



Conduct of Engineering Request for Variance or Alternate Method

Assigned by SMPO or SMPOR: Alternate Method Variance

Tracking number: VAR-2011-032.1

1.0 Affected Document(s)

- Engineering Processes (e.g., P 341)
- Engineering Standards (e.g., P 342)
- Engineering Training & Qualification (e.g., P 343)

Subordinate (Functional Series) document if applicable (ESM Chapter, Master Spec, AP, etc.):

Document(s) Title/Number:

ESM Chapter 17, "Pressure Safety", Rev. 3, Section 1, Program Requirements

If against P documents themselves, revision: _____

Section/Paragraph

ESM Chapter 17, Section 13.0, *Inspection, Testing and Maintenance*, Item C, *Post Modification/Maintenance Testing*

Specific Requirement(s) as Written in the Document(s)

ESM Chapter 17, Section 13.0, *Inspection, Testing and Maintenance*, Item C, *Post Modification/Maintenance Testing*

- "1. For existing (legacy) pressure systems that require system modifications, or any other action which requires the system to be opened and modified by installing a new joint (or removal and replacement of components for calibration purposes), the affected section of piping must be tested/examined as follows (illustration of joint shown below):
- a) For welded connections where elevated pressure leak test is not possible:
 - (1) Full Penetration Weld – Perform volumetric examination (N/A for Cat D per B31.3)
 - (2) Partial Penetration weld – Perform surface examination (N/A for Cat D per B31.3)
 - (3) Perform Initial Service Leak Test as follows:
 - i) Gradually increase pressure in steps until the operating pressure (maximum pressure during normal system operating conditions) is reached, holding the pressure at each step long enough to equalize piping strains.
 - ii) Between each pressure step, examine the affected joints for indications of leaks.
 - b) For welded connections which can be leak tested at elevated pressure:
 - (1) CPSO must approve test method and test pressure.
 - c) For mechanical (e.g., threaded, flanged) connections:
 - (1) Fluid Category M systems: CPSO must approve test method.
 - (2) All other fluid category systems: Perform in-service leak test as described in a) (3) above."

2.0 Request

Brief descriptive title: Alternative Method of Leak Testing for Modification/Maintenance.

NCR required (work has occurred)? Yes No If Yes, NCR Number (NCR-2011-205, NCR-WFO-11-77)

TA-Bldg-(Room) and/or Project Affected:
LANL

System/Component Affected:
Modified/Maintenance of Pressure systems

Proposal

Alternative Method of Leak Testing for Modification/Maintenance

In addition to the leak test method listed in "ESM Chapter 17 ESM Chapter 17 Rev. 3, Section 13.0.C. Post Modification/Maintenance Testing" for leak testing pressure system modifications/maintenance that only consist of ASME B31.3 or LANL CPSO approved components with mechanical connections and/or code tested sub-assemblies, where mechanical connections are assembled in accordance with manufacturer's instruction or the applicable code or standard. ESM Chapter 17, Section 13.0.C. Post Modification /Maintenance Testing the initial-service leak test proscribed by a)(3) may also be performed by either test as follows:

- a) Vacuum rate-of-rise method: To execute a vacuum rate-of-rise leak test, the relevant sections of the system are evacuated to a predetermined absolute pressure level. The evacuation stopped and the system monitored for absolute pressure for at least five minutes. The acceptance criteria will be specified by the responsible engineer/designer and will be determined independently for each unique leak test situation based on system parameters for example volume, number of joints, and system function. Acceptance criteria will be specified as an acceptable rate of absolute pressure rise. PSO approval is required for specified acceptance criteria greater than 10^{-3} standard cc/sec.
- b) Trial run of substitute referee inert gas(s) at same operating conditions as will exist with process gas(s): A trial run at the same pressure, temperature, and other salient operating conditions as process gas(s) with substitute inert gas(s) prior to introduction of the process gas(s). Pressure system will be examined for evidence of leakage at the Modification /Maintenance in accordance with the Gas and Bubble Test method specified in the BPV Code, Section V, Article 10, or by another method demonstrated to have equal or greater sensitivity. Sensitivity of the test method shall not be less than 10^{-3} atm/ml/sec under test conditions. Allowable leakage rates higher than 10^{-3} standard cc/sec may be specified by engineering and approved by the PSO.

Justification/Compensatory Measures

The following excerpts from ASME B31.3 2008 provide justification for the proposed leak testing of final connections:

300 General Statements,

"(c) Intent of the Code:

- (1) It is the intent of this Code to set forth engineering requirements deemed necessary for safe design and construction of piping installations.
- (2) This Code is not intended to apply to the operation, examination, inspection, testing, maintenance, or repair of piping that has been placed in service. The provisions of this Code may optionally be applied for those purposes, although other considerations may also be necessary."

"345.2.3 Special Provisions for Testing

- (a) *Piping Components and Subassemblies.* Piping components and subassemblies may be tested either separately or as assembled piping.
- (b) *Flanged Joints.* Flanged joints used to connect piping components and subassemblies that have previously been tested, and flanged joints at which a blank or blind is used to isolate equipment or other piping during a test, need not be leak tested in accordance with para. 345.1.
- (c) *Closure Welds.* The final weld connecting piping systems or components which have been successfully tested in accordance with para. 345 need not be leak tested provided the weld is examined in-process in accordance with para. 344.7 and passes with 100% radiographic examination in accordance with para. 344.5 or 100% ultrasonic examination in accordance with para. 344.6."

"341.3.2 Acceptance Criteria. Acceptance criteria shall be as stated in the engineering design..."

Duration of Request:		Start Date:		End Date:		<input checked="" type="checkbox"/> Lifetime	
Requestor Grant Stewart		Z Number 197703	Organization ES-WFO	Signature On File		Date 1/9/11	
USQD/USID required (Nucl. High/Mod Hazard)?		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		If Yes, USQD/USID Number USQ-WETF-10-617-D			
Design Authority Representative Grant Stewart		Z Number 197703	Organization ES-WFO	Signature On File		Date 1/9/11	

LANL Owning Manager (FOD or Programmatic) Raeanna Sharp-Geiger	Z Number 109636	Organization WFO-DO	Signature On File	Date 2/4/11
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3.0 Safety Management Program Owner (SMPO) Representative (SMPOR/POC)

<input type="checkbox"/> Decline <input checked="" type="checkbox"/> Accept <input type="checkbox"/> Accept Labwide <input type="checkbox"/> with Modification:				
POC Ari Ben Swartz, ES-DE	Z Number 2352511	Signature On File		Date 1/5/11

4.0 Additional Approval for P341 and APs; P342, ESM, Code, and Regulation Matters; and P343

<input checked="" type="checkbox"/> Accepted <input type="checkbox"/> Accepted with comments <input type="checkbox"/> Declined				
Comments:				
Safety or Security Management Program Owner Daniel L. Steinberg, ES-DO		Z Number 219039	Signature On File	Date 1/7/11