

Conduct of Engineering Request for Variance or Alternate Method

To display the *VAR Request Metadata* pane for this document, click **File > Info > Properties > Show Document Panel.**

1.0 General

1.1 Document Number: VAR-10198		1.2 Revision: 0					
1.3 Brief Descriptive Title: In-process Examination of Tie-in to Existing Contaminated Wet Vac Piping							
1.4 Affected Program: Engineering Standards		1.5 Request Type: Alternate Method					
1.6a Affected Tech Area 55		1.6b Affected Buildings Sitewide					
1.7 Requestor: Biggs, Ramona Organization: ES-EPD							
1.8 Revision History <table border="1"> <thead> <tr> <th>Revision Number</th> <th>Changes and Comments</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Initial issue.</td> </tr> </tbody> </table>				Revision Number	Changes and Comments	0	Initial issue.
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0	Initial issue.						

2.0 Affected Conduct of Engineering Program/Documents

2.1 Affected "P" Document: P342 Engineering Standards If against the P document itself, revision (or N/A): N/A		2.2 Subordinate or related document(s) [AP, master spec, LANL ESM chapter & section; or code, Order, standard, etc.]: Document Title/No.: ESM Chapter 17, Section EXIST – Legacy System Requirements Revision Rev. 2 Document Title/No.: <i>Enter text..</i> Revision <i>Enter text..</i> Document Title/No.: <i>Enter text..</i> Revision <i>Enter text..</i>	
2.3 Section/Paragraph: Paragraph 3.0 Modification or Maintenance of an Existing System, B, 1, c, 2).			
2.4 Specific Requirement(s) as Written in the Document(s): <i>Enter text..</i> B. Testing of Modifications to Existing Systems 1. For existing (not only legacy as illustrated below) 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: c. For mechanical (e.g., threaded, flanged) connections: 2) All other fluid category systems: Perform in-service leak test as described in 1.a.3) above. a. For welded connections where elevated pressure leak test is not possible: 3) Perform Initial Service Leak Test as follows: i. Gradually increase pressure in steps until the operating pressure (pressure during normal system operating conditions) is reached, holding the pressure at each step long enough to			

equalize piping strains except for systems under 25 psig and with a volume of 2 cubic foot or less, pressure can be brought up in one step.

2.5 Contractual, preference, or other basis for requirement in 2.4:
ESM Chapter 17 is the required implementation of 10CFR851.

A. Piping that is not part of a "supporting piping system" but is within the scope of B31.3 or B31.9 may apply the applicable, approved equivalency evaluations in the Attachments (*e.g., NASME-1, NASME -2*)

B. In order to be eligible for the attached equivalencies, the piping system cannot have a boiler, pressure vessel, or air receiver as part of the pressure system or be part of the supporting piping system.

From ESM Ch 17 Section GEN Attachment GEN-1 Definitions and Acronyms:

"Supporting piping systems" shall be considered any and or all the piping necessary for the function of the process or system for all pressure vessels, boilers, and air receivers. Piping that is attached in excess of that required for the process or system operation is not "supporting piping." For LANL, the system boundaries are defined by ESM Chapter 1, Section 220, and Chapter 1, Section 210, Attachment A. In practical applications to separate "supporting piping" from non-supporting piping, a unique pressure safety system identification number in accordance with ESM Chapter 17 will be used to identify piping that is considered to be non-supporting piping. All pressure systems are required to meet the requirements of ESM Chapter 17.

2.6 Type of VAR from ESM Chap 1, Z10 [*Applies only to standards variances*)

Type 2

2.7 Discipline

Pressure Safety

3.0 Request Information & Comments

3.1 NCR required (work has occurred)? No

If Yes, NCR Number: [Enter text.](#)

3.2 System/Component Affected

OpSystem Acronym & Name WV_Wet Vacuum

System Number or Name WV_Wet Vacuum

3.3 Highest ML Level

ML-4

3.4 Proposal with Justification/Compensatory Measures:

Background

The Wet Vacuum at TA55 is designated as B31.3 Fluid Category Normal see Attachment A.

PEI 1 RCD-TA55-15-001 Rev 2, Table 8.1, Wet Vacuum requires compliance with ASME B31.3-2012, Category Normal for the design of Gloveboxes and equipment fluid services and utilities. However, per Section 8.20 System Interface, "For systems where the code of record is ASME B31.3, and the pressure is reduced below 15 psig, they are excluded from the ASME B31.3 requirements and ESM Chapter 17 for design and testing requirements".

B31.3-2012 states:

300.1.3 Exclusions. This Code excludes the following:

(a) piping systems designed for internal gage pressures

at or above zero but less than 105 kPa (15 psi), provided the fluid handled is nonflammable, nontoxic, and not damaging to human tissues as defined in 300.2, and its design temperature is from -29°C (-20°F) through 186°C (366°F).

Therefore new vacuum systems meeting the above conditions are not excluded from B31.3. Existing systems (the subject of this request) are not within the code's scope (see below).

300 (c) (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.

At LANL, ESM Chapter 17, EXIST 3.0 *Modification or Maintenance of an Existing System*, provides the requirements for the interface connections. See Field 2.4 for EXIST's wording. The EXIST wording does not address tie-in to vacuum system. Looking at both EXIST wording and B31.3 345.7 (below), it is not possible to comply precisely as written because, for a hot tie-in to vacuum system, internal pressure would not gradually increase in steps (it would change/decrease).

345.7 Initial Service Leak Test

This test is applicable only to piping in Category D Fluid Service, at the owner's option. See para. 345.1(a).

345.7.1 Test Fluid. The test fluid is the service fluid.

345.7.2 Procedure. During or prior to initial operation, the pressure shall be gradually increased in steps until the **operating pressure** is reached, holding the pressure at each step long enough to equalize piping strains. A preliminary check shall be made as described in para. 345.5.5 if the service fluid is a gas or vapor.

Furthermore, the EXIST wording is written as such because, in modified system tie-ins that cannot be isolated and pressurized, it is not possible to perform testing per 345.2.4 (see below) on the connection.

345.2.4 Externally Pressured Piping. Piping subject to external pressure shall be tested at an internal gage pressure 1.5 times the external differential pressure, but not less than 105 kPa (15 psi).

The ESM Chapter 17 also allows NASME to be applied because it meets the following criteria.

A. Piping that is not part of a "supporting piping system" but is within the scope of B31.3 or B31.9 may apply the applicable, approved equivalency evaluations in the Attachments (*e.g.*, *NASME-I*, *NASME -2*)

B. In order to be eligible for the attached equivalencies, the piping system cannot have a boiler, pressure vessel, or air receiver as part of the pressure system or be part of the supporting piping system.

From ESM Ch 17 Section GEN Attachment GEN-1 Definitions and Acronyms:

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from non-supporting piping, a unique pressure safety system identification number in accordance with ESM Chapter 17 will be used to identify piping that is considered to be non-supporting piping. All pressure systems are required to meet the requirements of ESM Chapter 17.

This evaluation of risk is per Chapter 17 Section EXIST-1 (Qualitative Risk greater than 3).

1. Applicable for B31.3 piping not including a pressure vessel, boiler, air receiver, or supporting piping.
2. This evaluation is for new pressure systems that allow workers to be in close proximity without additional shielding while the system is pressurized.
3. For severely cyclic system see specific code requirements.
4. Applicable only for NON - metallic piping systems.
5. A list of reputable manufacturers will be maintained by Engineering Services.
6. The "Equivalent Risk Evaluation" in the table below or the original paragraph in B31.3 may be followed. The equivalency is intended to provide an equivalent level of personnel safety to B31.3 not code compliance.
7. Applies to ML-4 only.

Since the Wet Vacuum system meets the requirements of NASME-1-B for Normal fluid service for non-metallic piping and NASME-1-C for Normal fluid service metallic piping systems.

The NASME paragraphs for metallic (NASME 1-C 302.3) and non-metallic (NASME 1-3 A302.3) are the same and both state The Allowable Stresses and other Design Limits – Per design may consider other protective measures in order of precedence as follows: engineering controls (barriers, interlocks or controls), procedural controls (access control), and/or PPE.

Proposal

Previous the Variance VAR-10163, In-process Examination of Tie-in to Existing Contaminated Piping allowed the change to the ESM Chapter 17 wording.

Allow fabrication of the connecting joint in accordance with the ESM Chapter 17, Exist, 3. B. 1. A, modified by including the words "or brazed" along with "welded" in 3. B. 1. a., and substituting the word "change" for "increase" in Exist, 3. B. 1. a. 3) i. **NOTE: This is not substituting the words in ASME B31.3 345.2.4 or 345.7, but only ESM Chapter 17. This Alternate Method is valid for any tie-in to an existing vacuum system that cannot fulfil the requirements of 345.2.4 or 345.7 as written.**

Since the EMS Chapter 17 reference for leak testing of threaded joints references the paragraph on welded joints the same criterion is applicable [ESM Chapter 17 EXIST 3.0 B. 1. C. 2) references ESM Chapter 17 EXIST 3.0 B. 1. A. 3)]

Thus, the initial service leak test will be performed by a return to service and subsequent check for gross leaks which might be indicated by contamination release. The assembly and testing is performed inside a hot glovebox which provides confinement for possible leakage and protection for personnel.

Justification

This method of performing the hot (wet vacuum system potentially contaminated with radio-nuclides) tie-in of a vacuum line while allowing the pump to run has been historically used for all Wet Vacuum tie-in joints at TA-55-0004, but not necessarily documented. It is the only practical approach that can be followed under the circumstances.

Compensatory Measures

All jointing except for the actual tie in will be performed per the ASME B31.3 2012 code of record.

The connection will be inside a glovebox and personnel will be protected against exposure if a leak were to occur.

3.5 Attachments Attachment A LANL Memorandum ES-EPD-15-001 Attachment B ESM Chapter 17 NASME 1-B A302.3 and NASME 1-C 302.3 Attachment C Code of Record and Fluid Service FOD 1 2015 01 22 final		
3.6a Project ID 103150	3.6b: Project Name Plutonium Implementation (CMRR Continuation) PEI1	3.6c: Code of Record Date 2012 issued Jan 10, 2013
3.7 Duration: Lifetime	3.8a If Finite Period, Start Date: Click to enter a date.	3.8b End Date: Click to enter a date
3.8c Provide the PFITS number for tracking removal/correction: [PFITSNum]		
3.9 USQD/USID required (Nuclear, High/Mod Hazard)? Yes If Yes, USQD/USID Number tbd		
3.10 QA Review for process change matters potentially affecting LANL's NQA-1 implementation Is a QPA Determination required?: No If Yes, then: Choose an item. QPA Comments: Enter text..		
3.11 POC Determination: Accept POC Comments:		
3.12 Management Program Owner's (SMPO) Approval for P341 and APs; P342, ESM, ML-1 and -2, and Contract Matters; and P343 SMPO Determination: Accept Comments: Enter text..		

4.0 Participant Signatures **NOTE:** DO NOT ADD NAMES FROM WITHIN WORD! [Save and close the form first](#), then do 1-4 below:

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- In the small dialog click the **ellipsis** again
- Click **Edit Properties** and check out the document if prompted to Enter names using the controls provided, then **Save**

4.1 POC (Management Program Owner's Representative): Swartz, Ari Ben	Organization ES-EPD	Signature
4.2 Facility Design Authority Representative Talachy, Stacey FDAR signature not required <input checked="" type="checkbox"/>	Organization ES-55	Signature

<p>4.3 LANL Owning Manager (FOD or R&D/Program)</p> <p>Mason, Robert Clifford</p> <p>FOD or Program Manager signature not required <input checked="" type="checkbox"/></p>	<p>Organization</p> <p>TA-55-DO</p>	<p>Signature</p>
<p>4.4 Quality Reviewer's Name:</p> <p>[QPAName]</p> <p>QPA review/signature not required <input checked="" type="checkbox"/></p>	<p>Organization</p> <p>Enter text.</p>	<p>Signature</p>
<p>4.5 Safety or Security Management Program Owner's Approval for P341 and APs; P342, ESM and Contract Matters; and P343</p> <p>Goen, Lawrence</p> <p>SMPO signature not required (Type 1 variance) <input checked="" type="checkbox"/></p>	<p>Organization</p> <p>ES-DO</p>	<p>Signature</p>
<p>4.6 Additional Signer 1</p> <p>[AdditionalSigner1]</p> <p>Role: Enter text.</p>	<p>Organization</p> <p>Enter text.</p>	<p>Signature</p>
<p>4.7 Additional Signer 2</p> <p>[AdditionalSigner2]</p> <p>Role: Enter text.</p>	<p>Organization</p> <p>Enter text.</p>	<p>Signature</p>
<p>4.8 CoE Administrator Signature</p> <p>Salazar-Barnes, Christina</p> <p>NOTE: The CoE Admin is always the last signature placed on this document. The date of that signing is the date of this document.</p>	<p>Signature</p>	