

NAME _____

DATE _____

**ARC WELDING AND OXYFUEL HAZARDS
SAFETY TEST**

From the list of Safety Hazards below, use a letter response in the answer box.

- A. Fire/Burns
- B. Toxic Fumes
- C. Radiation
- D. Electric Shock
- E. Explosion

1. ____ Never allow petroleum based products (oil, grease, kerosene, etc.) to come in contact with oxy-fuel equipment, especially at the oxygen regulator connection.
2. ____ Use the appropriate shade filter lens for the amount of amperage being used.
3. ____ Inspect insulation on electrode holders and leads for damage. Make sure all connections are tight.
4. ____ Never weld in confined spaces without proper ventilation.
5. ____ Never allow acetylene pressure to exceed 15 PSIG.
6. ____ Wear high top leather boots, leather gloves, welders cap and flame resistant clothing.
7. ____ Avoid welding on lead, cadmium, or galvanized metals. If you must weld on these materials, use a proper face mask, respirator, or extra ventilation.
8. ____ Never expose skin to the arc rays even if there is not any danger from sparks
9. ____ Keep all equipment dry and do not stand in water while welding or using power tools.
10. ____ Do not cut or weld on any used container until it has been emptied, washed out, and purged.
11. ____ Dispose of used electrode stubs properly, remove combustibles from the area before welding.
12. ____ Caution others standing nearby before striking the arc.
13. ____ Handle all metal around a welding shop as if it were hot, use leather gloves.
14. ____ Do not weld on parts that have been cleaned with degreasers containing hydrocarbons. A highly toxic phosphene gas will result.
15. ____ Do not touch the electrode or work piece with bare skin or wet gloves or clothing.

ARC WELDING AND OXY-FUEL CUTTING SAFETY HAND-OUT

- 1. USE WELDING HELMET AND APPROPRIATE SHADE FILTER LENS FOR PROCESS BEING DONE (REFER TO LENS SHADE SELECTOR, AWS F2-89).**
- 2. DO NOT EXPOSE SKIN TO THE ARC RAYS OR SPARKS. WEAR HIGH TOP LEATHER BOOTS, LEATHER GLOVES, WELDERS CAP, AND LONG SLEEVE FLAME RESISTANT CLOTHING.**
- 3. USE PROTECTIVE SCREENS AND CAUTION OTHERS NEARBY BEFORE STRIKING AN ARC.**
- 4. KEEP ALL EQUIPMENT DRY AND DON'T STAND IN WATER WHILE WELDING.**
- 5. INSPECT ALL ELECTRICAL LEADS FOR DAMAGED INSULATION. MAKE SURE ALL CONNECTIONS ARE TIGHT.**
- 6. NEVER WELD IN CONFINED SPACES WITHOUT PROPER VENTILATION.**
- 7. AVOID WELDING OR CUTTING ON METALS THAT HAVE BEEN PAINTED, GALVANIZED, OR LEAD COVERED.**
- 8. HANDLE ALL METAL AROUND A WELDING SHOP AS IF IT WERE HOT, USE LEATHER GLOVES.**
- 9. NEVER LET ANY PETROLEUM BASED PRODUCT COME IN CONTACT WITH OXY-FUEL EQUIPMENT.**
- 10. NEVER CUT OR WELD ON ANY CONTAINER UNTIL IT HAS BEEN FLUSHED OUT AND PURGED WITH ARGON.**
- 11. BE SURE TO TURN OFF OXYGEN AND ACETYLENE VALVES ON THE TORCH AND TANK AFTER CUTTING.**
- 12. ACETYLENE REGULATORS SHOULD NEVER EXCEED 15 PSIG.**
- 13. HANG ELECTRODE HOLDER UP WHEN WORK IS COMPLETED AND DISPOSE ELECTRODE STUBS PROPERLY.**
- 14. USE EYE PROTECTION WHEN CHIPPING SLAG.**
- 15. NEVER USE OXYGEN AS A SUBSTITUTE FOR COMPRESSED AIR.**
- 16. LOOK AROUND FOR OTHERS AND CAUTION THEM BEFORE GRINDING, LIGHTING A TORCH, OR WELDING.**

WELDING
Basic ARC Welding and Oxy-Fuel Cutting

Name: _____ Date: _____

- 1) A carburizing flame is:
 - a. more Oxygen than Acetylene
 - b. equal parts Oxygen and Acetylene
 - c. more Acetylene than Oxygen
 - d. used to preheat metal
- 2) Acetylene cylinders should be opened _____ max when welding or cutting plate:
 - a. All the way
 - b. $\frac{1}{4}$ turns
 - c. 4 turns
 - d. 1-1/2 turns
- 3) An oxidizing flame is _____:
 - a. excessive Oxygen
 - b. used to cut plate
 - c. excessive Acetylene
 - d. equal parts Oxygen and Acetylene
- 4) The minimum shade lens when cutting plate with Oxy-Fuel is:
 - a. #1
 - b. #3
 - c. #7
 - d. #9
- 5) Using the correct sequence for shutting down Oxygen/Acetylene equipment, the first step is to:
 - a. disconnect hose connections at torch
 - b. turn pressure adjusting screw to the left on regulators
 - c. close valves at cylinder
 - d. bleed pressure off hoses
- 6) Using the answers above, what is step 2?
 - a.
 - b.
 - c.
 - d.
- 7) Using answers in Question 5, what is step 3?
 - a.
 - b.
 - c.
 - d.

- 8) When using oxy- Acetylene equipment, the _____ hose is for Acetylene:
- a. red
 - b. yellow
 - c. green
 - d. orange
- 9) An oxygen cylinder should be opened all the way to:
- a. equalize the Acetylene pressure.
 - b. insure a full flow of oxygen
 - c. prevent leakage around valve
 - d. reduce condensation in the regulator
- 10) When should you perform a cutting operation without goggles with shaded lens?
- a. never
 - b. cutting metal less than $\frac{1}{4}$ inch thick
 - c. only when you can't see the soapstone mark
 - d. cutting nuts off of bolts
- 11) When changing oxygen or Acetylene cylinders, you should always _____ cylinders first after Placing them in cart.
- a. Check pressure in
 - b. Install regulators on
 - c. Remove protective cap on cylinders
 - d. Chain

Shield and Metal -Arc Welding (post test)

Name _____

Date _____

Check the letter that best completes the statement or answers the question.

1. Another name for shielded metal arc is
☐ A gas metal arc
☐ B TIG
☐ C stick
☐ D flux cored arc
2. Shielded metal-arc welding is widely used because
☐ A it is so versatile
☐ B it can be used to join many different types and thicknesses of metal in all four welding positions.
☐ C both the equipment and the electrodes are relatively low in cost compared to other processes.
☐ D all of the above
3. The word "shielded" refers to
☐ A the face shield that protects the welder
☐ B the fume cloud that protects the arc
☐ C the electrode covering that protects the core metal of the rod from contamination
☐ D the ground cable that protects the welder and the work from shorts.
4. Slag _____ the rate at which the metal cools, which helps to maintain the integrity of the metal.
☐ A slows down
☐ B speeds up
☐ C maintains
☐ D has no effect on
5. The SMAW process uses what type of power supply?
☐ A constant potential
☐ B constant voltage
☐ C high voltage
☐ D constant current

18. As you gain experience, you'll learn that the quickest way to determine if the arc length is correct is by listening. When the proper arc length has been maintained you'll hear
- ☐ A a low humming sound
 - ☐ B a popping sound
 - ☐ C a crackling sound
 - ☐ D no sound
19. Opened containers of low hydrogen electrodes should be stored
- ☐ A in a dry store room
 - ☐ B in a vented electric oven
 - ☐ C in a refrigerator with a light bulb
 - ☐ D require no special storage
20. The property of metal that resists forces acting to pull it apart is its ____ strength
- ☐ A shear
 - ☐ B compressive
 - ☐ C tensile
 - ☐ D impact

Circle the correct answer

1. Gas Metal- Arc Welding uses what type of electrode?
 - A. Electrodes coated with flux
 - B. Coiled electrodes
 - C. Non-consumable electrode
 - D. Hollow electrodes
2. The electrode is fed into the weld pool
 - a. Manually
 - b. Intermittently
 - c. Automatically
 - d. None of the above
3. The gas metal-arc electrode serves
 - a. Only as a conductor
 - b. Only as a source of filler material
 - c. As a source of filler metal and flux
 - d. As a conductor and a source of filler metal
4. For shielding, gas metal-arc welding primarily uses
 - a. Gas
 - b. Flux
 - c. A fume cloud
 - d. Slag
5. There are basically two primary controls on any GMAW welding machine
 - A. open circuit voltage and arc voltage
 - B. Arc voltage and high frequency
 - c. Feed rate and open circuit voltage
 - D. feed rate and duty cycle
6. On a CV power supply, you can adjust the amount of
 - a. voltage output
 - b. current output
 - c. current input
 - d. voltage input

7. In a GMAW operation, you determine the amount of
 - a. voltage by the arc length
 - b. current by the feed rate
 - c. resistance by the arc voltage
 - d. open circuit current by the arc length
8. GMAW is primarily done using
 - a. AC current
 - b. DCSP current
 - c. DCRP current
 - d. all of the above
9. Air cooled torches are cooled by
 - a. the air around the torch
 - b. the gas moving through the torch
 - c. the air inside the hollow handle of the torch
 - d. none of the above
10. When the torch trigger is pulled
 - a. shielding gas flows out of the nozzle
 - b. the electrode wire is energized
 - c. a signal is sent to the wire feed unit, which activates it.
 - d. all of the above

11. When threading the electrode, it is important to
- a. keep it slack
 - b. not hold the wire with bare fingers
 - c. keep the clipped end taut
 - d. let the coil unravel
12. Stickout that is too short will
- A. cause excess spatter
 - B. inhibit the gas flow
 - C. burn the contact tip
 - D. all of the above
13. At high current levels, the metal will be transferred as a
- a. pulsed current
 - b. short circuit
 - C. spray
 - d. globular
14. Because voltage and current levels tend to be much _____, a _____ shade lens is used in the helmet.
- a. lower/higher
 - b. higher/lower
 - c. higher/ darker
 - d. lower/darker
15. What type of metal transfer would produce the most spatter?
- A. globular
 - b. spray
 - c. short circuiting
 - D. pulsed

16. Electrode wire labeled E70S, the S stands for
- a. sample filler metal
 - B. solid filler metal
 - C. sodium filled
 - D. none of the above
17. The copper coating on the electrode wire provides
- A. protections from moisture
 - B. lubrication
 - C. improved electrical contact
 - D all of the above
18. Welding current is transferred to the wire by the
- A. conduit
 - B. Feed rolls
 - C. contact tip
 - D. liner
19. What is not a type of metal transfer?
- A short circuiting
 - B Globular
 - C Spray
 - D Long circuiting voltage
20. What gas would you choose for short circuit transfer on mild steel?
- A. 75 % Ar 25 % Co₂
 - B. 100% Ar
 - C. 98 % O₂ 2% Ar
 - D. 98% Ar 2% O₂

21. Short Circuit transfer can be used in what position?

A. vertical down and flat only

B. flat and horizontal

C. all positions

D. flat only

BASIC WELDING I FINAL EXAM

Safety Inspection & Set-up of OFC Equipment

Set Up

- _____ Ensure cylinders are upright and secured, and then remove safety caps.
- _____ Inspect valves and “crack open” to remove any debris, be sure no oil is present.
- _____ Connect regulators to appropriate cylinder, release pressure adjusting screws.
- _____ Open cylinder valves slowly, while standing off to one side.
(Oxy, full open / Fuel, one full turn)
- _____ Adjust regulators to purge lines and establish the correct cutting pressure
(Oxy, 40 PSI / Fuel 10 PSI for 1/2” tip) Purge individually
- _____ Inspect hoses and leak test each fitting.
- _____ Utilize proper clothing and equipment, remove combustibles from the area
- _____ Point torch in safe direction, light, and adjust to neutral flame.
(Open torch fuel valve 1/8 turn, light flame, increase adjustment to remove soot;
Open oxygen valve slowly to establish pre-heat cones. Fine tune adjustment with
cutting lever depressed)
- _____ Extinguish flame correctly.
(Close torch oxygen valve first, then fuel gas)

Shut down

- _____ Close both cylinder valves
- _____ Open torch valves individually and remove all pressure from lines.
(Do not purge lines at the same time, close valves for storage)
- _____ Release pressure adjusting screws on regulators
- _____ Replace safety caps for storage, or when changing out empty cylinders
(Make sure cylinder valves are closed)

Name _____ Instructor _____ Date ____ / ____ / ____

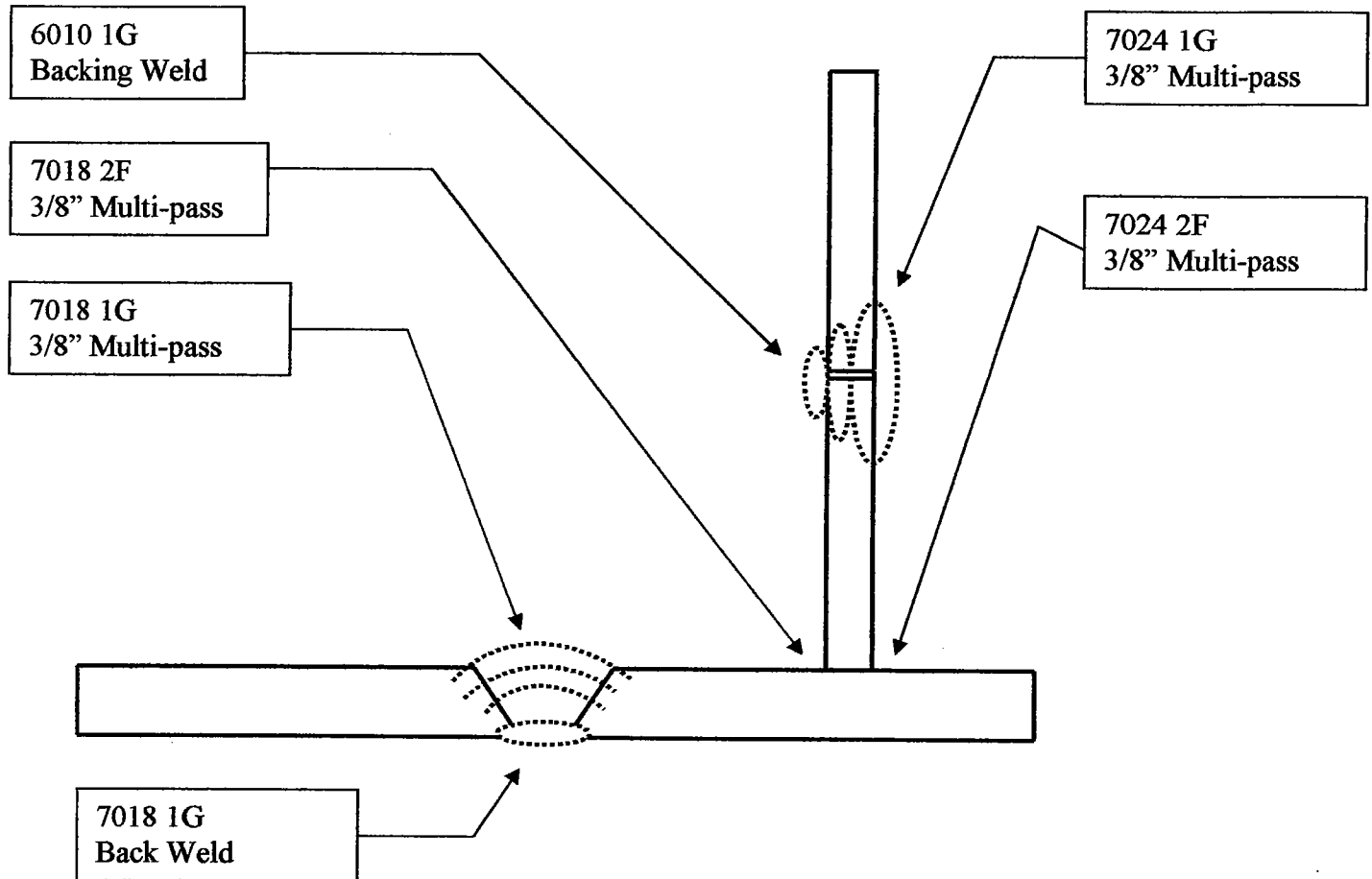
Instructor _____

Date Ended _____

Post-test

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Basic Welding Performance Test



Materials:

- (2) Pieces 3/8"x 3"x 6" plate
- (2) Pieces 3/8"x 3"x 6" plate with 30 degree bevel
- 6010 Electrodes
- 7018 Electrodes
- 7024 Electrodes

Final Exam Workmanship Checklist

Name of Student _____ Sample # _____ Date _____

Section I – Reviews

Fit-up procedure reviewed with candidate	Yes _____	No _____
Safety requirements reviewed with candidate	Yes _____	No _____
WPS reviewed with candidate	Yes _____	No _____

Section II – Fit-up Inspection

Correct position	Pass _____	Fail _____
Correct Fit-up	Pass _____	Fail _____
Root opening	_____	_____
Outside width of groove	_____	_____
Secured in position	Yes _____	No _____

Section III – Visual Inspection

Witnessed root pass	Yes _____	No _____
No cracks	Pass _____	Fail _____
Undercut no greater than lesser of 1/32" or 10% of base metal	Pass _____	Fail _____
Thorough fusion at weld toes & between adjacent beads	Pass _____	Fail _____
All craters filled	Pass _____	Fail _____
Porosity: One max In 4 in	Pass _____	Fail _____
All pores $\leq 3/32$ in diameter	Pass _____	Fail _____
Root Reinforcement flush to 1/8"	Pass _____	Fail _____
Face Reinforcement flush to 1/8"	Pass _____	Fail _____
Face Reinforcement width	_____	_____
Weld size	Pass _____	Fail _____
Acceptable appearance	Pass _____	Fail _____

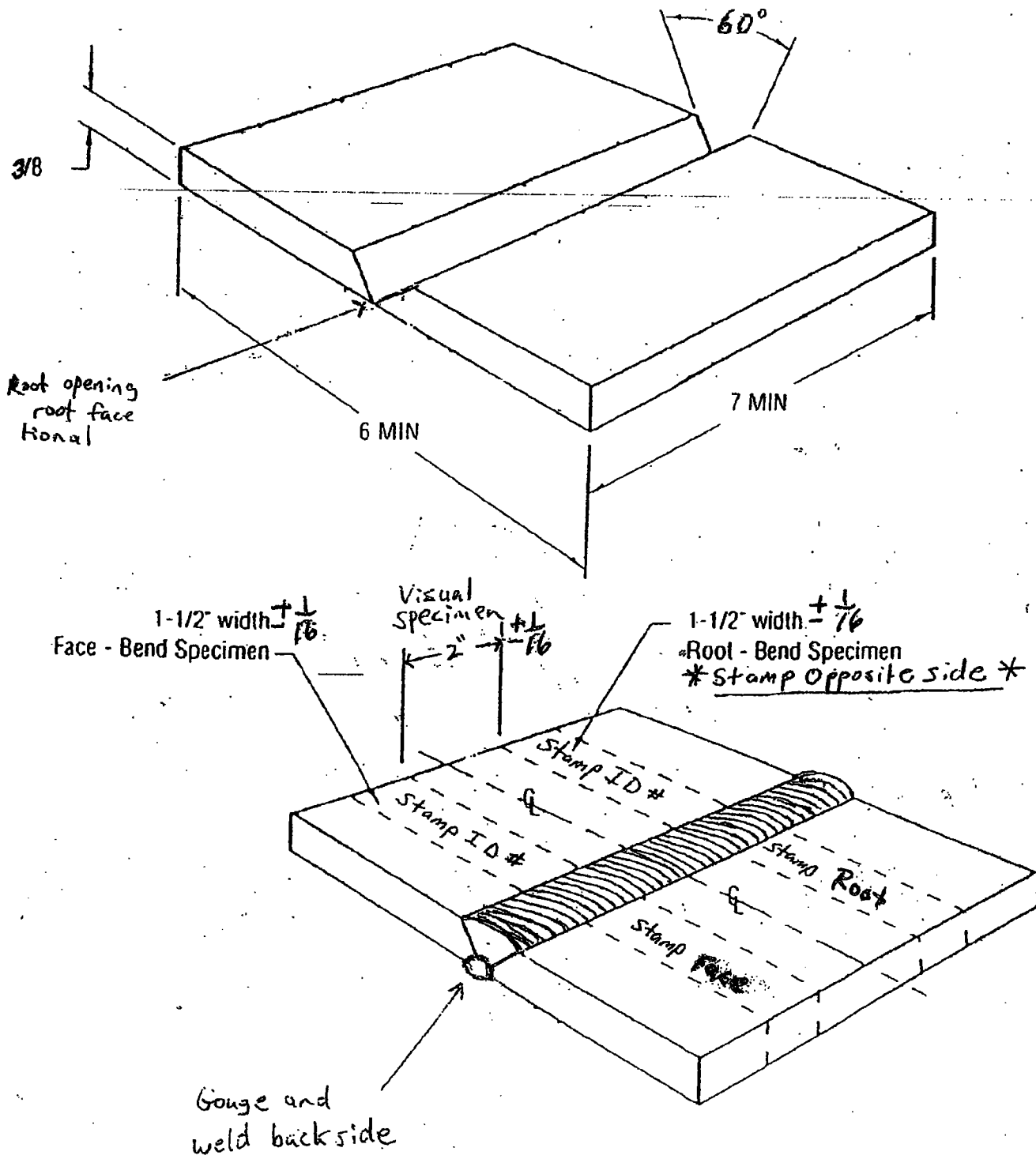
Bend Test Results

2G Face bend: Length of each discontinuity over 1/32"	_____	_____
_____ Sum _____	Pass _____	Fail _____
2G Root bend: Length of each discontinuity over 1/32"	_____	_____
_____ Sum _____	Pass _____	Fail _____
3G Face bend: Length of each discontinuity over 1/32"	_____	_____
_____ Sum _____	Pass _____	Fail _____
3G Root bend: Length of each discontinuity over 1/32"	_____	_____
_____ Sum _____	Pass _____	Fail _____

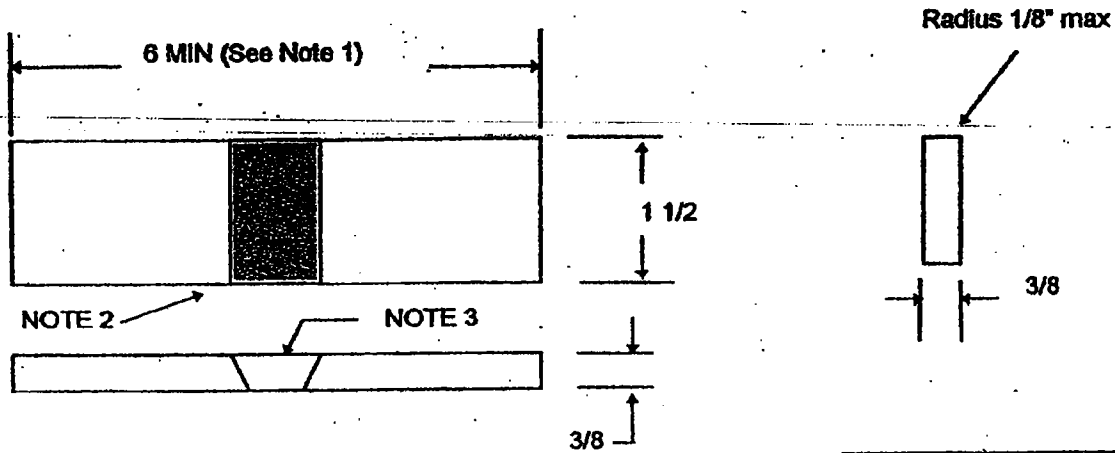
Test Supervisor

Date

SMAW Plate Test

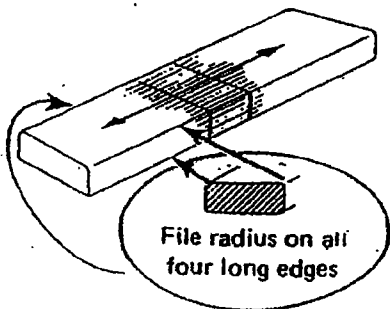


Face and Root Bend Test Specimens



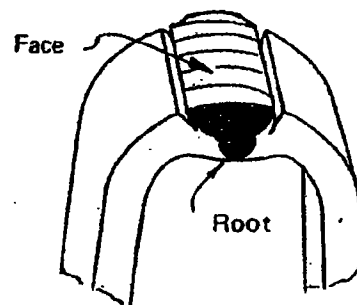
Notes:

1. A longer specimen length may be necessary.
2. These edges may be oxygen-cut and may or may not be machined.
3. The weld reinforcement shall be removed flush with the surface of the specimen.
4. Cut surfaces shall be smooth and parallel.



Grinding marks must be parallel with specimen edges. Otherwise they may have a notch effect which could cause failure.

Figure 2



If weld reinforcement is not removed, stretching is concentrated at the edge of the bead and failure results.

Figure 3

Visual Inspection Criteria

All weld passes are subject to visual inspection at the discretion of the Test Supervisor.

- There shall be no cracks.
- There shall be no or incomplete fusion or incomplete joint penetration.
- ~~The Test Supervisor shall examine the weld for acceptable appearance, and be satisfied that the welder is skilled in the process and procedure.~~
- Undercut shall not exceed $1/32$ ".
- The frequency of porosity shall not exceed one in each 4" of weld length and the maximum diameter shall not exceed $3/32$ ".
- The weld shall be free of overlap.
- The face reinforcement height shall be flush to $1/8$ " of the base metal.
- The face reinforcement width shall be within $1/8$ " the groove width.

Face and Root-Bend Criteria

- No single indication shall exceed $1/8$ " measured in any direction on the surface.
- The sum of all indications on the surface which exceed $1/32$ ", but are less than or equal to $1/8$ ", shall not exceed $3/8$ ".
- Cracks occurring at the corner of the specimens shall not be considered unless there is definite evidence that they result from internal discontinuities.

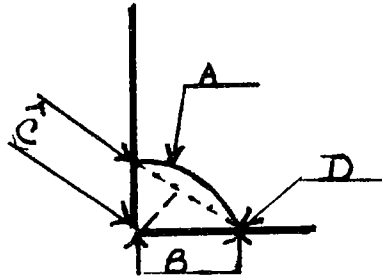
FINAL TEST

- 1.) A carburizing flame is:
 - a. more oxygen than Acetylene
 - b. equal parts oxygen and Acetylene
 - c. more Acetylene than oxygen
 - d. used to preheat metal
- 2.) Acetylene cylinders should be opened _____ max when welding or cutting plate:
 - a. All the way
 - b. 1/4 turns
 - c. 4 turns
 - d. 1 1/2 turns
- 3.) An oxidizing flame is _____:
 - a. excessive oxygen
 - b. used to cut plate
 - c. excessive Acetylene
 - d. equal parts oxygen and Acetylene
- 4.) The minimum shade lens when cutting plate is:
 - a. #1
 - b. #2
 - c. #3
 - d. #5

1 2 3 4 5
6 7 8 9 10
- 5.) Using the correct sequence for shutting down oxygen/Acetylene equipment, the first step is to:
 - a. disconnect hose connections at torch
 - b. turn pressure adjusting screw to the left on regulators
 - c. close valves at cylinder
 - d. bleed pressure off hoses
 - e. place protective valve cap on cylinders
- 6.) Using the answers above, what is step 2?
 - a. d.
 - b. e.
 - c.
- 7.) Using answers in Question 5, what is step 3?
 - a. d.
 - b. e.
 - c.
- 8.) The electrode that produces the maximum deposition rate is the:
 - a. 6010
 - b. 6013
 - c. 7018
 - d. 7024

- 9.) The distance at which persons can observe an electric ARC without receiving eye injury is:
- has not been determined
 - 50 feet
 - depends on current
 - 20 feet
- 10.) What electrode welds best on dirty, rusty metal?
- 7024
 - 6010
 - 110-18
 - 308 L

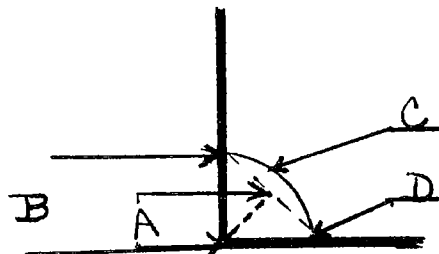
- 11.) Select the correct letter that indicates the throat of a weld:



- 12.) There are ____ basic weld joints:
- 8
 - 5
 - 7
 - 10
- 13.) How is the size of an electrode determined?
- diameter of filler metal
 - overall diameter of the electrode
 - thickness of coating
 - length of electrode
- 14.) The best shape for a weld bead is:
- concave
 - flat
 - convex
 - hemisphere
- 15.) The current amperage range for a 6010 1/8" electrode is:
- 50-75
 - 75-125
 - 100-150
 - 130-190
- 16.) A general rule for beveling a plate is _____ the thickness if measured at the top of the bevel:
- 1 1/2 times the thickness of plate
 - 2 times the thickness of plate
 - 1/2 times thickness of plate
 - 3 times thickness of plate

- 17.) In the A.W.S. Numbering System, what digit or digits indicate the tensile strength of the weld? (4 digit numbers only.)
- a. last two (2) digits
 - b. second digit
 - c. first two (2) digits
 - d. third digit only
- 18.) Electrodes that produce high deposition rates should be used for:
- a. large fillet welds in the flat position
 - b. overhead welding
 - c. horizontal
 - d. cast iron welding
- 19.) When using oxy-Acetylene equipment, the _____ hose is for Acetylene.
- a. red
 - b. yellow
 - c. green
 - d. orange
- 20.) What is the correct pressure setting for Proylene when cutting plate?
- a. 35 PSI
 - b. 5 PSI
 - c. 15 PSI
 - d. 10 PSI
- 21.) When current polarity is in D.C.S.P., the Ground clamp is always:
- a. negative
 - b. alternates - to +
 - c. alternates + to -
 - d. positive
- 22.) To obtain DCRP, the electrode cable should be connected to:
- a. AC power supply
 - b. an electric holder
 - c. the positive terminal
 - d. the negative terminal
- 23.) What device should be used to ignite a welding torch?
- a. book matches
 - b. a flint lighter
 - c. propane cigarette lighter
 - d. sparks from an electric welder
- 24.) An oxygen cylinder should be opened all the way to:
- a. equalize the Acetylene pressure
 - b. insure a full flow of oxygen
 - c. prevent leakage around valve
 - d. reduce condensation in the regulator

- 25.) What digit indicates the position you can weld in, according to the A.W.S. Numbering system?
- a. third
 - b. first two (2)
 - c. last
 - d. first
- 26.) When restarting a bead, where should the arc be struck?
- a. on the bead deposited
 - b. close and directly in front of the crater
 - c. a considerable distance from the crater
 - d. to one side of the crater
- 27.) Which one of the following is a ferrous metal?
- a. aluminum
 - b. copper
 - c. magnesium
 - d. mild steel
- 28.) The strength of a welded joint depends upon the following:
- a. strength of the weld metal
 - b. type of joint preparation
 - c. skill of operator
 - d. any of the above
- 29.) Which answer best describes ferrous metals?
- a. metals having high iron content
 - b. metals having high carbon content
 - c. metals having high nickle content
 - d. metals having high magnesium content
- 30.) Which metal is considered non-ferrous?
- a. cast iron
 - b. stainless steel
 - c. carbon steel
 - d. aluminum
- 31.) Which letter indicates the toe of a weld?



- 32.) What is the angle an electrode is held in relation to the direction of travel?
- a. 0° to 5°
 - b. 10° to 20°
 - c. 30°
 - d. 40° to 45°

- 33.) How many methods did we use to strike an arc?
- a. 1
 - b. 2
 - c. 3
 - d. 4
- 34.) The flux on the electrode _____.
a. cleans the base metal
b. adds the deposit
c. controls the cooling rate of the weld
d. all of the above
- 35.) Watching the arc with unprotected eyes is likely to cause a condition known as:
a. Welder's eye
b. flashburn
c. red eye
d. hot flash
- 36.) The letters A.W.S. stand for:
a. Arc Welding Systems
b. American Welding Society
c. Arc Welding Society
d. Airco Welding Supply
- 37.) Which electrode is considered low hydrogen?
a. 7018
b. 6011
c. 6013
d. 7024
- 38.) The 7024 electrode will weld in what current polarity setting?
a. DCSP
b. DCRP
c. AC
d. all of the above
- 39.) What is the approximate strength of a weld made with a 7018 electrode?
a. 7,000 PSI
b. 18,000 PSI
c. 180,000 PSI
d. 70,000 PSI
- 40.) The letters S.M.A.W. refers to what welding process?
a. submerged arc welding
b. semiautomatic arc welding
c. stick welding
d. mig welding

- 41.) Oxygen and Acetylene cylinders may be lifted by a crane if a _____ is used:
- a. nylon strip
 - b. protective valve cap
 - c. wire choker
 - d. cradle
- 42.) When using AC current polarity, the electrode holder is _____:
- a. alternates both + and -
 - b. negative
 - c. positive
 - d. none of the above
- 43.) When should you perform a cutting operation without goggles with shaded lens?
- a. never
 - b. cutting metal less than 1/4" thick
 - c. only when you can't see your soapstone mark
 - d. cutting nuts off of bolts
- 44.) Which best describes protective clothing worn during a welding or cutting operation?
- a. long sleeve shirt, long pants (without cuffs), and hat made of cotton
 - b. long sleeve shirt, long pants, and hat made of 50% polyester and 50% cotton
 - c. long sleeve shirt and pants
 - d. 100% cotton pants and shirt
- 45.) A 7024 electrode can be used to weld in what position?
- a. flat
 - b. vertical
 - c. overhead
 - d. all of the above
- 46.) What may stop arc blow?
- a. move ground clamp
 - b. change direction of travel
 - c. change rods
 - d. A and B
- 47.) What is 1 G position when welding plate?
- a. flat
 - b. horizontal
 - c. vertical
 - d. overhead
- 48.) What is 4 G position when welding plate?
- a. vertical
 - b. horizontal
 - c. overhead
 - d. flat

49.) What is 3 G position when welding plate?

- a. overhead
- b. vertical
- c. horizontal
- d. flat

50.) By increasing the percentage of _____ in steel, the tensile strength increases and the weldability is reduced:

- a. nickel
- b. phosphorus
- c. carbon
- d. sulfur

JW06je