Chapter 6.11
Pressurized Gas and Liquid Systems

This could be you . . .

A technician was burned by a fire in a component of a high-pressure oxygen system.

An expansion bellows on a section of piping ruptured during pressure testing and injured several employees. The bellows wasn't properly restrained during the testing.

A gate valve on a high-pressure nitrogen trailer flew off and killed an employee during maintenance. The maintenance workers didn’t take all possible steps to make sure that the trailer wasn’t pressurized before working on it.

1. Applicability of this chapter

You are required to follow this chapter if you use pressurized gas or liquid systems.

2. Requirements for using any pressurized systems

All your pressure vessels, pressure systems, and pressure systems components shall:


b. Have their current design, installation, testing, certifications, modifications, periodic recertifications, and maintenance properly documented.

c. Be marked, tagged, or otherwise identified to indicate the certified use.

d. Be located to minimize the risk to personnel and surrounding equipment and facilities if a leak or rupture occurs.

3. Requirements for systems that contain pressure vessels, fixed piping or tubing, valves, or other components

Your pressure systems shall:

a. Meet JPR 1710.13 (current version) for the design, installation, testing, certification, and periodic recertification of your pressure vessel.


c. Make sure that relief valves and other discharge parts follow minimum separation distances as called out in the references given above.
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d. Properly restrain relief valves, rupture discs, burst discs, and associated piping or tubing to prevent movement from the thrust created by a pressure release.

e. Properly bond and ground your systems.

4. Requirements for fire protection systems

All fire protection systems shall meet the requirements of the NFPA for the specific type of fire protections system involved.

5. Requirements for flex hoses

You shall meet the following requirements:

a. Proof pressure-test and tag flex hoses according to the requirements of JPR 1710.13 (current version).

b. Secure flex hoses that are not in a cabinet or other containment and that are used in 150-psig or greater normal service at both ends and tether or weigh them down at no greater than 6-foot intervals, and you shall:
   1. Secure hoses between 3 and 6 feet in length at both ends and tether or weigh them down in the middle. Hoses shorter than 3 feet in length only need to be secured at both ends.
   2. Ensure that this securing, tethering, or weighting is sufficient to withstand forces arising from sudden failure. Strapping hoses together is considered tethering.
   3. Secure flex hose vent and drain lines at the free end.

c. Flex hoses need not be secured if in vacuum service or a written hazard analysis or technical order, which controls the hazard, is approved Safety and Test Operations Division.

d. For commercial off the shelf (COTS) flex hoses, with the exception of hoses having quick disconnect type fittings, the hose end fittings connected to rigid pieces are considered to provide adequately secured restraint at the hose ends without having to redundantly secure them by any additional method such as tethering or strapping. A rigid attach point is defined as fixed hardware capable of withstanding MAWP. Hoses longer than 3 feet with ends secured in this manner must still be secured in the middle and at intervals not to exceed 6 feet.

6. Requirements for systems using oxygen or oxygen-enriched gas (greater than 25 mole percent oxygen or oxygen greater than 25% oxygen by volume)

You shall meet the following requirements:


Verify this is the correct version before you use it by checking the online version.

b. For systems using oxygen or oxygen-enriched gas above 250 psi and that involve humans in the loop, you need to flow the oxygen through the system unmanned before introducing a human into the system. Examples of these systems include chambers and breathing gas systems. Testing shall follow these requirements:

1. Test new systems and test, after modifications, existing systems that require disassembly and reassembly of the parts of the system.
2. Test the system at maximum operating pressure (just below relief valve pressure) for 10 cycles.
3. Sample for chemical purity per MIL-PRF-27210G. Also test moisture levels per specific program requirements. Sample the system before use, or monthly and after any maintenance activities that violate system integrity.

7. Requirements for using non-bulk compressed gas cylinders

You shall meet all the requirements of 29 CFR 1910.101, “Compressed Gas Cylinders” and any additional requirements defined by Center Operation Directorate or by contract.

Firm fixed price contractors that are supporting Construction of Facilities (CoF) projects at JSC, Ellington Field and SCTF are allowed to bring all necessary gases needed for the project on site provided they meet all NASA, OSHA, site and contractual requirements to ensure safe handling, transport and use of required gases. For all other contractors or JSC organizations, the Logistics Division is the only authorized avenue for purchasing and disposing of non-bulk compressed gas cylinders for use at JSC, Ellington Field, and SCTF. For safety and accountability, NASA and vendor owned cylinders are tracked, disposed of, and/or returned to vendors when no longer required. Any unauthorized gas purchases will be held in the hazardous storage area and may be returned to the vendor. As an authorized user of compressed gas cylinders, you shall:

a. Send gas requests to the Logistics Support Contractor/Bldg. 421 on a JSC Form (JF) 1710, JSC Warehouse Requisition, or fax to 46540.

b. Contact the Logistics Support Contractor at extension 36547 for pickup of cylinders that are empty or no longer needed.

c. Ensure that a completed JSC Form 1161 accompanies any cylinder(s) that contain hazardous material(s). (A compressed gas container is empty if it is at atmospheric pressure.)

NOTE: "Exceptions to purchasing gases through the Logistics Division may also be granted for specialty gases used in experiments with the concurrence of the Logistics Division, the Safety and Test Operations Division, and the Clinical Services Branch."
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8. For more information on pressurized gases and liquids

You can find more information on pressure systems in the following:

a. 29 CFR 1910.101

b. JPR 1710.13 (current version)

