

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
A. Appreciate and apply all personal and work place safety procedures.			
1. Demonstrate proper use and inspection of personal protective equipment (PPE).	HP6	3.1	M2.1
2. Demonstrate proper safe work area and hot zone operation practices.	HP6	3.1	M2.1
3. Demonstrate proper use and inspection of ventilation equipment.	HP6	3.1	M2.3
4. Describe proper work actions for working in confined space.	HP6	3.1	M2.5
5. Demonstrate proper use of precautionary labeling and MSDS Information.	HP6	3.1	M2.6
6. Demonstrate proper inspection and operation of equipment used for each welding and thermal cutting process used. (Best accomplished as a part of the process module/unit for each of the required welding or thermal process).	HP6	3.1	M2.7
7. Recognize when first aid is needed for occupational injuries and follow proper procedures.	HP6, HP7	3.1	M2.1, M2.2
B. Demonstrate leadership skills in the classroom, industry, and society.			
1. Demonstrate an understanding of SkillsUSA, its structure and activities.	CA6, CA3, SS3		
2. Demonstrate an understanding of one's personal values and develop and maintain a code of professional ethics and professional appearance.	HP2	4.1	
3. Perform tasks related to effective personal management skills.	HP2	4.3	
4. Demonstrate interpersonal skills, including personal hygiene, etiquette and courtesy, and effectiveness in oral and written communication.	CA3, HP5	4.7	
5. Perform basic tasks related to securing and terminating employment.	CA1		
6. Perform basic parliamentary procedures in a group meeting.	SS3	1.10	
C. Describe and safely interact with all welding systems, including equipment, supplies, tools, power sources, and applied academic skills			
1. Obtain and use reference materials and charts.	C3		M4.3, M5.3, M5.8, M6.3, M7.3, M7.8, M7.13, M8-1.3, M8-2.3, M8-3.3, M8-4.3
2. Apply mathematics to solution of problems (e.g., whole numbers, fractions, decimals, rounding numbers, metric conversions, geometry, and trigonometry).	MA1, MA2	3.1, 3.2, 3.4	M3.3
3. Identify, select, use, and care for basic welding tools and accessories.		3.1, 1.5	M3.3

June 2010

CA = Communication Arts
 MA = Math
 HP = Health/Physical Education

SS = Social Studies
 SC = Science
 FA = Fine Arts

Measurable Learner Objectives are bold font.

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
4. Identify and store electrodes/filler materials.		3.1, 1.5	M1.3, M1.4
5. Read and implement welding procedures.	CA3	2.1, 1.5	M1.1, M1.4
6. Identify basic power sources.		3.1, 1.5	M4.3, M5.3, M5.8, M6.3, M7.3, M7.8, M7.13, M8-1.3, M8-2.3, M8-3.3, M8-4.3
7. Identify structural shapes, sizes, and weights		3.1, 1.10	M3.1, M3.3
D. Drawing and welding symbol interpretation.			
1. Interpret welding symbols, abbreviations, and joint designs.	CA3	3.1, 2.1	M3.1, M3.2
2. Read and interpret basic prints.	CA3	2.1	M3.1, M3.2
3. Make layout of materials (e.g., plate, structural, and pipe fabrication).	MA1, MA2, MA3	3.1, 2.3	M3.1, M3.2, M3.3
4. Prepare material for weld procedure specification (Welding Procedures Specification).	MA1, MA2, MA3	4.1, 2.1	M4.7, M5.7 & M5.12, M6.7 & M6.12, M7.7, M7.12 & M7.17
5. Fabricate parts from a shop print using both standard and metric linear measurements.	SC1	1.5	M3.3
E. Identify, describe, and demonstrate oxyfuel cutting.			
1. Describe oxyfuel cutting.	CA1, CA6	1.5	M8.3
2. Identify types of fuel/gases and their applications.	CA3	1.5	M8.1
3. Identify, select, and set up oxyfuel equipment safely (e.g., cylinders, regulators, flame cutting apparatus).	CA3, SC1	1.5	M8.3
4. Light and adjust flame safely for cutting.	SC1	1.5	M8.4
5. Pierce holes, and cut slots and circles.	SC1	1.5, 1.10	M8-1.4
6. Make straight, 90-degree, and beveled cuts on plate.	SC1	1.5, 1.10	M8-1.7
7. Perform square edge pattern cuts.	SC1	1.5, 1.10	M8-1.6

June 2010

CA = Communication Arts

MA = Math

HP = Health/Physical Education

SS = Social Studies

SC = Science

FA = Fine Arts

Measurable Learner Objectives are bold font.

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
8. Perform scarfing operations to remove base/weld metal.	SC1	1.5, 1.10	M8-1.8
9. Layout, cut, and fit materials (structural shapes).	MA1, MA2, MA3	1.5, 1.10	M3.3
10. Set-up for mechanized oxyfuel cutting operations on carbon steel.	SC1 & SC2	1.5, 1.10	M3.3
11. Perform straight, square edge cutting with track torch.	SC1 & SC2	1.5, 1.10	M8-2.5
12. Perform straight, bevel edge cutting with track torch.	SC1 & SC2	1.5, 1.10	M8-2.5
13. Identify and correct cutting problems.		1.5, 3.1, 3.2	M8-1.2 & M8-2.2
F. Demonstrate basic shielded metal arc welding procedures consistent with industry and safety standards.			
1. Performs safety inspections of shielded metal arc welding equipment and accessories.	CA1	3.1, 3.2	M4.1
2. Make minor external repairs to shielded metal arc welding equipment and accessories.	SC1	3.1, 3.2	M4.2
3. Describe shielded metal arc welding theory.	SC1, C3, C6	1.5, 3.2	M4.1
4. Set up for shielded metal arc welding operation on carbon steel.	SC1	1.5, 3.2	M4.3
5. Operate shielded metal arc welding equipment on carbon steel.	SC1	1.5, 3.2	M4.4
6. Make fillet welds in all positions on carbon steel.	SC1, SC2	1.5, 3.2	M4.5
7. Make groove welds in all positions on carbon steel.	SC1, SC2	1.5, 3.2	M4.6
8. Passes shielded metal arc welding, welder performance qualification test on carbon steel (2G & 3G uphill, limited thickness test plates).	SC1, SC2	1.5, 3.2	M4.7
G. Create shielded metal arc welds on carbon steel plate consistent with industry and safety standards.			
1. Make weld in 2F position with E-7018.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.5
2. Make weld in 3F position with E-7018.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.5
3. Make weld in 4F position with E-7018.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.5
4. Make weld in 2G position with E-6010 or E-6011.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.6

June 2010

CA = Communication Arts

MA = Math

HP = Health/Physical Education

SS = Social Studies

SC = Science

FA = Fine Arts

Measurable Learner Objectives are bold font.

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
5. Make weld in 3G position with E-6010 or E-6011.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.6
6. Make groove welds in 4G position with E-6010 or E-6011.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.6
7. Make weld in 2G position with E-7018.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.6
8. Make weld in 3G position with E-7018.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.6
9. Make weld in 4G position with E-7018.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.6
H. Create gas metal arc welds on plate and structural members consistent with industry and safety standards.			
1. Describe gas metal arc welding theory	C3, C6		M5.3, M5.8
2. Identify and select shielding gases for various metals and transfer mode.	SC1, SC2		M5.3, M5.8
3. Identify, select, and set up equipment.	SC1, SC2		M5.3, M5.8
4. Adjust current, voltage and gas flow.	SC1, SC2		M5.3, M5.8
5. Make weld in 2F position on carbon steel.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M5.5, M5.10
6. Make weld in 3F position, vertical down with material 3/16" or thinner.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M5.5
7. Make weld in 3F position, vertical up, with material 3/16" or thicker.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M5.5
8. Make weld in 4F position.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M5.5
9. Make weld in 1G position.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M5.6, M5.11
10. Make weld in 2G position.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M5.6
11. Make weld in 3G position, vertical down less than 3/16" thick.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M5.6
I. Create flux cored arc welds consistent with industry and safety standards.			
1. Describe flux cored arc welding theory.	C6		M6.3
2. Identify, select, and set up equipment.	SC1, SC2		M6.3

June 2010

CA = Communication Arts
 MA = Math
 HP = Health/Physical Education

SS = Social Studies
 SC = Science
 FA = Fine Arts

Measurable Learner Objectives are bold font.

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
3. Identify and select cored wire electrodes for carbon steel.	SC1, SC2		M6.3
4. Adjust current, voltage, and gas flow.	SC1, SC2		M6.3
5. Make weld in 2F position using gas shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.5
6. Make weld in 3F using gas shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.5
7. Make weld in 4F using gas shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.5
8. Make weld in 1G position using gas shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.6
9. Make weld in 2G position using gas shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.6
10. Make weld in 3G using gas shielded electrodes.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.6
11. Make weld in 4G position using gas shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.6
12. Make weld in 2F using self-shielded electrodes.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.10
13. Make weld in 3F position using self-shielded electrodes.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.10
14. Make weld in 4F position using self-shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.10
15. Make weld in 1G position using self-shielded electrodes.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.11
16. Make weld in 2G position using self-shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.11
17. Make weld in 3G position using self-shielded electrodes.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.11
18. Make weld in 4G position using self-shielded electrode.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M6.11
19. Identify welding problems, their causes, and take corrective action.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M4.4, M5.4, M5.9, M6.4, M6.9, M7.4, M7.9, M7.14, M8-1.4, M8-2.4, M8-3.4, M8-4.4
J. Create gas tungsten arc welds consistent with industry and safety standards			
1. Performs safety inspections of gas tungsten arc welding equipment and accessories.	CA3		M7.1
2. Make minor external repairs to gas tungsten arc welding equipment and accessories.	SC1, SC2		M7.2

June 2010

CA = Communication Arts
 MA = Math
 HP = Health/Physical Education

SS = Social Studies
 SC = Science
 FA = Fine Arts

Measurable Learner Objectives are bold font.

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
3. Set up gas tungsten arc welding operations on carbon steel.	SC1, SC2		M7.3
4. Operate gas tungsten arc welding equipment on carbon steel.	SC1, SC2		M7.4
5. Make fillet welds in all positions on carbon steel.	SC1, SC2		M7.5
6. Make groove welds in all positions on carbon steel.	SC1, SC2		M7.6
7. Pass gas tungsten arc welder performance qualification test on carbon steel.	SC1, SC2		M7.7
8. Set up for gas tungsten arc welding operations on austenitic stainless steel.	SC1, SC2		M7.8
9. Operate gas tungsten arc welding on austenitic stainless steel.	SC1, SC2		M7.9
10. Make fillet welds in the 1F, 2F, and 3F positions on austenitic stainless steel.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M7.10
11. Make groove welds in the 1G and 2G positions on austenitic stainless steel.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M7.11
12. Pass gas tungsten arc welder performance qualification test on austenitic stainless steel.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M7.12
13. Set up for gas tungsten arc welding operations on aluminum.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M7.13
14. Operate gas tungsten arc welding equipment on aluminum.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M7.14
15. Make fillet welds in the 1F and 2F positions on aluminum.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M7.15
16. Make groove welds in the 1G position on aluminum.	SC1, SC2	1.5, 2.5, 3.1, 3.2	M7.16
17. Pass gas tungsten arc welding performance qualification test on aluminum.	SC1, SC2	1.10, 2.5	M7.17
K. Layout and cut materials using plasma arc cutting procedures.			
1. Describe plasma cutting theory.	CA6	2.1	M8-3.3
2. Set up and operate plasma cutting equipment (e.g., torch consumables, air supply, line filtration).	SC1, SC2	2.5	M8-3.3
3. Lay out and make straight line cuts.	MA1, SC1, SC2	2.5	M8-3.5
5. Lay out and make cuts (e.g., bevel, circular, and pattern).	MA1, SC1, SC2	2.5	M8-3.6

June 2010

CA = Communication Arts

MA = Math

HP = Health/Physical Education

SS = Social Studies

SC = Science

FA = Fine Arts

Measurable Learner Objectives are bold font.

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
L. Manipulate material using carbon arc gouging consistent with industry and safety standards.			
1. Describe carbon arc gouging theory.	CA6	2.1	M8-4.3
2. Identify and select electrode, polarity, amperage, and air pressure.	SC1, SC2	1.5	M8-4.3
3. Set up and operate carbon arc gouging equipment.	SC1, SC2	1.5	M8-4.3, M8-4.4
4. Remove weld material/backgouge.	SC1, SC2	2.5	M8-4.5
M. Demonstrate metallurgy concepts and skills in the welding laboratory.			
1. Identify and apply pre- and post-heating principles.	SC1, SC2	1.5	
2. Describe and apply metallurgy principles (e.g., annealing, hardening, and tempering).	CA6, CA3, SC1, SC2	2.1	
3. Describe metal testing methods, such as mechanical and physical properties.	CA6, CA3, SC1, SC2	2.1	
4. Identify ferrous metal types by spark test.	SC1, SC2	1.5	
5. Describe the relationship between weld hardness tests (e.g., HAZ and base metal); interpret the results.	CA6, SC1, SC2	2.1, 1.5	
N. Inspect and test welds (non-destructive and destructive).			
1. Describe theories of nondestructive and destructive weld testing.	CA6	1.5	M9
2. Prepare sample coupon for non-destructive and destructive testing per appropriate standard.		2.5	M4.7, M5.7 & M5.12, M6.7 & M6.12, M7.7, M7.12 & M7.17
3. Conduct non-destructive testing, including visual (inspect for undercut, overlap, porosity, slag, spatter, weld size) and dye penetrant (inspect for cracks, nonfused areas, holes/leaks).	CA3	2.5	M9
4. Conduct destructive testing, including root/face bends and side bends.	CA3	2.5	M4.7/M5.7/M5.12/M6.7/M6.12/ M7.7/M7.12/M7.17
5. Identify defects and take corrective action based on testing method(s).	CA3	1.5, 2.5, 3.1, 3.2	M9.2
O. As applicable, explain and demonstrate skills in a specialization area as identified by the instructor's advisory committee. (Not limited to competencies listed below.)			

June 2010

CA = Communication Arts
 MA = Math
 HP = Health/Physical Education

SS = Social Studies
 SC = Science
 FA = Fine Arts

Measurable Learner Objectives are bold font.

Welding

Cross-reference to Show-Me standards (main report)

Measurable Learner Objective and Task Statement	Knowledge (Content)	Performance (Goals)	National Standards (AWS)
1. Prepare pipe joint for welding.		2.5	
a. Make weld in 5G using E-6010/E-7018 electrodes.		1.5, 2.5, 3.1, 3.2	
b. Make weld in 6G using E-6010/E-7018 electrodes.		1.5, 2.5, 3.1, 3.2	
c. Prepare four pipe specimens for destructive testing.		2.5	
2. Make weld in 1G and 2F positions using metal cored electrodes.		2.5	
3. Describe gas metal arc welding-pulse theory.	CA6, CA3	1.5	
a. Make gas metal arc welding-pulse weld in 1G and 2F positions.		2.5	
4. Describe gas tungsten arc welding-pulse welding theory.	CA6, CA3	1.5	
a. Make gas tungsten arc welding-pulse welds in 1G and 2F positions.		2.5	
5. Describe Oxy-acetylene welding/brazing theory.	CA6, CA3	1.5	
a. Perform welds on sheet metal using Oxy-acetylene welding in 1G and 2F positions.		2.5	
b. Perform welds on sheet metal using brazing process in 1G position.		2.5	
6. Make weld with gas metal arc welding process in 2F with aluminum.		2.5	II 2.9
7. Make weld with gas metal arc welding - stainless process in 2F position on stainless steel.		2.5	

June 2010

CA = Communication Arts
 MA = Math
 HP = Health/Physical Education

SS = Social Studies
 SC = Science
 FA = Fine Arts

Measurable Learner Objectives are bold font.