

JSC Safety and Health Requirements	JPR No.	1700.1
	Effective Date:	10/02/2024
	Expiration Date:	10/02/2029
	Page Number	Page 8.4-1 of 4

CHAPTER 8.4 WELDING, CUTTING, AND BRAZING SAFETY

8.4.1. Applicability of this chapter

You are required to follow this chapter if you do arc or heliarc welding, gas welding, gas cutting, or brazing.

8.4.2. General requirements for welding, cutting, or brazing

8.4.2.1 Employees engaged in welding, cutting, or brazing shall follow the general requirements below:

- a. Follow the requirements in 29 CFR 1910, Subpart Q (1910.252 – 255).
- b. Have a copy of the Safety Data Sheet (SDS) in the shop for every type of welding rod used.
- c. Have a valid JSC Form 1475, “Hot Work-Welding-Cutting Permit,” for all burning, cutting, or welding operations in all areas other than welding shops. See Chapter 5.8, “Hazardous Operations: Safe Practices and Certification,” paragraph 5.8.12 for more information. To create a permanent welding or hot work area, follow the procedure in Chapter 5.8, paragraphs 5.8.13.
- d. Complete and get approvals on a JSC Form 992, “Confined Space Entry Procedure,” and JSC Form 1476, “Confined Space Entry Permit,” for all welding operations done in confined spaces. Welding in a confined space will change the space classification to a permit-required confined space. See Chapter 6.9, “Entering Confined Spaces.”
- e. Observe the requirements of Chapter 5.6, “Personal Protective Equipment,” for fall protection and Chapter 8.7, “Ladders, Scaffolds, and Elevated Platforms: How to Work with Them Safely,” when working at heights of 4 feet or more above adjoining surfaces.
- f. Keep welding cables and other equipment clear of all areas where others may be working.
- g. Have protective equipment, such as helmets, shields, aprons, gloves, gauntlets, and other personal protective equipment required for each individual on the job, as described in 29 CFR 1910.252.(b)(2) and (3).
- h. Observe the requirements of Chapter 7.2, “Respiratory Protection,” when welding activities could cause exposures to exceed established limits for metal fumes. Contact Occupational Health x36726 or Email jsc-dl-occ-health@mail.nasa.gov for evaluation.
- i. Never weld, cut, or braze painted surfaces. The paint may contain lead, chromium, or other hazardous compounds and will cause significant toxic exposures when heated or burned. Properly remove the paint before welding, cutting, or brazing. OSHA has regulations governing the proper removal of paint containing lead, chromium, and other metals. If you are not sure about the compounds in the painted surfaces, contact Occupational Health, x36726 or Email jsc-dl-occ-health@mail.nasa.gov. They will analyze the paint and provide recommendations for its safe removal.

8.4.3. Fire precautions for welding, cutting, and brazing operations

8.4.3.1 Employees shall take the following fire precautions:

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 JSC Form JF2420B (Revised January 15, 2020) (MS Word August 28, 2006)

JSC Safety and Health Requirements	JPR No.	1700.1
	Effective Date:	10/02/2024
	Expiration Date:	10/02/2029
	Page Number	Page 8.4-2 of 4

- a. Observe the requirements of Chapter 5.1, “Fire Safety.”
- b. Provide and maintain suitable fire extinguishing equipment for instant use.
- c. Provide a properly trained fire watch for all welding or cutting operations where other than a minor fire may develop. A fire watch stays at the work site for at least 30 minutes after the hot-work operation. See Chapter 5.8, “Hazardous Operations: Safe Practices and Certification,” paragraph 5.8.11 for more information.
- d. Before starting the job, remove, guard, or cover all materials or structures that might catch fire with a fire-resistive covering. This includes the bottled gas.
- e. Where practicable, move all combustible materials at least 35 feet from the work site.
- f. Take precautions to prevent sparks or slag from falling onto combustible material below through floor openings or cracks that can’t be covered.
- g. Never weld, cut, or braze any unidentifiable material.
- h. Have all areas and vessels that could have flammable or explosives materials present checked out by Occupational Health.
- i. Never weld, cut, or braze near flammable or explosives materials.

8.4.4. When to use mechanical ventilation for welding

8.4.4.1 Employees shall have adequate local ventilation, such as an exhaust hood or snorkel meeting the requirements of 29 CFR 1910.252(c) under the following conditions:

- a. When required by 29 CFR 1910.252(c)(2)(i).
- b. When welding, cutting or brazing any metals listed in 29 CFR 1910.252(c)(5) – (12).
- c. **When welding in a room in which it is recommended by Occupational Health to control exposures to welding fumes.**

8.4.5. General requirements for welding, cutting, or brazing in a confined space

8.4.5.1 Employees welding, cutting, or brazing in a confined space shall:

- a. Observe the requirements of Chapter 6.9, “Entering Confined Spaces and Controlled Areas.”
- b. Observe the requirements in 29 CFR 1910.252(b)(4).

8.4.6. General requirements for gas welding

8.4.6.1 Employees engaged in gas welding shall:

- a. Follow the requirements in 29 CFR 1910.253.
- b. Use the special T-wrench to open the cylinder and leave it close to the cylinder for emergency use.
- c. Have flashback protection on the cylinder.
- d. Only use oxygen cylinders, gauges, regulators, valves, and fittings rated and identified for oxygen use.

JSC Safety and Health Requirements	JPR No.	1700.1
	Effective Date:	10/02/2024
	Expiration Date:	10/02/2029
	Page Number	Page 8.4-3 of 4

e. Store cylinders per 29 CFR 1910.253(b)(2) – (4).

8.4.7. Caring for hoses

8.4.7.1 Employees shall properly care for hoses by:

- a. Protecting the hoses from damage.
- b. Visually inspecting the hoses for leaks.
- c. Repairing or replacing damaged hoses.
- d. Using only standard ferrules or clamps on all hoses.
- e. Not using tape or wire for holding hoses onto attachment points.
- f. Regularly operating any relief valves to make sure they work.
- g. Never using bootleg adaptors that allow hoses to be used for non-specified connections.

8.4.8. Requirements for arc welding

8.4.8.1 Employees engaged in arc welding shall:

- a. Follow the requirements in 29 CFR 1910.254.
- b. Connect the ground return line securely.
- c. Not ground the welding generator. This supplies a second current path through building steel.
- d. Protect auxiliary 240/120 volt outlets from the generator with a GFCI at the generator.
- e. Ground the work piece properly.
- f. Check connections before starting the welding machine.
- g. Wear appropriate PPE as called out on the SDS, by supervisors and by the governing safety and health plan.
- h. Make sure helpers also wear appropriate PPE when working on or near welding, cutting, brazing, or grinding operations.
- i. Use helmets, shields, and appropriate clothing to protect against flash burns, sparks, or flying particles.
- j. Protect terminals for welding leads against accidental electrical contact by personnel or metal objects.

8.4.9. Certification required for welding at JSC

8.4.9.1 For the safety of all personnel, employees shall be certified for the welding process, material, and hardware type they will be welding. Use the certification requirements in the following publications appropriate to what they are welding:

- a. Flight Hardware – AMS-STD-1595, “Qualification of Aircraft, Missile, and Aerospace Fusion Welders”
- b. Structural Hardware – AWS B2.1, “Specification for Weld Procedure and Performance Qualification”

JSC Safety and Health Requirements	JPR No.	1700.1
	Effective Date:	10/02/2024
	Expiration Date:	10/02/2029
	Page Number	Page 8.4-4 of 4

- c. Pressure Systems – American Society of Mechanical Engineers (ASME) Section IX, “Welding and Brazing Qualifications”

8.4.10. For more information on welding, cutting, and brazing

- a. 29 CFR 1910, Subpart Q, “Welding, Cutting, and Brazing”
- b. NIOSH 75-115, “Engineering Controls for Welding Fumes”
- c. NIOSH 77-131, “Welding Safety”
- d. NIOSH 78-138, “Safety and Health in Arc Welding and Gas Welding and Cutting”
- e. NIOSH 79-125, “Assessment of Selected Control Technology Techniques for Welding, Fumes”