



**Langley
Procedural
Requirements**

LPR 1710.42 F
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**Subject: Safety Program for the Recertification and Maintenance of
Ground-Based Pressure Vessels and Piping Systems (PVS)**

Responsible Office: Safety & Mission Assurance Office

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PREFACE

P.1 PURPOSE

This Langley Procedural Requirement (LPR), in conjunction with LPR 1710.40, implements the requirements of NASA STD 8719.17 and is part of the Langley Management System.

P.2 APPLICABILITY

This LPR is applicable to all pressure systems owned by or used at NASA Langley Research Center (LaRC), including new, existing, temporary, and permanent systems (Government or Contractor-owned). However, systems excluded by LPR 1710.40 are also excluded from the requirements in this LPR.

P.3 AUTHORITY

- a. NPR 8715.1, NASA Safety and Health Programs.

P.4 APPLICABLE DOCUMENTS AND FORMS

- a. LPR 1710.40, Langley Research Center Pressure Systems Handbook.
- b. LPR 1740.5, Langley Research Center Standard for Precision Cleaning and Testing of Systems and Equipment.
- c. LMS-CP-7151, Obtaining Waivers for Langley Management System (LMS) Requirements.
- d. LMS-TD-5569, Performing Visual Inspections.
- e. LF 533, Safety Permit Request – Pressurized Systems.
- f. LF 611, Request for Component Exclusion from PVS Requirement.
- g. NASA-STD-8719.17, NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems (PVS).
- h. ASME Boiler and Pressure Vessel Code (BPVC), Section V: Nondestructive Examination.
- i. ASME BPVC, Section VIII: Rules for Construction of Pressure Vessels.
- j. ASME B31, Standard Toughness Requirements for Piping.
- k. ASNT CP-189, ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel.
- l. ASNT SNT-TC-1A, Personnel Qualification and Certification in Nondestructive Testing.

P.5 MEASUREMENT/VERIFICATION

Compliance with these requirements is ensured by the use of in-service inspections and periodic NASA Headquarters Institutional/Facility/Operational (IFO) Safety Audits.

P.6 CANCELLATION

LPR 1710.42E, dated December 19, 2019.

Original signed on file

David Young, Deputy Director March 10, 2023

Title

Date

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CHAPTER 1: RESPONSIBILITIES

1.1 Scope

1.1.1 The functions and responsibilities listed below are essential for the management and implementation of this safety program and supplement the responsibilities listed in LPR 1710.40.

1.2 Pressure Systems Manager (PSM)

1.2.1 The PSM shall be responsible for:

- a. Verifying that Center-specific procedures are developed and implemented for PVS design, acquisition, fabrication, inspection, repair, alteration, operation, maintenance, certification, and documentation of noncompliance.
- b. Serving as the Center expert and final authority on the application of national consensus standards and NASA requirements regarding the remaining life and fitness for service of ground-based pressure vessels and piping systems (PVS).
- c. Verifying that periodic inspection and recertification is performed for all ground-based PVS to assure their ongoing fitness for service and to document and assess relevant changes in condition or knowledge that materially affect risk assessment.
- d. Establishing the type of recertification method that is applicable to PVS within the scope of the program.
- e. Determining the final disposition of PVS and system components which do not meet Agency requirements.
- f. Approving recertification documentation for PVS.
- g. Issuing recertification letters for PVS.
- h. Ensuring all non-excluded PVS are evaluated and either certified or covered by approved waiver prior to operation.
- i. Reviewing and approving or disapproving requests for waivers from PVS requirements via the LMS Waiver Process described in LMS- CP-7151.
- j. Serving as Center liaison with NASA Headquarters in matters relating to ground-based PVS certification and recertification.
- k. Identifying, reviewing, and evaluating specific PVS or categories of PVS that may be excluded from Center PVS programs on the basis of negligible operational risk or hazard to personnel under any foreseeable failure, and documenting the rationale for the exclusion in the PVS configuration management system.

1.3 Deputy Pressure Systems Manager (DPSM)

1.3.1 The DPSM shall be responsible for:

- a. Acting as the PSM and performing all necessary functions of the PSM in their absence.

- b. Maintaining a spreadsheet of unfunded low-risk corrective actions resulting from Phase 1 and Phase 3 activities (i.e., repair backlog).

1.4 Recertification Group Manager (RGM)

1.4.1 The RGM shall be responsible for:

- a. Implementing the LaRC ground based PVS recertification program.
- b. Maintaining a database of PVS within the scope of the LaRC recertification program.
- c. Maintaining pressure system certification/recertification documents as part of a recertification file for each PVS, e.g., engineering analyses, drawings, sketches, inspection reports, manufacturer's catalog data, and waivers.
- d. Performing structural integrity assessments to provide the PSM with recommendations regarding the compliance status of PVS.
- e. Developing weld location drawings and specifications as applicable to facilitate implementation of the corrective actions resulting from Phase 1 recertification activities.
- f. Developing in-service inspection plans and documenting the rationale for choosing the specified inspection techniques.
- g. Managing the performance of Phase 3 inspections as required by inspection plans and developing in-service inspection reports.
- h. Managing the Component Verification Facility and Component Cleaning Lab.
- i. Implementing a program for periodically re-testing pressure relief valves and pressure gauges.
- j. Ensuring the Component Verification Facility maintains a current National Board Valve Repair ("VR") certification program.
- k. Ensuring the Component Verification Facility has up-to-date operating procedures and facility drawings in the LaRC configuration management system.
- l. Developing and presenting progress reports of the recertification program to the PSM and the LaRC Safety Manager at least quarterly.
- m. Maintaining PVS documentation in the LaRC configuration management system.

1.5 Standard Practice Engineer for Pressure Systems (SPE)

1.5.1 The SPE for Pressure Systems shall be responsible for:

- a. Serving as the Center expert and final authority on the application of national consensus standards and LaRC requirements to the design and construction of ground based PVS.
- b. Reviewing and approving new designs, modifications, and repair specifications to ground based PVS for compliance with LaRC requirements.
- c. Certifying new pressure systems for initial operation as a member of Operational Readiness Review (ORR) boards.

- d. Providing guidance to support PVS designers (civil servant and contractor) in the processes of design, fabrication, procurement, modification, inspection, verification, shakedown, maintenance, and documentation of PVS.

1.6 Safety and Facility Assurance Branch (SFAB) Safety Engineer

1.6.1 The designated SFAB Safety Engineer for the facility with PVS shall be responsible for:

- a. Identifying the hazards associated with PVS, assessing their severity and probability of occurrence, and determining any controls necessary to abate the risks.
- b. Developing, updating, and maintaining configuration control of pressure systems' risk analyses in each facility's Safety Analysis Report (SAR).

CHAPTER 2: RECERTIFICATION OF GROUND-BASED PVS

2.1 Scope

2.1.1 This LPR is applicable to all ground based PVS owned by or used at LaRC, including new, existing, temporary, and permanent systems. However, systems excluded by LPR 1710.40 are also excluded from the requirements of this LPR.

2.2 Description of the Recertification Program Structure

2.2.1 Phase 1 – Structural Integrity Assessment and Recertification

2.2.1.1 The objective of Phase 1 is to assess the structural integrity of the PVS by collecting or developing documentation relating to its construction; evaluating and establishing the remaining life of the system; and developing in-service inspection plans. To assist in performing the structural integrity assessment, nondestructive examination techniques are used to sample the current condition of the system. The initial sample size typically includes 10% of welded joints and all high-stress areas.

2.2.2 Phase 2 – Major Repairs

2.2.2.1 The objective of Phase 2 is to develop repair plans, specifications, and statements of work to perform corrective actions that may have been identified during the integrity assessment completed in Phase 1. To establish the extent of repairs and corrective actions required, an in-depth nondestructive examination of the problem areas is conducted, typically including 100% of welded joints and all high-stress areas.

2.2.3 Phase 3 – In-service Inspection

2.2.3.1 The main objective of Phase 3 is to conduct periodic inspections in accordance with the approved inspection plans. Minor repairs and corrective actions to abate any observed degradation are implemented, the system's recertification file is updated by incorporating inspection reports, and the remaining service life of the system is updated.

2.3 Recertification Methods

2.3.1 PVS at LaRC come in a variety of sizes and complexities. The degree of risk to personnel, facilities, and the NASA mission presented by these systems varies greatly. For this reason, several methods for documenting the recertification of these diverse systems are introduced here.

2.3.2 Level 1 Recertification

- a. This method is applicable to most ground based compressed gas PVS that are a permanent part of the Center's infrastructure.
- b. Systems undergoing Level 1 recertification shall be documented with a Pressure Systems Document (PSD), a Process and Instrumentation Diagram (P&ID), an Inspection Plan (IP), a risk analysis, a recertification file, and a recertification letter.

Note: These documents are discussed in detail in Section 2.5.

2.3.3 Level 2 Recertification

- a. This method is applicable to ground based PVS that are specifically exempted

from full recertification by the PSM based on limited risk, level of complexity, energy content, and other factors. Examples include, but are not limited to, the following:

- (1) Code-stamped dewars containing cryogenic liquids of nitrogen, oxygen clean level 1, helium, or argon, operating at constant internal temperature and constant pressure.
 - (2) Small, cart-mounted, piping systems used to test different research test articles or wind tunnel models.
 - (3) PVS containing pressurized incompressible, non-flammable, and non-toxic fluids.
 - (4) Systems composed of Department of Transportation (DOT)-certified compressed gas bottles, a pressure regulator, a relief valve, and interconnecting piping/tubing supplying gas to an industrial process.
- b. Systems undergoing Level 2 recertification shall be documented with a drawing or sketch (e.g., Process Diagram, Process and Instrumentation Diagram, or an Isometric diagram), an IP, a recertification file, and a recertification letter.

2.3.4 Permit Recertification

- a. This method is primarily intended for research laboratories where a compressed gas cylinder (K-bottle) is connected to commercial off-the-shelf (COTS) laboratory equipment via a pressure regulator and relief device combination. This method may also be used to certify temporary pressure system installations.
- b. Systems undergoing permit recertification shall be documented via a completed and approved LF 533.
- c. The LF 533 shall be reviewed at the inspection frequency of the relief valve protecting the downstream equipment (5 years for inert gases and 2 years for all others, see Appendix D) and whenever the PVS configuration is changed. A copy of the signed LF 533 forms are maintained in the recertification file.

2.3.5 Department of Transportation (DOT) Recertification

- a. This method is applicable to pressurized forged vessels mounted on transportable trailers (i.e., tube trailers) whether they are used in mobile or stationary applications.
- b. Systems undergoing DOT recertification are documented with a copy of the purchase specifications and purchase orders issued to DOT-certified contractors, and a copy of the submittals from the Contractor at the completion of recertification. These documents are maintained in the system's recertification file.

2.3.6 Boiler Recertification

2.3.6.1 This method is applicable to the steam generating boilers at LaRC. Even though Building 1215 is located within the boundaries of LaRC's exclusive federal jurisdiction zone, the boilers are certified by a boiler inspection Contractor certified by the National

Board of Boiler and Pressure Vessel Inspectors (NBBI). The boiler inspection contracts are managed by the Maintenance Program of the LaRC Center Operations Directorate. A copy of the submittals from the boiler inspector is maintained in the recertification file.

2.4 Recertification Program Requirements

2.4.1 The PSM shall establish the type of recertification method that is applicable to each PVS within the scope of the recertification program.

2.4.2 Inspection Personnel Training

- a. The RGM shall ensure that personnel conducting nondestructive examinations of LaRC PVS are trained via a program meeting the requirements of the American Society for Nondestructive Testing (ASNT) SNT-TC-1A or ASNT CP-189.

2.4.3 Prioritization of Work Activities

- a. The RGM shall develop a prioritized listing of PVS within the scope of the program based on factors such as their energy content, exposure of personnel to the release of energy, importance to the Center's mission, age, and other relevant factors.
- b. The prioritized listing shall be used as a guideline and a discriminator in establishing the relative sequence by which PVS are inspected and recertified.

2.4.4 Certification of New PVS (Code Compliant)

- a. Prior to initial certification by an ORR board, the Project Manager, or the cognizant engineer responsible for the installation or the modification of a PVS shall provide the RGM copies of all required documentation.
- b. After receiving the information listed above, the RGM shall scan it for completeness and develop a plan for inclusion of the new system in the recertification program.
- c. The RGM shall utilize the applicable documentation procedures in this LPR to complete the recertification process.
- d. The RGM shall give priority to the development and establishment of the in-service inspection plan.

Note: Fully documented, code-stamped, pressure components generally do not require in-depth analysis or additional inspection to establish their structural integrity, unless it is suspected that a modification to the component was performed without following NBBI procedures.

2.4.5 Recertification of Existing Systems

- a. The RGM shall conduct a structural integrity assessment of existing PVS to determine their compliance with the applicable construction codes and standards in force at the time of construction of the system.

Note: The following list shows documents that may be needed to recertify a PVS:

- (a) *Engineering design calculations*
- (b) *Manufacturing catalog sheets highlighting selected part or model numbers*

- (c) *Manufacturer drawings*
- (d) *Certified Material Test reports (CMTR) or other material certification*
- (e) *Certificates of compliance*
- (f) *ASME U-1 or U-2 data reports (for pressure vessels)*
- (g) *Special welding procedures used*
- (h) *Inspection reports*
- (i) *Nondestructive examination reports*
- (j) *Test reports*
- (k) *Verification letter*
- (l) *Shakedown procedures and checklist*

Potential sources of this information include the system fabricator's files, component manufacturer files, facility files, contract specifications and drawings, and LaRC electronic document retrieval systems like the Virtual Library, Facility Configuration Management System (FCMS), and Electronic Drawing File (EDF).

- b. The RGM shall search manufacturers' technical literature to establish recommended maximum operating pressures and temperatures for PVS components and to determine if national consensus codes or industry standards were used in their design. The RGM shall contact component manufacturers to obtain information about specific component designs.
- c. In the absence of manufacturers' technical literature, the RGM shall develop equivalent documentation by conducting engineering analyses of the components using applicable construction code formulas and/or other engineering analysis methods as necessary.
- d. The RGM shall conduct an initial visual examination of the entire system to look for signs of cracks, corrosion, wear, leakage, excessive vibration, missing fasteners, broken supports, or other surface defects.
- e. The RGM shall develop a means to identify the pressure-retaining welds in a PVS, either by weld map drawings, weld databases, or other.
- f. The RGM shall conduct an initial radiographic examination of 10% of all pressure-retaining welds and all high-stress areas identified of non-code-stamped components.
- g. If unacceptable welds are found during the initial radiographic examination, the RGM, with concurrence from the PSM, shall examine up to 100% of all welds.
- h. The RGM shall conduct an initial ultrasonic spot wall thickness survey of system components to confirm adequate component strength.
- i. From time to time, issues may be encountered while assessing the integrity of system components. Table 2-1 lists typical evaluation issues and recommended resolutions. Other approaches are possible provided they meet the intent of the applicable construction codes and NASA standards.
- j. If the integrity assessment indicates that some components are not adequate for their maximum operating pressure or temperature, the RGM shall develop recommendations to achieve compliance by means of component repairs or

replacements, or by de-rating the system operating conditions.

- k. The RGM shall develop an in-service inspection plan to monitor all expected degradation mechanisms affecting the PVS.
- l. The RGM shall document the rationale used in developing each PVS Recertification interval.
- m. The RGM shall maintain configuration control of system documentation.

2.4.6 Assessed Hazard Exclusions

2.4.6.1 At the discretion of the PSM, components may be excluded from LaRC PVS requirements after an assessed hazard exclusion is completed. The exclusions and hazard assessment shall be documented utilizing LF 611.

2.4.6.2 Excluded components are still subject to the requirements of the Occupational Safety and Health Administration (OSHA), all applicable codes, and NASA safety requirements. Operation of COTS systems shall be within manufacturers' documented limitations.

Table 2-1. Some Typical Integrity Assessment Issues and Possible Resolutions

Issue	Possible Approaches
Material specification is unknown / unavailable	<p>a) A small sample of the component material shall be removed for chemical testing and identification, where feasible.</p> <p>b) A calibrated Positive Material Identification (PMI) system may be used to obtain chemical composition data and compare to known material specifications. Note that an X-ray fluorescence (XRF) examination is not suitable for the material identification of carbon steels and cannot distinguish between straight grade and L grade stainless steels.</p> <p>c) When obtaining a material sample is not feasible, it shall be assumed that the component is fabricated of the lowest strength material in the same material family (e.g., carbon steels, stainless steels, coppers) that is used in fabricating the same product type (e.g., pipes, forgings, castings, or plates).</p>
Component integrity cannot be reasonably analyzed using code formulas and methods	<p>a) Use other known engineering analysis methods (e.g., closed form equations or finite element analysis) and compare calculated global stresses to code allowable stresses. At the discretion of the PSM, local stresses shall also be evaluated.</p> <p>b) The Maximum Allowable Working Pressure (MAWP) of components fabricated in quantity, or of some components with factors of safety in excess of 3 with respect to yield point, may be established by conducting tests per Section UG-101, "Proof Tests to Establish Maximum Allowable Working Pressure," of Section VIII Division 1, ASME B&PV Code if approved by the PSM.</p>
Non-code component made of a known material	<p>Allowable stresses to be used in engineering analyses shall be calculated using the "Basis for Establishing Stress Values" section for the applicable Code. This condition requires a waiver per LPR 1710.40.</p> <p>During the design process, consult with material fabricator/suppliers to establish the feasibility of recertifying a material with a non-code spec to a code-accepted spec if the material properties of both are the same or approved by the SPE.</p>

2.4.7 In-service Inspection Program

- a. The primary goal of the in-service inspection program is the verification of the structural integrity of a PVS as the system ages and undergoes pressure-temperature cycles. Secondary goals include, but are not limited to, the field verification of system documentation and the verification of the certification status of relief devices and pressure gauges.
- b. The RGM shall perform the periodic inspections required by the IPs and coordinate with the affected Facility Coordinators to schedule the required inspections.
- c. For each system inspection conducted, the RGM shall develop a report providing details of the inspection results.
- d. As a minimum, the RGM shall forward the inspection report to the Facility Safety Head (FSH), the Facility Coordinator (FC), and the PSM, with a copy placed in the PVS's recertification file.
- e. The inspection report shall include all necessary descriptions, redlined sketches, and photographs to clearly convey the inspection findings.

2.4.8 Handling of Inspection and Recertification Findings

- a. Emergency repairs – When non-compliant components are identified, the RGM and the PSM shall make an assessment to determine whether the non-compliance requires emergency repair action. For example, a finding of cracks or a finding of wall thickness below the minimum required by the code qualifies the non-compliance as requiring emergency repair. In these cases, the RGM shall immediately report the emergency condition to the FSH and the FC. The FSH and FC shall immediately de-energize the section of the PVS containing the non-compliant component. A facility representative shall then initiate a Work Request to resolve the emergency condition prior to continued operation.
- b. Routine repairs – When non-compliant components are identified and emergency repairs are not warranted, the PSM shall then decide whether temporary means to ensure system integrity are necessary while repair plans are developed, advocated, and implemented. In the event of a de-rating action, a letter shall be sent by the PSM to the FC and the FSH indicating the new limits of operation for the pressure system.
- c. The RGM shall develop repair specifications to resolve routine repairs, attaching any necessary photographs and sketches to describe the scope of the required repairs.
- d. The DPSM shall keep a listing of unresolved routine repairs awaiting funding from the PVS-owning organizations.
- e. When work requests initiated as a result of recertification or inspection findings are closed out, the RGM shall conduct a brief inspection of the repaired areas to confirm completion of the work and submit a re-inspection letter to document closure of the findings.

- f. Documentation describing repairs completed as a result of recertification activities shall be kept in the system's recertification file (e.g., statements of work, photographs, descriptions, inspection reports)

2.5 Documentation Requirements

2.5.1 Pressure Systems Documents

- a. When required by the method of recertification used, the RGM shall develop a PSD to document PVS components.
- b. The PSD shall include drawings or sketches of the PVS, showing components in the system. These drawing/sketches shall assign a unique number to each pressure-retaining component for identification purposes.
- c. The PSD shall include a database of component data for PVS, containing salient information such as sizes, materials, pressure ratings, wall schedules, dimensions, flange and valve class ratings, manufacturer's nameplate data, relief valve set points and capacity, the location of welds and support structures, and other information, as applicable to each component.
- d. The Pressure Systems Document shall be maintained under configuration control.

Note: Figures E-2 and E-3 show a typical piping system PSD sketch and a sample component database sheet.

- e. For pressure vessels and pressurized wind tunnel shells, the PSD shall contain a listing of drawings of the pressure shell (e.g., design drawings, fabrication drawings, inspection drawings, and weld maps) and a report identifying the safety devices protecting the vessel.

2.5.2 Recertification Files (White Books)

- a. The recertification file for each PVS shall serve as repository for non-configuration controlled documentation used as a basis for recertification.
- b. The recertification file for a PVS shall have the organization shown in Figure E-1.
- c. The contents of a recertification file shall be customized to meet the needs of the PVS being documented.

2.5.3 Inspection Plans (IP)

- a. The purpose of an IP is to ensure that system degradation is properly monitored and to identify the need for corrective actions.
- b. Guidelines for the development of inspection plans are listed in Appendix C.
- c. Recommendations from the manufacturer of pressure system components and recommendations resulting from failure modes and effects analyses shall also be incorporated into the IP as appropriate.

2.5.4 Process and Instrumentation Diagrams

- a. A process and instrumentation diagram is used to show the interconnection of equipment in a piping system, such that the flow of the process fluid can be

followed.

- b. Process and instrumentation diagrams shall accurately represent the sequence of equipment in the piping system and their interconnections within the system and to the outside. Physical details such as piping bends and supports need not be shown.
- c. Process and instrumentation diagrams shall identify the set points of safety devices such as relief valves, burst discs, and pressure switches.
- d. Process and instrumentation diagrams shall clearly indicate where important process parameters change, such as pressure, temperature, physical state, or composition.

2.5.5 Risk Analyses

- a. A risk analysis in accordance with LPR 1710.40 shall be conducted for each PVS within the scope of the recertification program or as directed by the LaRC Safety Manager.
- b. Risk analyses shall identify all credible hazards associated with the operation of a PVS and characterize those hazards in terms of their severity and probability of occurrence.
- c. Throughout the life of a PVS, new risks shall be identified, as needed, as a result of in-service inspections and recertification actions.

2.5.6 Recertification Letters

- a. When all rejectable conditions in the system satisfy the requirements, the RGM shall notify the PSM to send a recertification letter to the FSH and the FC. See Figure E-4 for a sample recertification letter.
- b. Recertification letters shall be maintained in the recertification file.

CHAPTER 3: REQUIREMENTS FOR THE MAINTENANCE OF PVS

3.1 Scope

3.1.1 This chapter outlines the elements of the LaRC maintenance program that work together with the recertification program to effectively maintain pressure system integrity.

3.2 Preventive Maintenance (PM) Program

3.2.1 The PM program consists of a time-based schedule of maintenance activities to be executed at an established frequency.

3.2.2 All pressure relief valves and rupture discs shall be documented in the Computerized Maintenance Management System (CMMS) and shall be provided with an appropriate job plan.

- a. Relief valves - Appendix D provides the required frequencies for the verification of relief valve set points.
- b. Rupture discs - are not required to be retested. Rupture Discs should be documented in CMMS with specs related to manufacturer, type, size, material, operating ratio, and burst pressure.

Note: Pressure relief valves and burst disks are the primary safety devices in pressurized systems. These devices are intended for protection from overpressure caused by:

- a) *Inadvertent failure of process control equipment such as pressure regulators, control valves, isolation valves, and/or failure of system interlocks.*
- b) *Incorrect system operation (human error).*
- c) *Runaway conditions of compressors, blowers, and process heaters.*
- d) *External sources of heat such as fire and solar radiation.*
- e) *Evaporation of entrapped cryogenic or volatile liquids.*

3.2.3 Bourdon-tube pressure gauges shall be listed in the CMMS and shall be retested in accordance with LPR 1710.40.

3.2.4 Flex hoses do not require periodic retesting if the hose is in a permanent installation and does not present a hazard to personnel or critical mission hardware. Flex hoses that are not in permanent installations (temporary) and subjected to frequent handling (i.e., connection and disconnection), repeated flexing, or abuse during their lifetime shall be retested prior to each use, but not more frequently than every two years.

3.3 Component Verification Facility (CVF)

3.3.1 The Component Verification Facility is a key element of the pressure system recertification program. In this facility, the following services are performed:

- a. Hydrostatic testing (pressures up to 33,000 psig).

- b. Pneumatic testing (pressures up to 10,000 psi).
- c. Relief valve set point verification.
- d. Pressure gauge verification.
- e. Flex hose fabrication.

3.3.2 The CVF shall maintain a physical log book identifying each relief valve, pressure gauge, or other equipment tested and electronically input into CMMS. The log shall include, as a minimum, the date of the test and a narrative of the test including results.

3.3.3 The RGM is responsible for ensuring the CVF maintains its National Board "VR" certification. This includes maintaining the Facility Resume, the Quality Control Manual, the Standard Operating Procedures, and ensuring operators receive training as required by the National Board.

3.4 Component Cleaning Lab (CCL)

3.4.1 The Component Cleaning Lab (CCL) is a key element of the pressure system safety program. The CCL provides component cleaning for various facility and flight components at various levels of cleanliness as prescribed in LPR 1740.5. In this facility, the following services are performed but not limited to:

- a. Ultrasonic cleaning with an approved caustic detergent;
- b. Pressure washing using hot water and approved caustic detergent, rinse with deionized water;
- c. Drying with heat or filtered nitrogen;
- d. Immersion in chemical cleaning solvents, such as Brulin 815 GD, and isopropyl alcohol.; and/or
- e. Use of distilled Freon 113.

APPENDIX A. DEFINITIONS

Combustible Liquid. A liquid with a flashpoint above 100 °F.

Dewar. A double-wall glass bottle or double-wall metal vessel used to contain cryogenic liquids at temperatures below –240 °F. The annular space between the inner vessel and the outer jacket may be evacuated almost entirely of air to minimize heat conduction and convection or may be filled with insulating materials.

Flammable Liquid. A liquid with a flashpoint below 100 °F.

Interlock. A control device or devices designed with the purpose of preventing the pressure, temperature, flow, or other operating parameter of a PVS from crossing a specified threshold, thus reducing the likelihood of an undesirable event.

K-bottle. A cylindrical container for the transport of compressed gases. K-bottles are commonly designed to hold a volume of approximately 1.5 cubic feet of water and are built to specifications governed by the United States Department of Transportation (DOT). Common pressure ratings for k-bottles are: 3K – 3600 psig, 4K – 4500 psig, 6K – 6000 psig.

National Consensus Codes and Standards. A document which (1) has been adopted or distributed by a nationally recognized standards producing organization under procedures whereby it can be determined by the Secretary of Labor or by the Assistant Secretary of Labor for Occupational Safety and Health that persons interested and affected by the standard have reached substantial agreement on its adoption; (2) was formulated in a manner that afforded an opportunity for diverse view to be considered; and (3) has been so designated by the Secretary or the Assistant Secretary, after consultation with other appropriate Federal Agencies.

PVS. A NASA acronym meaning “pressure vessels and piping systems”. May also be written as PV/S.

APPENDIX B. ACRONYMS

ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
B&PV	Boiler and Pressure Vessel
CCL	Component Cleaning Lab
CMMS	Computerized Maintenance Management System
COTS	Commercial Off-The-Shelf
CVF	Component Verification Facility
DOT	Department of Transportation
DPSM	Deputy Pressure Systems Manager
EDF	Electronic Drawing File
ET	Eddy Current Testing
FCMS	Facility Configuration Management System
FC	Facility Coordinator
FSH	Facility Safety Head
IP	Inspection Plan
LF	Langley Form
LPR	Langley Procedural Requirements document
LaRC	Langley Research Center
MAWP	Maximum Allowable Working Pressure
MT	Magnetic Particle Examination
NBBI	National Board of Boiler and Pressure Vessel Inspectors
NDE	Nondestructive Examination
OEM	Original Equipment Manufacturer
ORR	Operational Readiness Review
P&ID	Process and Instrumentation Diagram
PM	Preventive Maintenance
PMI	Positive Material Identification
PSD	Pressure Systems Document
PSIG	Pounds Per Square Inch Gauge
PSM	Pressure Systems Manager
PT	Penetrant Testing
PVS	Pressure Vessels and Piping Systems
RGM	Recertification Group Manager
RT	Radiographic Examination
SAR	Safety Analysis Report
SFAB	Safety and Facility Assurance Branch
SPE	Standard Practice Engineer
UT	Ultrasonic Examination
UTT	Ultrasonic Thickness Examination
VNG	Virginia Natural Gas
VR	Valve Repair
VT	Visual Examination

Note: The acronyms UT, MT, RT, VT are legacy acronyms meaning “ultrasonic testing”, “magnetic particle testing”, “radiographic testing” and “visual testing.”

They were redefined by the National Board using the word examination in lieu of testing; however, the old acronyms are still being used.

APPENDIX C. RECOMMENDED PRACTICE FOR THE DEVELOPMENT OF PVS INSPECTION PLANS

C.1 General

- a. This Appendix serves as a guide for the development of IPs for PVS. These plans list the inspections necessary to monitor the condition of a pressure system on a time-based schedule or a run-cycle-based schedule. Secondary goals include, but are not limited to, the field verification of system documentation and the verification of the certification status of relief devices and pressure gauges.

C.2 Inspection Plans (See Figure E-5 for a sample inspection plan.)

As a minimum, an IP should contain the following information:

- a. Inspection Technique: The IP should list the inspection techniques that are required for a specific inspection task.
- b. Inspection Intervals: If the inspection plan is time based, the IP shall present a schedule at least as long as the system's recertification interval. If the inspection plan is based on cycles of operation, the IP shall present the maximum number of run cycles between inspections, the current year cycle count, and the maximum number of cycles between system recertification. It is the responsibility of the owner of the pressure system to maintain a log of the pressure and thermal cycles incurred by a cycle-limited pressure system.
- c. Inspection Procedure and Acceptance Criteria: The IP should list the applicable procedure to be followed in performing each inspection point, e.g., LMS-TD-5569 for visual inspections, or ASME BPVC Section V and Section VIII for other inspection techniques.
- d. Notes: The IP shall identify any special conditions, special requirements, or waivers that may affect the inspection process.
- e. Not all PVS are necessarily affected by the same degradation mechanisms. The inclusion of inspection tasks in an IP shall be based on the expected mode of degradation and the suitability of the selected NDE techniques to detect the degradation. See Table C-1.
- f. Inspection intervals selected shall give consideration to the specific degradation mechanisms affecting the item being inspected. Table C-2 provides guidelines for minimum required in-service inspection for systems affected by internal or external corrosion.
- g. When basing in-service inspection intervals on analysis techniques such as fatigue analysis or fracture mechanics analysis, the maximum inspection intervals for that system or component shall be equal to $\frac{1}{2}$ the calculated remaining life or 20 years, whichever is less.
- h. Inspection intervals for relief valves and pressure gauges shall be based on their required retesting frequency. See Appendix D.

C.3 Changes to inspection intervals

- a. When the results of at least three consecutive in-service inspections performed at the intervals specified in an IP show that no degradation is detected, the RGM may extend the inspection intervals with concurrence from the PSM.
- b. When the results of two consecutive in-service inspections in a specific area of a pressure system show signs of degradation even after corrective actions were performed, the RGM shall shorten the inspection interval for the area of interest and notify the FSH and the PSM.

Table C-1, Applicability of NDE Techniques for Recertification of PVS

NDE Technique	Recommended for	Not Recommended for
Visual (VT)	Detecting surface defects (e.g., surface cracks, corrosion, weld undercut)	Detecting subsurface defects
X-ray (RT)	Detecting internal fabrication defects such as inclusions, voids, incomplete fusion, incomplete penetration, porosity, and improper joint fit-up	Finding service-induced flaws such as shallow surface cracks
Ultrasonic (UT)	Detecting internal fabrication defects such as inclusions, voids, incomplete fusion, and incomplete penetration. Characterizing size and location of sub-surface cracks and plate laminations. Determining wall thickness	Examination of complex geometries
Eddy Current (ET)	Detecting surface or shallow defects on smooth surfaces	Detecting deep subsurface defects
Dye penetrant (PT)	Detecting surface cracks and other defects open to the surface on clean, paint-free surfaces (e.g., surface porosity and weld undercut)	Detecting subsurface defects
Magnetic particle (MT)	Detecting surface cracks, linear surface defects, and weld undercut	Examination of non-magnetic materials, examination of joints made of materials with different magnetic permeability, detecting subsurface defects, paint thickness > 5 mils

Table C-2, Recommended Inspection Intervals

Degradation Mechanism	Location of System	Recommended Inspection
External Corrosion	Underground utility tunnels	VT and UTT every 1 yrs
	Outdoors	VT and UTT every 6 yrs
	Indoors (climate controlled)	VT and UTT every 8 yrs

APPENDIX D. REQUIRED RELIEF VALVE SET POINT VERIFICATION INTERVALS

D.1 The tables in this Appendix establish the maximum time intervals allowed for retesting relief valve set points by the Component Verification Facility.

D.2 In lieu of bench testing at the Component Verification Facility, in-line testing (or in-situ testing) of relief valves may be performed provided the following conditions are met:

- a. A maximum of two consecutive in-line set point accuracy tests are allowed on any one valve. In-shop verification and inspection of the valve internals shall occur at least every third time.
- b. Failure to successfully pass an in-line set point verification test may be reason to perform an inspection of the valve internals and an in-shop bench test by the Component Verification Facility.
- c. For hydraulic power systems, in-line testing is permitted if the system design allows for safely increasing the pump discharge pressure.

D.3 Required Relief Valve Testing Intervals

Notes for Relief Valve Testing Tables:

D.3-1 Relief valve retesting for this class of systems is not mandatory per NASA-STD-8719.17. However, retesting (if possible) or replacement is recommended at 5-year intervals.

D.3-2 Steam relief valves set at 15 psig or less are excluded from retesting with the exception of *the first relief valve* downstream of a pressure regulator reducing the pressure from a higher source (e.g., 125/15 psi or 350/15 psi).

D.3-3 Internal relief valves in fuel storage tanks shall be replaced every 10 years.

Table D - 1, Testing Intervals for Water Systems

Type of System	Condition	Frequency
Water piping systems	$P \leq 160$ psig and $T \leq 210$ °F	Note D3-1
Water piping systems	$P \leq 160$ psig and $T > 210$ °F	5 years
Water piping systems	$P > 160$ psig, all temperatures	5 years
Fire protection water deluge systems	$P \leq 250$ psig, all temperatures	Note D3-1
Fire protection water deluge systems	$P > 250$ psig, all temperatures	5 years
Fire protection sprinkler systems for facilities	All	Note D3-1
Water heaters (COTS)	All	5 years
Water heating boilers for facilities (COTS)	All	5 years
Water storage tanks	Atmospheric	Note D3-1
Water storage tanks	Above Atmospheric	5 years
COTS pressurized cleaning systems (water)	All	Note D3-1
COTS, self-contained, pressurized eye wash systems	All	Excluded

Table D - 2, Testing Intervals for Steam and Condensate Systems

Type of System	Condition	Frequency
Steam heating boilers for facilities (COTS)	$P \leq 15$ psig and H-stamped	Note D3-1
Steam heating boilers for facilities (COTS)	All not excluded above in table	1 year
Central heating boilers in Building 1215	All	Per Virginia DOLI Regs
125 psig and 350 psig steam piping	All	1 year
Steam and condensate piping for building heat	$P \leq 15$ psig	Note D3-1, D3-2
Steam and condensate piping for building heat	All not excluded above in table	1 year
COTS pressurized cleaning systems (steam)	All	Note D3-1

Table D - 3, Testing Intervals for Inert Gas Systems (Non-laboratory use, e.g., dry air, nitrogen, argon, helium)

Type of System	Condition	Frequency
Inert gas piping systems	$P \leq 150$ psig and Pipe diameter ≤ 2 "	5 years
Inert gas piping systems	Not excluded above	3 years
Pressure vessels (including pressurized tunnel shells)	All	3 years

Table D - 4, Testing Intervals for Systems Containing Other Gases (Non-laboratory use, e.g., oxygen, R134, NO, CO₂)

Type of System	Condition	Frequency
Piping systems	All	3 years
Pressure vessels	All	3 years

Table D - 5, Testing Intervals for Systems Containing Cryogenic Liquids of Nitrogen, Argon, Helium, and Oxygen

Type of System	Condition	Frequency
Cryogenic piping systems	All	5 years
Pressure vessels	All	5 years
Storage tanks (dewars)	All	5 years

Table D - 6, Testing Intervals for Vacuum Systems

Type of System	Condition	Frequency
Vacuum piping	Nominal diameter < 6 inch	Note D3-1
Vacuum piping	Nominal diameter ≥ 6 inch	5 years
Vacuum vessels with no positive pressure source	All	Note D3-1
Vacuum vessels with positive pressure source	RV set point ≥ +2 psig	5 years
Vacuum vessels with positive pressure source	RV set point < +2 psig	10 years

Table D - 7, Testing Intervals for Systems Containing Flammable Fluids (e.g., LP, methane, H₂, ethylene, silane)

Type of System	Condition	Frequency
Natural gas distribution piping	Owned by VNG	Note D3-1
Natural gas piping in facilities	Owned by NASA	2 years
Fuel storage tanks (liquid)	All	Note D3-3
Pressure vessels	All	2 years
Piping systems	All	2 years
Fuel systems in motorized vehicles (DOT-certified)	All	Note D3-1

Table D - 8, Testing Intervals for Hydraulic Power Systems

Type of System	Condition	Frequency
Prepackaged hydraulic systems (COTS)	All	Note D3-1
Other hydraulic systems	Not excluded above	5 years

Table D - 9, Testing Intervals for Other Systems

Type of System	Condition	Frequency
HVAC Systems, refrigerators, and freezers (COTS)	All	Note D3-1
Systems containing Non-Flammable Fluids (Fuel Oil, JP-10, RP-2, etc.)	All	5 years
Welding equipment (COTS)	All	Note D3-1
Glove boxes (COTS)	All	Note D3-1
RV protecting laboratory equipment	Inert gas supplied by K-bottle and regulator	5 years
RV protecting laboratory equipment	Corrosive, flammable, or toxic gas supplied by K-bottle and regulator	2 years

APPENDIX E. FIGURES**Figure E-1, Sample of a Typical Organization of a Recertification File****A. Title Sheet**

1. System Name
2. System Location
3. System Serial Number

B. Revision Sheet**C. System Description**

1. Abstract
2. Pressure System Document Number
3. Safety Analysis Report Number
4. Drawing Numbers

D. Integrity Assessment

1. ASME U-1A Reports (ASME BPVC, Sec VIII, Div. 1)
2. ASME A-1 Reports (ASME BPVC, Sec VIII, Div. 2)
3. Materials of Construction
 - a. Special Welding Procedures
 - b. Material Test Report (MTR)/Chemical Analyses
 - c. Material Properties
 - d. Hardness Measurements
 - e. Heat Treatment Records
 - f. Fatigue Test Reports
 - g. Fracture Toughness/Fatigue Test Reports
4. Engineering Analyses
 - a. Code/Sizing Calculations
 - b. Flexibility Analysis
 - c. Relief Device Sizing
 - d. Other
5. High Stress Areas Identification
6. Hydrostatic/Pneumatic Test Reports

E. Initial Service Life

1. Corrosion Degradation
 - a. Minimum Required Thicknesses

- b. Initial Thickness Measurement Data
 - 2. Fracture Degradation
 - a. Fatigue/Fracture Analysis
- F. Remaining Life
 - 1. Corrosion Degradation
 - a. NDE Reports (VT)
 - b. Thickness Measurements (UTT)
 - c. Condition Assessments
 - 2. Fracture Degradation
 - a. NDE Reports (UT, RT, ET, PT, MT, VT)
 - b. Actual Cycle Counts
 - c. Estimated Cycle Counts
- G. In-service Inspections
 - 1. Inspection Plan
 - a. Latest Version
 - 2. Inspection Plan Rationale
 - 3. Inspection Results
 - a. Historical Records
- H. Risk Assessment
 - 1. SAR Attachment
- I. Miscellaneous Records
 - 1. Manufacturer's Catalog Cuts
 - 2. Purchase Requisitions
 - 3. Photographs
 - 4. Unresolved Inspection Findings
 - 5. Waivers
 - 6. SPE/PSM Interpretations
 - 7. Recertification Letter
 - 8. Other Documents

Figure E-2. Sample Sketch in a Pressure System Document

Figure E-3. Sample Component Database Sheet in a Pressure System Document

CONFIGURATION CONTROLLED DOCUMENT												03-2250LOX-PSCM		
FACILITY: BLDG. 1265														
SYSTEM: 2250 PSI LIQUID OXYGEN														
REFERENCE SKETCH: 22-LO-1														
JAN 29, 2003														
NO	Component	END	Manufacturer / Description	Material	Installation	Inspection	Rated Pressure	Working Pressure	Code	Analysis	NDE	Foot Notes	Reference	Rec
1	LOX RUN TANK	BW	SOUTHEAST WELDING AND MFG 14", S/N 20023/20024 8000 GALLON, "U" STAMP	STAINLESS	12/89	02/98	2290	2250	B1	ES	V		D1, D2, D3	RC
2	PIPE REDUCER	BW	GULF ALLOY INC. 14" X 6", SCH 120	A403 GR 304	12/89	02/98	2892	2250	B9	PS, CE	V	4	A1, D1, D2, D3, D4	RC
3	WELDOLET	BW	GULF ALLOY INC. 4", SCH XXS	A182 GR 304	12/89	02/98	5859	2250	B9	PS, CE	V	4	D1, D2, D3, D4	RC
4	FLANGE ASSEMBLY	BW	R-CON INC 4", SCH XXS	A182 GR 304	12/89	02/98	7013	2250	B3	MC	V		D1, D2, D3, D4	RC
5	PIPE ELL	BW	GULF ALLOY INC. 4", SCH XXS	A403 GR 304	12/89	02/98	5859	2250	B9	PS, CE	V	4	D1, D2, D3, D5	RC
6	FLANGE ASSEMBLY	BW	R-CON INC 4", SCH 160	A182 GR 304	12/89	02/98	4114	2250	B3	MC	V	17	D1, D2, D3, D5	RC
7	FLANGE ASSEMBLY	BW	R-CON INC 6", SCH XXS	A182 GR 304	12/89	02/98	4899	2250	B3	MC	V		D1, D2, D3, D4	RC
8	CONTROL VALVE 3845X	FL	MASONEILAN 6", M/N 467 2500#	STAINLESS	12/89	02/98	6000	2250	B4	TC	V	15	D1, D2, D3, D4, D8	RC
9	FLANGE ASSEMBLY	BW	R-CON INC 6", SCH XXS	A182 GR 304	12/89	02/98	4899	2250	B3	MC	V		D1, D2, D3, D4	RC
10	WELDOLET	BW	GULF ALLOY INC. 1 1/2", SCH XXS	A182 GR 304	12/89	02/98	6941	2250	B9	PS, CE	V	4	D1, D2, D3, D4	RC
11	FLANGE ASSEMBLY	BW	R-CON INC 1 1/2", SCH XXS	A182 GR 304	12/89	02/98	6919	2250	B3	MC	V		D1, D2, D3, D4	RC
12	RELIEF VALVE 3853X	BW	ANDERSON & GREENWOOD 1 1/2", M/N 81S1216-8 SET @ 2900 PSI	STEEL	12/89	02/98	2900	2250	N/A	MC, TC	V	9	D1, D2, D3, D6, D8	RC

13

CONFIGURATION CONTROLLED DOCUMENT

SHEET: 1 of 3

REV. A

Description of the Recertification Status Sheet Columns in Figure E-3:

Fifteen columns (read left to right)

- (1) **NO:** Component number which can be found on the sketch referenced in the upper right of the recertification status sheet. (Example: REF SK. 60-A-1)
- (2) **COMPONENT:** Component name.
- (3) **END:** End connection type. It is listed by abbreviation: TH = threaded; SW = socket weld; BW = butt weld; FL = flanged; CW = connection weld; SO = slip on; WN = weld neck (for flanges only).
- (4) **MANUFACTURER/DESCRIPTION:** Manufacturer's label information gathered in the field. The first line gives the manufacturer name (if known). The second line lists the line size of the component and model number, serial number, class, or type. The last line contains any additional information available.

- (5) **MATERIAL:** Material the component is made of or is assumed to be made of.
- (6) **INSTALLATION:** Component's installation date.
- (7) **INSPECTION:** In-service inspection date.
- (8) **RATED PRESSURE:** Maximum allowable working pressure of the component. This number is arrived at by information found on the component, information found in the manufacturer's catalog, comparing the component's dimensions to dimensions given in the applicable code or standard, by making contact with the manufacturer by phone or by letter, or by using the pipe pressure formula from ASME B31.
- (9) **WORKING PRESSURE:** Working pressure (WPRES) of the system at the component's location.
- (10) **CODE:** Code or standard that the component meets. The codes are abbreviated. The abbreviations are explained on the "Definition of Symbols" page located in the PSD. Entries in the CODE column come from the manufacturer's catalogs, crossing the component's dimensions with dimensions listed in the code, or by contacting the manufacturer.
- (11) **ANALYSIS:** Method of analyzing or evaluating the component. Abbreviations are explained on the "Definition of Symbols" page.
- (12) **NDE:** Method of nondestructive examination used to evaluate the component. Abbreviations are explained on the "Definition of Symbols" page.
- (13) **FOOTNOTES:** Footnotes which further explain or clarify the information for the component. Footnotes are specific to a system and can be found on the "Footnotes" page located in the back of the PSD.
- (14) **REFERENCE:** NASA specifications, NASA drawings, engineering analysis, and nondestructive examination. These can be referenced on the "Document Reference List" page located in the back of the PSD.
- (15) **REC:** Recommendation for each component. The component is either recertified (RC) or recommended for removal (RM), repair (RP), or derating (DR). A letter (W) in this field indicates that a waiver has been issued for this component.

Figure E-4. Sample Recertification Letter

National Aeronautics and
Space Administration

Langley Research Center
Hampton, Virginia
23681-0001



Reply to Attn of **M/S 134**

December 19, 2022

TO: 188F/J.J. Wilfong, Facility Safety Head

FROM: 134 / Pressure Systems Manager, Chief Engineer's Office, COD

SUBJECT: Recertification of the LN2 Dewar Unit 51 (DWR-051) (SSN 0401), Building 1205

REF:

1. NASA STD 8719.17, "NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems"
2. LPR 1710.42, "Safety Program for the Maintenance of Ground-Based Pressure Vessels and Pressurized Systems"
3. LPR 1710.40, "LaRC Pressure Systems Handbook"

The purpose of this letter is to document the completion of the recertification of the subject system. All required engineering analyses, nondestructive examinations (NDE), and corrective actions, if any, have been completed and accepted. All components in the system satisfy the requirements of the referenced NASA and Langley Research Center standards and requirements.

An inservice inspection plan for this system has been updated in the Configuration Management System. The inspection plan lists the nondestructive examinations that are required for this system to maintain its operational certification status.

If you have any questions regarding this letter, do not hesitate to contact me.

Concur:



Pressure Systems Manager
864-8016

Annette Powell (affiliate)

CMOE Recert Group Manager
864-2818

Digitally signed by Annette Powell (affiliate)
Date: 2022.12.19 14:56:22 -05'00'

Cc:
305/SFAB/R.D. Barnhill, Bldg. 1232A
188F/FC/S.M. Lee, Bldg. 1205
130A/FSR/D.K. Leggette, Bldg. 1220
188E/FM/L.R. Kessler, Bldg. 1148

Figure E-5. Sample Inspection Plan

INSPECTION PLAN FOR THE 2400/800 PSI AIR SYSTEM (24/8-A) AT BUILDING 1265														
RESULTS OF ALL INSPECTIONS SHALL BE REPORTED TO THE LARC PRESSURE SYSTEMS MANAGER AND THE FACILITY SAFETY HEAD														
ITEM NUMBER	DWG/SK NUMBER(S)	WELD/COMP NUMBER(S)	WELD / COMPONENT	INSPECTION SCHEDULE										INSPECTION REQUIREMENTS
				2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	
1	704167	5-1	GASKET RETAINING RING					VTS					VTS	LMS-TD-5569
2	704165	3-1	INTAKE CLOSURE COVER		VTS					VTS				LMS-TD-5569
3	1081402	DET-J	COMBUSTOR RETAINING RING					MT					MT	PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
4	-	INSIDE & OUT	COMBUSTOR SHELL WELDS					MT					MT	PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
5	704153	DET. B & E	LAMINATED SECTION WELDS					MT					MT	PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
6	704165	3-2, 3-3, 3-6, 3-7, 3-8, 3-9	FUEL PIPING				MT					MT		PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
7	704165	3-13	FUEL CHECK VALVE					VTS					VTS	LMS-TD-5569
8	550412	ALL	FUEL BURNER					PT					PT	PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
9	550412	ALL	ALL WELDS					PT					PT	PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
11	704172	10-1, 10-2	COMBUSTION AIR MANIFOLD					MT					MT	PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
12	850137	W1 THRU W18	LOX INJECTION RING			PT		PT		PT		PT	PT	INSPECT THE WELDS BETWEEN THE LOX INJECTION RING AND THE LOX TORUS RING USING THE PROCEDURES OUTLINED IN SECT V OF THE ASME B & PV CODE
13	1081458	SECTION BB, CC, DD	DOWNSTREAM SHELL, SHTM 4 MIXER		MT							MT		PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
14	1297079	ALL	MACH 7 NOZZLE EXTERIOR WELDS			PT		VTS		VTS		PT	VTS	LMS-TD-5569 AND PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
15	1081555 SHEET 3 & 4	ITEMS 2 & 3	NOZZLE HOUSING WELDS			PT						PT		PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 1
16	1081556 SHEET 2	ITEMS 2, 3, 5, 8	SPOOL HOUSING WELDS			PT						PT		PROCEDURE: ASME B & PV CODE, SECTION V ACCEPTANCE CRITERIA: SECTION 8, DIV. 2
18	704165	3-4, 3-5	FUEL PIPING			VTS						VTS		LMS-TD-5569

NOTE: FACILITY SAFETY HEAD SHALL NOTIFY THE LARC PRESSURE SYSTEMS MANAGER WHENEVER THE LINER IS REMOVED AND INSPECTIONS OF ITEMS 4 AND 5 SHALL BE PERFORMED.

CONFIGURATION CONTROLLED ITEM

FUNCTIONAL VERIFICATION

VERIFIED BY: K. HENDERSON

APPROVED BY: J.

LATEST DATE: 26 JAN 2022

PROP. # OR EFFORT CODE
03

REFERENCE DOCUMENT: NONE				<p>Jacobs Technology, Inc. 3A East Ames St. Building 1189 Hampton, VA 23661-2199</p>				NNL13AA14C NATIONAL AERONAUTICS & SPACE ADMINISTRATION LANGLEY RESEARCH CENTER HAMPTON, VIRGINIA 23665-5225				
1/26/2022	M	-	INSPECTION REQUIREMENTS FROM ITEMS 12 AND 14. TUNNEL HAS NOT BEEN ACTIVE SINCE LAST INSPECTION. REV. FLD. VER.							KLH	ASP	JKB
3/4/2019	L	-	CNS 03-835: UPDATE INSP. SCH. FOR ITEMS 1, 3, 4, 5, 7, 8, 9, AND 11. REV. FLD. VER.							KLH	JKB	CAS
12/1/2016	K	-	CNS 03-788: UPDATED ITEM 14 REF. REV. FLD. VER.							JES	JKB	CPR
12/1/2011	J	-	CNS 03-701: UPDATED INSP. SCHEDULE. ADDED ITEM 12 FROM IP 740528. COMBINED ITEMS 14 & 17. REV. FLD. VER.							KLH	CAS	CPR
2/12/2006	H	-	CNS 03-639: CHANGED PT TO MT ON ITEM 6. ADDED ITEM 18. UPDATED INSPECTION SCHEDULE. REV. FLD. VER.	NUM	CAS	CPR						
DATE	LTR	FREQ	DESCRIPTION	BY	CHK	APPD						

REVISIONS

8 FT HIGH TEMPERATURE TUNNEL COMBUSTOR SHELL, BLDG. 1265

INSPECTION PLAN

APPROVALS	DATE	TITLE
DRAWN: C. PRICE	1/8/1998	
CHECKED: D. GUINETTINO	1/13/1998	
NASA REP: C.M. HUDSON	1/13/1998	
SIZE: A	FSCM NO.	DWG NO.
SCALE: NONE	BLDG	740523
		REV: M
	1265	SHEET 1 OF 1