job
3. General job and shop safety rules
4. Hazard Communication
5. Storage of hazardous materials
6. Facts about the purposes of material safety data sheets
7. Colors of the safety color code and their uses
8. Safety tags and their color coding
9. Accident prevention signs, their colors and uses
10. Components of the fire triangle
11. Types of fires and their classifications
12. General types of fire extinguishers and their uses

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Unit 2: General Safety (continued)

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| 13. Fire extinguisher markings and their meanings | 23. Complete the student safety pledge form |
| 14. Fire extinguisher general operation instructions that follow the letters P-A-S-S | 24. Interpret a material safety data sheet |
| 15. Causes of back injuries and their contributing factors | 25. Draw a layout of your school and apply the safety color code |
| 16. Guidelines for lifting and moving items safely | 26. Determine correct fire extinguishers to use for various situations |
| 17. Guidelines for preventing slips, trips, and falls | 27. Identify and correct safety violations |
| 18. Rules for using ladders safely | 28. Operate a fire extinguisher |
| 19. Instances when lockout devices should be used | 29. Lift a heavy object properly |
| 20. Three types of fall protection systems | 30. Place and climb a ladder safely |
| 21. Terms related to confined space entry | |
| 22. Environmental contaminants requiring the use of a respirator | |

Unit 3: Welding Safety and First Aid

1. Terms and definitions
2. The ALWAYS rules for welding safety
3. The NEVER rules for welding safety
4. Personal protective clothing required for welding
5. Wearing proper eye protection
6. Hazards from arc rays
7. Types of welding hoods
8. Guidelines for duty cycle safety
9. Important rules for handling welding cables and gas and coolant hoses
10. Guidelines for oxygen safety
11. Guidelines for acetylene safety
12. Guidelines for other fuel gas safety
13. Guidelines for shielding gas safety
14. Rules for storing compressed gas cylinders
15. Rules for moving compressed gas cylinders

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Unit 3: Welding Safety and First Aid (continued)

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| 16. Steps for handling any emergency situation | 19. Determine basic first aid measures for given emergency situations |
| 17. Guidelines for first aid emergencies | |
| 18. Basic first aid procedures for various emergency situations | |

Unit 4: Welding Tools and Equipment

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| 1. Terms and definitions | 23. Identify basic hand tools |
| 2. Driving and chipping tools, their characteristics and uses | 24. Identify basic power tools and equipment |
| 3. Chisels, punches, and pry bars, and their uses | |
| 4. Characteristics and uses of files | |
| 5. Types and uses of wire brushes | |
| 6. Vise-grip® clamps and their uses | |
| 7. Holding and anchoring tools and their uses | |
| 8. Alignment tools and their uses | |
| 9. Types of jacks and their uses | |
| 10. Pulling and lifting tools, their characteristics and uses | |
| 11. Measuring tools and their characteristics and uses | |
| 12. Layout tools, their characteristics and uses | |
| 13. Turning tools and wrenches and their uses | |
| 14. Pliers and their uses | |
| 15. Manual cutting and shaping tools and their uses | |
| 16. Manually-operated shop tools, their characteristics and uses | |
| 17. Power equipment, their characteristics and uses | |
| 18. Power saws, their characteristics and uses | |
| 19. Positioning equipment, their characteristics and uses | |
| 20. Rules for hand tool safety | |
| 21. Rules for safe use of power tools and equipment | |
| 22. Rules for tool and equipment maintenance | |

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Unit 5: Basic Metals and Metallurgy

1. Terms and definitions
2. Advantages of proper metal identification
3. Basic metals and alloys, their properties and their definitions
4. Metal identification tests and their characteristics
5. Mechanical properties of metals and their characteristics
6. Mechanical strengths and their characteristics
7. Physical properties of metals and their characteristics
8. Steel identification systems and their characteristics
9. Carbon steel classifications, characteristics, and typical uses
10. Principal steel alloys and their uses
11. Alloy steel classifications, characteristics, and typical uses
12. Iron classifications, characteristics, and typical uses
13. Guidelines for identifying metals by color and characteristics
14. Aluminum, its characteristics and uses
15. Basics of the commercial system for identifying aluminum
16. The 1XXX group commercial identification system
17. The 2XXX plus group commercial identification system
18. Other elements of commercial aluminum identification
19. Aluminum quality designations and their meanings
20. Steps in using the commercial system to identify aluminum

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Unit 5: Basic Metals and Metallurgy (continued)

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| 21. Nonferrous metals and their typical uses | 39. Identify selected metals by appearance, color, and corrosion characteristics |
| 22. Guidelines for testing properties of metals | 40. Conduct magnet tests to identify common metals used for welding |
| 23. Equipment requirements for spark testing | 41. Conduct chisel tests to identify common metals used for welding |
| 24. Guidelines for spark testing | 42. Conduct spark tests to identify common metals used for welding |
| 25. Characteristics of residual stresses | |
| 26. Causes of residual stresses and distortion | |
| 27. Guidelines for controlling expansion and contraction | |
| 28. Routes for heat expansion from basic welds | |
| 29. Longitudinal and transverse stress in basic welds | |
| 30. Heat applications and their uses in weld quality control | |
| 31. Guidelines for preheating in special conditions | |
| 32. Methods of preheating and postheating and their applications | |
| 33. Torch preheating techniques and their applications | |
| 34. Types of steels and their recommended preheat temperatures | |
| 35. Temperature-sensing devices and their uses | |
| 36. Methods for controlling distortion with the welding process | |
| 37. Guidelines for controlling distortion with mechanical means | |
| 38. Methods of controlling distortion with restraining devices | |

Unit 6: Basic Math and Measuring

1. Terms and definitions
2. Basic mathematical terms and their definitions
3. Benefits of decimal equivalent charts
4. Benefits of an inches-to-decimal conversion chart

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Unit 6: Basic Math and Measuring (continued)

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| 5. Place values of decimal equivalents and how to express them | 15. Add, subtract, multiply, and divide fractions |
| 6. Type of rules and their graduations | 16. Add, subtract, multiply, and divide decimal equivalents |
| 7. Steps in reading a scale | 17. Convert fractions to decimal form, change fractions to a common denominator, and reduce fractions to lowest terms |
| 8. Terms used in geometry | 18. Write fractions as decimals and percents |
| 9. Types of geometric figures and their descriptions | 19. Write percents as decimals and fractions |
| 10. Units of measure and their equivalents | 20. Write decimals as fractions and percents |
| 11. Formulas for calculating the perimeter of squares, rectangles, and triangles | 21. Make conversions with a decimal equivalent chart |
| 12. Formulas for calculating the area of geometric figures | 22. Make conversions with an inches-to-decimal conversion chart |
| 13. English-metric conversion charts and how to use them | 23. Measure distances with 1", 1/2", and 1/4" graduations |
| 14. Methods of sizing commonly used steel stock | 24. Measure distances with 1/4" and 1/8" graduations |
| | 25. Measure distances with 1/8" graduations |
| | 26. Measure distances with 1/16" graduations |
| | 27. Make conversions with an English-metric conversion chart |
| | 28. Calculate area of geometric figures |
| | 29. Adjust a bevel square to a 45° angle using a framing square, a combination square, and a protractor |
| | 30. Form 90° and 45° angles with a combination square and draw parallel lines on metal stock |

Unit 7: Welding Print Reading

1. Terms and definitions
2. Basic lines and their uses
3. Basic views
4. Isometric and oblique drawings
5. Problems relating to dimensioning
6. Problems relating to tolerancing

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Unit 7: Welding Print Reading (continued)

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| 7. Methods of dimensioning | 17. Construct a top view |
| 8. Bevels and chamfers | 18. Construct a front view |
| 9. Reduction and enlargement scales | 19. Construct a right side view |
| 10. Types of holes | 20. Construct missing hidden lines |
| 11. Types of threads | 21. Interpret tolerance dimension in decimals, fractions, and degrees |
| 12. Types of section views | 22. Construct missing visible and hidden lines |
| 13. Other symbols | 23. Make a three-view sketch |
| 14. Structural shapes | 24. Construct adjacent parts in an assembly section |
| 15. Requirements for a formal bill of materials | |
| 16. Requirements for an informal bill of materials | |

Unit 8: Basic Welding Joints and Symbols

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| 1. Terms and definitions | 15. Identify basic weld symbols |
| 2. Basic parts of a welding symbol | 16. Interpret basic welding symbols |
| 3. Arrow side, other side significance | 17. Interpret working welding symbols |
| 4. Arrow line variations | 18. Draw welding symbols for given specifications |
| 5. Difference between weld symbols and welding symbols | 19. Interpret a welding print and welding procedure specifications |
| 6. Supplementary symbols | |
| 7. Contour and finish symbols | |
| 8. Information in a welding symbol tail | |
| 9. Basic welding joints | |
| 10. Basic welding symbols | |
| 11. Basic rules for locating dimensions | |
| 12. Additional symbols for fillet welds | |
| 13. Nondestructive testing symbols | |
| 14. Procedures for fitting up and welding structural shapes | |

