

## APS Documentation Requirements for Pressurized Experiment Apparatus

When bringing a piece of apparatus to the APS for an experiment that will involve pressure, whether it is to be used on a beamline during a measurement or in a laboratory to prepare the sample prior to the experiment, the hazards associated with the equipment must be reviewed. To review the equipment and make any recommendations, a certain level of documentation must be provided by the experimenter. The length and depth of the documentation should be commensurate with the complexity of the system.

1. Description of apparatus
  - a. Description of the assembly and operation of the system.
  - b. State the maximum working pressure, working fluid (liquid or gas) used to pressurize the system along with the pressurized volume of the system. This information is used to calculate the stored energy of the system.
  - c. Photo or schematic of system with major components identified. High and low pressure branches should be identified if present.
  - d. Safety analysis or features; i.e. pressure relief devices (PRD)
  - e. Additional hazards associated with apparatus; i.e. chemical compatibility, etc...
2. Component listing with pressure rating; i.e.  $P_{\max}$ 
  - a. List of all components including connecting tubing or pipe.
  - b. Use of the phrase “standard HP cone fittings” or “standard compressed air fittings” or “standard national pipe fittings” with their respective pressure rating is acceptable. PDFs of catalog pages or component datasheets are acceptable as supporting documents.
  - c. Any component with a pressure rating less than the working pressure of the experiment must be shown to be protected by an appropriately sized pressure relief device. See item 1.d above.
3. Design calculations on custom components; custom component being defined as machined as a “one of,” whether in a University, Argonne, or commercial machine shop. The pressure rating is defined as the maximum allowable working pressure (MAWP) and should be 10-20% higher than the working or operating pressure of the experiment.
  - a. Engineering drawing with dimensions, material spec, and reference to specific ASME or other national code requirements. If a component design fall within the scope of the ASME code, it must be designed to the respective code requirements. If the design is outside the scope of the ASME, it must be shown that it is designed to an equivalent safety of the ASME code.
  - b. Calculations of a maximum pressure rating with a safety factor of four (4) for ductile material and ten (10) for brittle material.
  - c. Material specs and mill reports.
4. Standard operating procedure (SOP) for the experiment
  - a. Level of SOP should be commensurate with complexity of the system. Moderate to high hazard systems should include hold points where certain requirements must be met before proceeding.
  - b. Risk Table or Off-Normal Occurrence Procedure; List what conditions would be considered off-normal and what the user should do when encountered.