Pressure Systems For Contractors

Revised 2/11/2025

For general information and questions on the information included in this presentation, contact the Pressure Systems Office (PSO) Helpline:

(216) 433-2973

grc-pso@mail.nasa.gov

Why we do it:

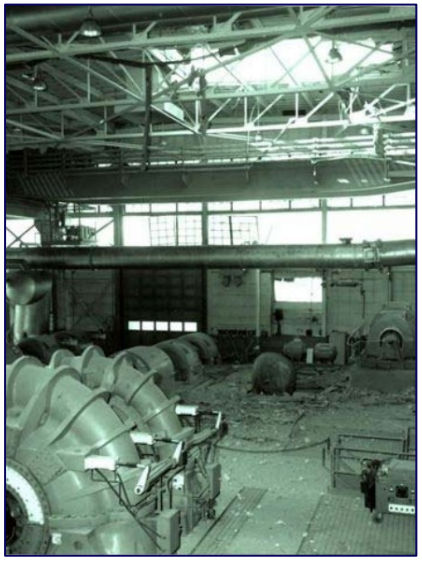
- NASA regulations require each center to have a Pressure Vessel and Pressurized Systems (PVS) compliance program
  - NPR 8715.1 – NASA Safety and Health Programs
  - STD 8719.17 – NASA Requirements for PVS

Why we do it:

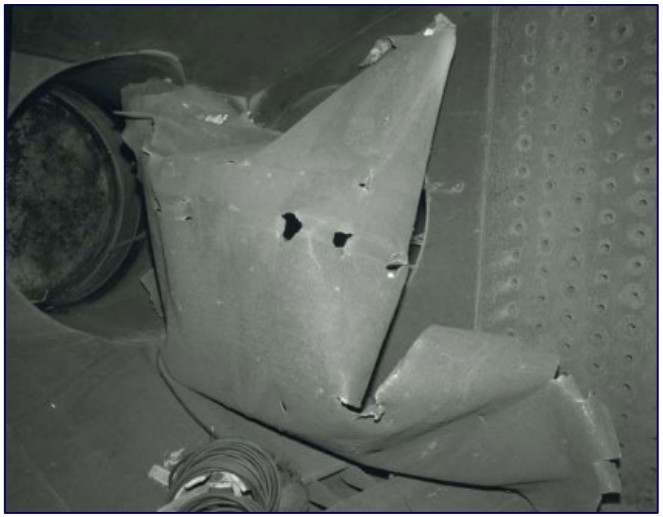
- State and federal regulations (e.g. OSHA, CFRs, State of Ohio Law) require PVS be constructed (and repaired) to National Consensus Codes and Standards (NCS)
  - Ohio is a code State (ASME and NBIC codes apply)
  - NASA policy is to NOT exercise Federal Exclusion (i.e. act like a commercial entity)
    - Follow state law with boilers (ASME Section I, Section IV)
    - Follow ASME Section VIII for pressure vessels
    - Follow ASME B31 series piping codes for piping systems
    - Follow NBIC for repairs
    - Follow others reg's as applicable for operations (NFPA, API, etc.)

Why it's important:

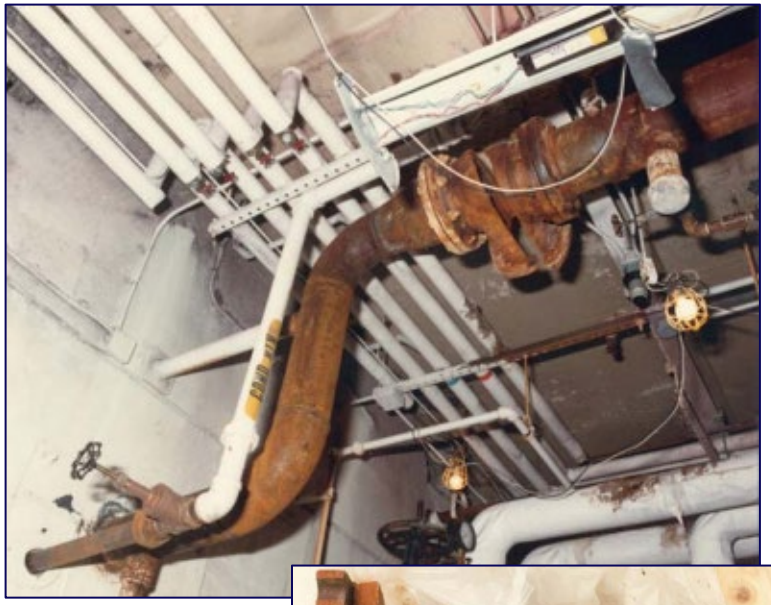
- Bad things can (and do) happen when NCS are not followed. Some Examples:



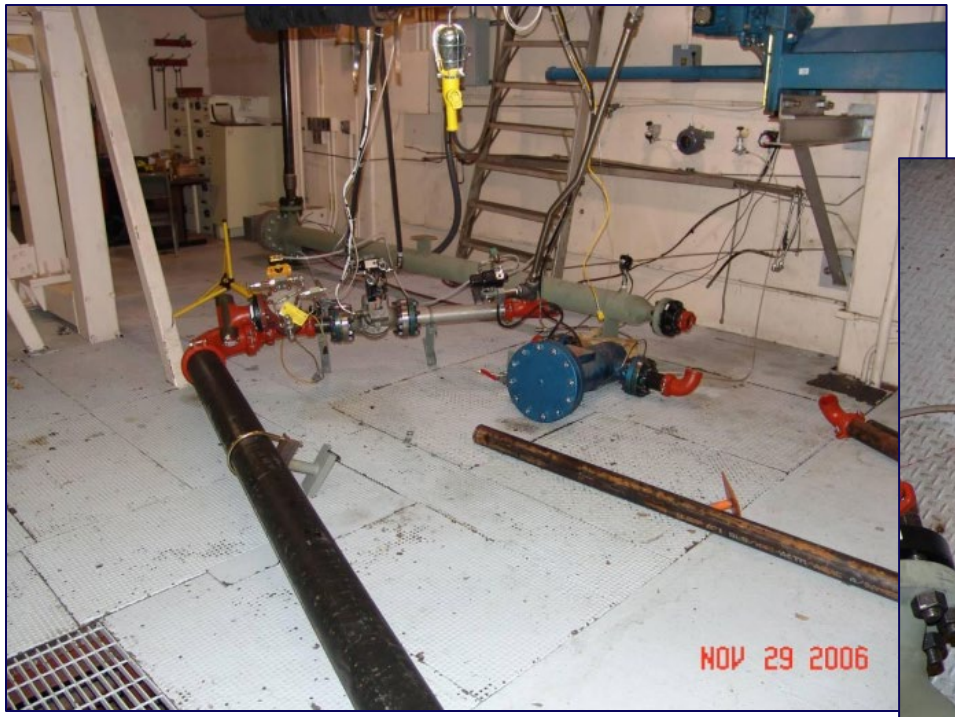
Bldg 64 explosion – lack of adequate relief



Bldg 38 implosion of cooler – lack of certification/inspection was a significant contributing factor



Bldg 60 steam line rupture – cast iron components, not recommended by code, contributed to piping system failure



8 x 6 piping failure – Victaulic coupling used to avoid code compliant welding. For the prepared shop, welding would be considerably cheaper, easier, and quicker construction method.

What it entails:

- All new construction and repairs must comply with applicable NCS:
  - Piping must comply with ASME B31 series piping code (typically B31.3 or 31.9) – Note: per code, owner, not contractor, determines applicable code
  - All vessels must comply with ASME Section VIII
  - Fabrication, installation, examination, and testing must comply with applicable codes
  - Pressure Systems Office (PSO) certifies system as code compliant when job is done (some exceptions)
  - Pressure Systems Manager (PSM) is responsible for assuring all construction is code compliant, all PVS is certified, and is the Authority Having Jurisdiction (AHJ) for all code interpretation matters

General Requirements

- Pressure vessel fabricators must have current code stamp(s)
- Piping fabricators should have a quality program consistent with ASME piping code
- Assure staff have correct credentials and qualifications – especially welders
- Know basic OSHA safety rules and requirements
- Know basic requirements of the Glenn Safety Manual (especially Chapter 7, others as applicable)
- Know basic piping code requirements and scopes (esp. ASME B31.3)

Pre-Construction Requirements

- Confirm PSO has verified design as code compliant
- If design-build, assure design is code compliant – ask to have PSO verify
- Assure P&ID drawing exists and is code compliant (or confirm P&ID is not required for the job)
- Collect key component cut sheets/specifications
- Compile a weld map if job involves more than a few welds; assure weld procedures exist, the procedures are qualified, and welders are qualified to do it
- Draft Health and Safety Plan (HASP); address Hot Work and Confined Space permit needs if applicable
- Determine Owners Inspector for PVS portion of job (may not be QA)

Construction Requirements

- Collect data sheets for major/critical components (e.g. relief valves, gauges, regulators, insulation, etc.)
- Verify fitting specifications/stampings (elbows, tees, weldolets, flanges, etc.)
- Collect mfgr certification sheets for critical components (e.g. relief valve cert's, vessel U-1 form, piping Material Test Reports (MTR), vessel MTR, bellows/expansion joint specifications, etc.)
- Assure piping support and vessel installations are code compliant
- Follow weld requirements and pressure test requirements

Welding Requirements

There are two approaches to assuring welds are code compliant and certified:

1. Quality Program:
   - Contractor hires an independent third party (i.e. Team or comparable entity) to examine welds, verify welder credentials, and validate process. Results are provided to Government Owner Inspector (OI) for PVS
   - This approach can be used for any job, but is essential for larger jobs involving many welds
2. Weld Request Form (GRC4025):
   - Form is filled out and submitted to PSO per form instructions
   - Examination is negotiated (typically 3rd party, but can be PSO examiner if QA concurs and provides funds
   - This approach is usually used only for jobs with very few welds

Welding Requirements, continued

Detail requirements are common to both approaches (see ASME B31.3, ASME Section IX, etc.):

- Verify and collect welding documentation to be provided to Owners Inspector:
  - Weld Procedure Specification (WPS)
  - Procedure Qualification Record (PQR)
  - Welding Operator Performance Qualification (WPQ)
  - Welder continuity logs
  - Weld pre-heat and post weld heat treat records
  - Welding rod MTRs and specification records
  - Weld map

Welding Requirements, continued

- Weld procedures must be followed for any piping system regardless if the system is certified or excluded (i.e. code welding procedures would be required on an excluded water system)
- Welding on any **pressure vessel** or **code-stamped component** must be accomplished by a shop holding a current R-stamp credential. Only the PSM has authority to waive this rule.
- R-1 form signed by Authorized Inspector (AI) can be used to certify welds (no need to produce weld procedure and qualification documents in this instance because AI verifies)

Pressure Test Requirements

- Piping/vessel code compliance requires a pressure test.
- The type of pressure test can vary between in-service leak check, hydrotest, pneumatic test, or sensitive leak test depending on:
  - The specific code (e.g. ASME B31.3 vs B31.9 piping code)
  - Type of service (e.g. Normal Fluid Service vs Category D Fluid Service)
  - Circumstances (e.g. system may not be able to tolerate water for hydrotest)

Pressure Test Requirements, continued

- The pressure test must be documented – standard code forms or GRC forms can be used for this purpose
- Hydrotest can be accomplished without any special approvals; Pneumatic tests require a permit due to the potential stored energy
- Pressure test requirements are detailed in Glenn Safety Manual (GSM), Chapter 7

Pneumatic Test Requirements

- Require a permit due to potential stored energy associated with the test
- Procedures and forms for pneumatic test permit are contained in GSM Ch. 7

For instructions on how to submit a pneumatic test request, contact the Pressure Systems Office (PSO) Helpline:

grc-pso@mail.nasa.gov

References

- NPR 8715.1 – NASA Safety and Health Programs
- STD 8719.17 – NASA Requirements for PVS
- Glenn Safety Manual (GLP-QS-8715.1)
- ASME piping and vessel codes (B31 series piping codes and Section VIII Boiler and Pressure Vessel Code)
- NBIC NB-23