



Iowa Skills USA Welding Fabrication Competition 2018

State Welding Fabrication Competitors:

We have exciting news for Welding Fabrication competition this year. For the first time ever, the welding fabrication competition project will be built during the state contest!

Please review these guidelines for the state competition in April. Now is the time to brainstorm, practice, and design your project to be built. Your team will have 6.5 hours to complete your project. Keep in mind your team & project will be judged throughout your 6.5 hours. Manage your time wisely. **Please Note: Prints of your design must be ready to turn in at orientation. (See items supplied by teams)**

- **Project Theme:**
 - Job Box with Removable Tray

- **Project Team Fee for Materials:**

Each Welding Fabrication Team must pay \$175/team for the materials that will be supplied for the competition. All teams must be registered no later than March 30, 2018. There will be no exceptions after this date. The materials fee must be paid to Iowa SkillsUSA.

- **Material List Supplied by Committee:**
 - Qty. 1 – 2' x 4' 11 ga. Hot Rolled Sheet Steel
 - Qty. 2 – 4' x 4' 14 ga. Hot Rolled Sheet Steel
 - Qty. 2 - 1" x 1" x 3/16" Angle Iron 10' long
 - Qty. 1 – 1" Sch. 40 Blk. Pipe 3' long
 - Qty. 1 – 3" Continuous (Piano) Hinge 3' long
 - Qty. 2 – 3" casters (swivel)
 - Qty. 2 – 3" casters (rigid)
 - Qty. 1 - ½" C.R. round stock 10' long
 - Qty. 1 - 48" #2/0 Passing link chain
 - Qty. 16 - 5/16-18 x 1-1/2" bolts
 - Qty. 32 – 5/16" flat washers
 - Qty. 16 – 5-16-18 nuts

- **Welding Consumables Supplied by Committee:**
 - .035 Lincoln SuperArc L-56 GMAW Consumable (ER70S-6)
 - .045 Lincoln Ultracore 71A85 FCAW Consumable (E71T-1)
 - 3/32" Lincoln ER70S-6 GTAW Filler Rods
 - 3/32" Lincoln Excalibur 7018 MR (E7018) SMAW Electrodes
 - 1/8" Lincoln Excalibur 7018 MR (E7018) SMAW Electrodes
 - 3/32" Lincoln Fleetweld 5P (E6010) SMAW Electrodes
 - 1/8" Lincoln Fleetweld 5P (E6010) SMAW Electrodes

- **Minimum Project Requirements:**

- 5 Individual SMAW Welds of 3” or greater (Two 3F vertical up welds required)
- 5 Individual GMAW Welds of 3” or greater (Two 3F vertical up welds required)
- 5 Individual GTAW Welds of 3” or greater (Two 3F vertical up welds required)
- 5 Individual FCAW Welds of 3” or greater (Two 3F vertical up welds required)
- 5 Individual OFC Cuts of 5” or greater
- 10 Drilled Holes made using the supplied Mag Drills
- Job box shall have a minimum capacity of 9 cubic feet
- Job box shall have at least 1 removable tray
- Job box shall have a lockable lid
- Job box shall have handles

- **Judging Overview:**

Category	Points	Judging Detail
Safety	75	Each safety infraction will be a 5pt deduction
SMAW	100	5 required welds will be judged on joint fit-up, size, contour and appearance
GMAW	100	5 required welds will be judged on joint fit-up, size, contour and appearance
GTAW	100	5 required welds will be judged on joint fit-up, size, contour and appearance
FCAW	100	5 required welds will be judged on joint fit-up, size, contour and appearance
OFC	100	5 required cuts will be judged on angle, appearance, dimension, bottom edges slag free and cuts free of chipping marks (Cuts must be judged prior to any cleaning, grinding, etc)
TEAMWORK	100	Students will be judged on equal participation, team communication and ability to work together
FABRICATION	150	10 critical dimensions will be judged for accuracy. Overall appearance and functionality is also scored
ORAL EXPLANATION	50	2-5 minute oral explanation of the project design and team's preparation. This will be conducted randomly during the 6-1/2 hour fabrication part of the competition
WELD DRAWINGS		Minimum requirements for Blueprint: Title Block, Proper Critical Dimensions, No Tolerances, Proper Welding Symbols, Proper Finishing Symbols, Proper Views to Fabricate the project, Proper Sub Assembly Drawings
WRITTEN TEST	75	The 3 individual test scores are averaged for your team's total score
Lbs. of Unused Material	50	0 lbs. – 5.0 lbs. - 50 pts. 5.1 – 10.0 lbs. - 45 pts. 10.1 lbs. -15.0 lbs. - 40 pts. 15.1 lbs. – 20.0 lbs. – 35 pts. 20.1 lbs. – 25.0 lbs. – 30 pts. 25.1 lbs. – 30 lbs. - 25 pts. 30.1 lbs. – 35.0 lbs. 20 pts. 35.1 lbs. – 40.0 lbs. - 15 pts. 40.1 lbs. – 45.0 lbs. - 10 pts. 45.1 lbs. – 50.0 lbs. - 5 pts. Over 50.1 lbs. - 0 pts.

- **Items that must be supplied by Teams:**
 - All Personal Protective Equipment
 - Welding helmet with appropriate filter plate/lens (#10 shade or darker for GMAW/FCAW/SMAW) and protective cover plate/lens in a flip or slide front. Auto darkening shields are permissible
 - Oxyacetylene goggles or face shields for cutting
 - Grinding face shields
 - Spare spatter and filter lenses/plates for arc welding helmet and oxyacetylene goggles
 - Drill bits needed to complete the project (Spares will be provided if needed)
 - Blueprints – See “Blue print requirements” below
 - Résumé for each team member
 - Teams must bring own hand tools needed to complete the project.
 - See recommended tool list below.
 - Team may bring additional hand tools however no power tools will be allowed.

- **Clothing / Personal Protective Equipment (Fire-resistant)**
 1. ANSI Z-87 approved safety glasses with side shields. (Competitors that require prescription glasses must have ANSI Z-87 approved prescription safety glasses with side shields or wear ANSI Z-87 approved cover safety glasses over their prescription glasses.)
 2. 100% cotton shirt. To be worn under the welding jacket or cape and bib
 3. 100% cotton work pants with no holes or tears
 4. Welding cape with sleeves (leather or fire retardant cotton) and bib or welding coat (leather or fire retardant cotton)
 5. Welder’s hat or skullcap
 6. Leather gauntlet welding gloves (for other than GTAW)
 7. Leather welding gloves GTAW
 8. Leather boots (steel-toed recommended)

(No tennis shoes allowed)

 9. Hearing and/or ear protection
 10. Welding helmet with an appropriate filter plate or lens (#10 or higher for SMAW/GMAW/or FCAW) and a protective cover plate for arc welding.
 11. Welding helmet, face shield, or goggles with an appropriate filter plate or lens (#5-#6) for OFC

- **Blue print Requirements:**
 - 11” x 17” size paper printed in the Landscape mode
 - No bindings or covers
 - Title block in lower right hand corner with space titled Team #.
 - **Your team number will be recorded** by the SkillsUSA staff when you turn in your prints.
 - No school name or identifying marks on the print
 - Max of 10 pages – You must have overall dimensions of the finished product included within the drawings you submit.
 - All Welds **MUST** have appropriate weld symbols included to show where the required welds and weld processes will be used on the parts
 - All vertical welds shall be noted
 - All prints will be submitted to the committee in a PDF format on a USB type drive. (The drive will not be returned to the team)
 - A blueprint can be neatly hand drawn if the team does not have access to design software. However, an electronically scanned pdf copy is still required.
 - (3) paper copy submissions per group to be turned in to the committee. You must provide your own copies to use in the contest.
 - Do NOT roll up paper copies

- **Tools Supplied by Committee to each team:**

- Welding Machines
 - Miller XMT350 with Miller 24A feeders for SMAW/FCAW/GMAW
 - Miller Electric Dynasty 200 or Lincoln Precision TIG 225 for GTAW
- Environmental Equipment
 - 1 Environmental Extraction Unit per team
- Smith OFC cutting torches
- Materials from Bill of Materials
- Two 4 ½" angle grinders
- 3 cutting disks, 3 grinding disks and 3 sanding disks per team

- **Recommended hand tool list to be supplied by each team:**

Tool	Quantity
Calculator	1
Clamp - 12" Bar Type	1
Clamp - 24" Bar Type	1
Hammer - 3# (Short Handle)	1
Hammer - Chipping	2
Level - 24" Bubble Type	1
Measuring Tape - 25'	3
Pliers - Channel Lock (Large)	1
Pliers - Channel Lock (Small)	1
Pliers - Diagonal Wire Cutters	1
Pliers - Lineman's (Large)	1
Pliers - Needle Nose (Large)	1
Pliers - Slip Joint (large)	1
Pliers - Slip Joint (Small)	1
Screwdrivers - Flat Blade (Various Sizes)	5
Screwdrivers - Phillips Head (Various Sizes)	3
Square - Framing	1
Tin Snips	1
Vise Grips - 10WR (Regular Type)	1
Vise Grips - 11R (Short C-Clamp Type/Without feet)	2
Vise Grips - 11SP (Short C-Clamp Type/With feet)	2
Vise Grips - 18SP (Long C-Clamp Type/With feet)	2
Wrench - 8" Adjustable	1
Wrench - Set - Combination 1/4" to 7/8" (10 pcs)	1

- **Other tools:**
 - There will be a limited number of Milwaukee Mag Drills provided for drilling. Teams must use the drills when they are available. **To ensure that you have the correct drill bit size, you should provide your own drill bits.** Backup drill bits will be made available of various sizes but quantities may be limited
- **Safety:**
 - Face shields must be worn while grinding
 - Helmets or oxyacetylene goggles must be worn while cutting
 - Welding jackets must be worn while welding and grinding.
 - Safety glasses must be worn at all times
 - Only one grinder and one welding machine may be used at a time due to close proximity of teammates and only one piece of environmental equipment
 - Directing grinding sparks toward welding equipment or other people will result in a deduction of points
 - Environmental equipment must be used at all times when welding. Points will be deducted for improper use.
- **Other Information:**
 - When fabricating, sometimes parts and/or steel pieces are not supplied with the correct dimensions. If the dimensions are different than your prints, “on the job” corrections must be made. Notify the judges if materials are not the correct dimensions prior to any material prep. The judges will take that into consideration when judging.
 - The oral interview will be conducted randomly during the 6-1/2 hour fabrication part of the competition.
 - Teams will be allowed to take their project or they will be donated
 - **Teams are not permitted to bring any power tools, templates or additional material.**
 - **Possession or use of cell phones, MP3 players, tablets, computers, etc. is not allowed in the contest area at any time.**

1. **Alternating Current (AC) is used to GTA weld Aluminum because:**
 - A. The electrode positive portion of the AC current cycle provides cleaning action at the Aluminum surface
 - B. Aluminum conducts AC better than DC
 - C. AC power supplies are generally less expensive than DC power supplies
 - D. The electrode negative portion of the AC current cycle provides cleaning action at the Aluminum surface
 - E. None of the above

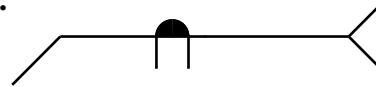
2. **Which type of power supply is used for the SMAW process?**
 - A. DCEP
 - B. DCEN
 - C. Constant Voltage
 - D. Constant Current

3. **Acetylene gas becomes unstable at what pressure?**
 - A. 3 PSI
 - B. 8 PSI
 - C. 15 PSI
 - D. 75 PSI

4. **Which one of the following is a ferrous metal?**
 - A. aluminum
 - B. copper
 - C. magnesium
 - D. mild steel

5. **The selection of the correct filter plate shade number depends on the:**
 - A. Brightness of the sun in the weld area
 - B. Type of shielding gas in use
 - C. Amount of current being used
 - D. Type of filler metal being used
 - E. All of the above

6. The weld symbol drawn below indicates:



- A. A full-penetration square groove weld
- B. A fillet weld with melt-through permitted
- C. A Butt weld with the arrow side ground flush
- D. A fillet weld with the arrow side ground flush

7. When GTA welding Carbon Steel plate, the Tungsten electrode should be:

- A. Located well inside the cup
- B. Balled
- C. Pointed at the tip
- D. Ground in such a fashion as to leave grind marks around the tip
- E. None of the above

8. Which of the following are functions of the coating on SMAW electrodes:

- A. Alloying
- B. De-Oxidization
- C. Shielding
- D. All of the above
- E. None of the above

9. When using an Oxy-Acetylene torch, the oxygen cylinder valve should be opened all the way.

- A. True
- B. False

10. The primary reason some suppliers coat their GMAW filler wire with copper is to:

- A. Aid in deoxidizing the weld metal in the weld pool
- B. Help smooth out the feeding of the wire
- C. Improve electrical transfer at the contact tip
- D. Prevent rusting of the filler wire

11. **Potential hazards relating to electric arc welding include:**
 - A. Heat
 - B. Radiation
 - C. Toxic gasses
 - D. All the above

12. **The size of a coated electrode is determined by the**
 - A. overall diameter
 - B. amperage setting
 - C. core diameter
 - D. AWS classification of electrodes

13. **If the Tungsten electrode turns blue after GTA welding, you should:**
 - A. Increase amperage
 - B. Increase preflow
 - C. Increase postflow
 - D. Decrease amperage

14. **When experiencing 'arc blow' during SMAW welding, one possible remedy could be:**
 - A. Use a full length electrode
 - B. Shorten the arc length
 - C. Change to DCEN from AC current
 - D. Whip the electrode

15. **When Oxy-Fuel cutting, a general rule is that the torch angle should vary according to:**
 - A. Type for fuel gas used
 - B. Size of tip used
 - C. Pressure settings
 - D. Thickness of metal to be cut

16. Which of the following is not an advantage of the Gas Metal Arc Welding process?
- A. Higher deposition rates compared to other welding methods
 - B. Relatively easy process for beginners to learn
 - C. Suitable for ferrous alloys
 - D. Suitable for nonferrous alloys
 - E. None of the above
17. Undercutting is a condition that occurs when
- A. welding current is too high
 - B. welding travel speed too slow
 - C. welding current is too low
 - D. arc length is too short
18. The distance through a fillet weld, from the face to the root is called the:
- A. Leg
 - B. Stem
 - C. Throat
 - D. Heart
19. The proper current type for most welding of Stainless Steels with the GTAW process is:
- A. DCEN
 - B. DCEP
 - C. Pulsed AC
 - D. None of the above
20. Which of the following SMAW electrodes are not suitable for use in all positions?
- A. E6011
 - B. E6018
 - C. E7024
 - D. E7018

21. Argon and helium gases are
- A. inert
 - B. reactive
 - C. reducing
 - D. oxidizing
22. In GMAW welding, shielding of the molten metal is accomplished through the use of:
- A. Granular Flux
 - B. Coating generated gas
 - C. Slag
 - D. Inert and reactive gasses
23. The safest clothing materials to wear in a welding environment are:
- A. Asbestos and Kevlar
 - B. Cotton and Wool
 - C. Nylon and Rayon
 - D. Polyester and Nylon
24. Which of the following is not considered a type of joint?
- A. Butt
 - B. T
 - C. Fillet
 - D. Corner
 - E. Edge
25. A green paint band on a GTA electrode indicates:
- A. Pure Tungsten electrode
 - B. Thorium
 - C. Lanthanum
 - D. Zirconium

26. **When using the SMAW process, as the arc length increases, the current does what?**
- A. Increases
 - B. Decreases
 - C. Initially increases then subsequently decreases
 - D. Initially decreases then subsequently increases
 - E. None of the above
27. **The flux on a SMAW electrode is broken down by the heat of the welding arc to produce,**
- A. Slag that reacts with the molten weld metal to reduce contaminants
 - B. Shielding gases to protect the molten weld from contaminating gases
 - C. A and B
 - D. None of the above.
28. **Which of the following shielding gasses is the most economical to use for GMAW welding of Carbon Steel with the short circuiting transfer method?**
- A. Argon
 - B. Carbon Dioxide
 - C. 98% Argon, 2% Oxygen mix
 - D. 75% Argon, 25% Carbon Dioxide mix
29. **An acceptable method of shielding yourself from the light from an electric arc while tackwelding is to:**
- A. Simply close your eyes while tackwelding
 - B. Hold your hands in front of the arc
 - C. Squint your eyes tightly while tacking
 - D. None of the above are acceptable
 - E. All of the above are acceptable

30. When two members are in the same plane with their edges meeting the joint is termed a:
- A. Corner joint
 - B. Lap joint
 - C. Butt joint
 - D. Tee Joint
31. When the electrode holder is connected to the positive (+) terminal on a Direct Current power supply, it is called:
- A. Direct Current Straight Polarity (DCSP)
 - B. Direct Current Reverse Polarity (DCRP)
 - C. Direct Current Direct Deposit (DCDD)
 - D. Direct Current Indirect Polarity (DCID)
32. Which of the following popular SMAW electrodes is classified as low-hydrogen?
- A. E6011
 - B. E6024
 - C. E7014
 - D. E7028
 - E. None of the above
33. When selecting a cutting tip for Oxy-Acetylene cutting, one should consider:
- A. Use the cleanest, newest tip available
 - B. How fast does the job need to be done
 - C. The thickness of the metal being cut
 - D. All of the above
34. What metal will a plasma cutter cut?
- A. stainless steel
 - B. aluminum
 - C. carbon steel
 - D. All of the above

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35. **When selecting a dark filter lens for a welding helmet, the higher the lens number is, the more arc light is blocked out.**
A. True
B. False
36. **Before opening the cylinder valves on Oxy-Fuel cylinders, the regulator adjusting screws should be turned in all the way.**
A. True
B. False
37. **Oxygen can be used for shielding gas when GMAW or GTAW welding, in an emergency.**
A. True
B. False
38. **Low hydrogen electrodes should be stored in a (an):**
A. Electric Oven
B. Electrode oven
C. A cool, dry place
D. A warm, humid place
E. Both (A) and (B) above
39. **What is the name for the opening produced during a cutting operation?**
A. Drag line
B. Slag
C. Kerf
D. Wraparound
E. None of the above
40. **The stringer bead weld is made with appreciable transverse oscillation.**
A. True
B. False

41. **Electric Arc welding performed with proper safety equipment presents great safety hazards.**
A. True
B. False
42. **On a completed groove weld, the surface of the weld on the side where the welding was performed is called the :**
A. Crown
B. Weld reinforcement
C. Weld Face
D. Root Face
E. None of the above
43. **Using the GTAW process, Aluminum can be successfully welded using DCSP.**
A. True
B. False
44. **When welding with the SMAW process, increasing the arc gap tends to have what effect on the molten pool?**
A. Heat up
B. Cool down
C. No effect- Molten Pool remains at the same temperature
D. None of the above
45. **When welding with an Oxy-Acetylene torch, the hottest part of the flame is:**
A. The tip of the inner cone
B. The yellow area of the flame
C. The blue area of the flame
D. None of the above
46. **"Arc Blow" is not found when using AC arc welding power sources.**
A. True
B. False

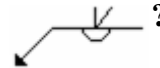
47. Oil or grease, used as a lubricant around Oxy-Fuel equipment, is very hazardous.
- A. True
 - B. False
48. Amperage (amp) is a measurement of the current in the welding circuit.
- A. True
 - B. False
49. Welding or cutting on zinc plated (galvanized) steel may cause
- A. metal fume fever
 - B. air quality problems
 - C. a rust resistant surface
 - D. A and B
50. The minimum protective shade number to be used for GMAW or FCAW processes is
- A. #7
 - B. #8
 - C. #10
 - D. #12
51. What metal will a plasma cutter cut?
- A. stainless steel
 - B. aluminum
 - C. carbon steel
 - D. All of the above
52. To safely light an oxy-fuel torch, a _____ should be used.
- A. Match
 - B. Friction spark lighter
 - C. Butane lighter
 - D. Welding arc

53. Acetylene cylinders should be
- A. stored and used in an upright position
 - B. used as leg for a steel bench
 - C. used as roller to move a heavy load
 - D. Heated to get all the acetylene out of the tank.

54. The most common inspection method for welding is
- A. dye penetrant inspection
 - B. visual inspection
 - C. Magnetic particle inspection
 - D. X-ray inspection

55. The "60" in E 6010 electrode specification stands for:
- A. Pounds of electrodes per can
 - B. Minimum current setting
 - C. Tensile Strength
 - D. All of the above

56. What type of weld does this welding symbol refer to ?



- A. Fillet With Backing
- B. Square Groove With Backing
- C. Bevel Groove With Backing
- D. Bevel Groove Without Backing
- E. Square Groove Without Backing



PRACTICE WRITTEN TEST
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