



Subject: Langley Research Center Requirements for Safety-Critical Products

Responsible Office: Mission Assurance Branch, Safety and Mission Assurance Office

P.1 POLICY

This directive defines safety-critical products and prescribes the policy and responsibilities for conducting receipt inspection and quality assurance testing on safety-critical products prior to distribution or use at Langley Research Center (LaRC).

- a. Safety-critical products are subject to the following policy, unless such items fall under Attachment C, Exceptions:
 - (1) All safety-critical products, regardless of procurement method or source of supply, shall be sent to the Materials Analysis and Quality Assurance Laboratory (MAQAL) upon delivery.
 - (2) No safety-critical products shall be distributed or utilized at LaRC prior to receipt inspection and quality assurance testing by the MAQAL.
 - (3) Lot integrity for fastener products shall be maintained both prior to delivery to the MAQAL and after testing, prior to use.
 - (4) For other metallic products, coupons are acceptable for testing provided a means for identifying the coupon to a heat/lot number is employed.
 - (5) When lot traceability has been lost, the product shall not be used in a safety-critical application.
 - (6) Traceability requirements for safety-critical products are specified as noted below:
 - (a) Safety-critical fastener products are set forth in LAPD 5330.3.
 - (b) Safety-critical products other than fasteners for applicable flight projects are set forth in LPR 5300.1.
 - (c) Facility safety-critical products other than fasteners shall be per the purchase order requirements.
 - (7) Safety-critical fastener and related hardware products shall be inspected and tested following requirements identified in LMS-CP-4520.6.
 - (8) Safety-critical non-fastener products shall be inspected and tested following requirements identified in LMS-CP-4520.5.
 - (9) Prior to use, users of safety-critical products for non-spaceflight hardware applications shall ensure that evidence of compliance to this policy is available for each safety-critical item.

b. Safety-Critical Products used for Flight Project Applications:

The above policy is the specified policy for safety-critical products. However, it is permissible for Projects to deviate from or tailor particular requirements as specified in the Project Product Assurance Plan (PAP). In the event the PAP requirements have deviated or tailored a particular requirement, the PAP shall take precedence.

2. APPLICABILITY

- a. This LAPD is applicable to all LaRC civil servant employees who procure and/or use safety-critical products as defined in Attachment A. Safety-critical products procured by contractors and provided to the Government as part of an assembled item, system, or entity are subject to the quality assurance requirements defined within their respective contracts. Such contractor-provided products may be subject to quality assurance audits as provided by the terms and conditions of the contract.
- b. In this LAPD, all mandatory actions (i.e., requirements) are denoted by statements containing the term “shall.” The terms “may” or “can” denote discretionary privilege or permission; “should” denotes a good practice and is recommended, but not required; “will” denotes expected outcome; and “are or is” denotes descriptive material.
- c. In this directive, all document citations are assumed to be the latest version, unless otherwise noted.

3. AUTHORITY

None

4. APPLICABLE DOCUMENTS AND FORMS

- a. NASA-STD-6008, NASA Fastener Procurement, Receiving Inspection, and Storage Practices for Spaceflight Hardware
- b. LAPD 5330.3, Langley Research Center (LaRC) Standards for the Acquisition and Use of Threaded Fasteners (Bolts)
- c. LPR 1710.40, Langley Research Center Pressure Systems Handbook
- d. LPR 1740.4, Facility System Safety Analysis and Configuration Management
- e. LPR 5300.1, Product Assurance Plan
- f. LMS-CP-4520.5, Receipt Inspection for Safety-Critical Products
- g. LMS-CP-4520.6, Receipt Inspection for Fastener, Insert and Nut Products
- h. LF 248, Materials Analysis & Quality Assurance Laboratory (MAQAL) Work Request
- i. LF 290, Fastener Work Request - MAQAL

5. RESPONSIBILITY

- a. Logistics Management Team, Center Operations Directorate shall ensure that all safety-critical stock and excess safety-critical products received at the Center are tested prior to incorporation into Center stock or dissemination to users.

- b. All recipients of safety-critical products (regardless of procurement mechanism) shall:
 - (1) Ensure that the products are tested by the MAQAL prior to use or distribution of the products.
 - (2) Call the MAQAL (867-6887 or 864-6890) if unsure whether any given product requires MAQAL testing prior to use and distribution at LaRC.
 - (3) Maintain evidence of compliance to this policy is available for each safety-critical item.
- c. MAQAL, Safety and Mission Assurance Office shall provide the necessary testing and reporting for safety-critical products as specified in LMS CP-4520.5, "Receipt Inspection" and LMS CP-4520.6, "Receipt Inspection for Fastener, Insert and Nut Products."
- d. LaRC civil servants responsible for developing contract tasks, or statements of work for safety-critical products where a contractor is responsible for procuring and/or installing/using safety critical products here at LaRC and for those products where exclusions to this directive apply (i.e., building construction fasteners, specific pressure systems, aircraft applications, etc. – see Appendix B) shall include quality assurance provisions in the procurement/task.

Such provisions may include the MAQAL providing testing services, but are not required.

6. DELEGATION OF AUTHORITY

None

7. MEASUREMENT/VERIFICATION

None

8. CANCELLATION

LAPD 4520.1 A-1, dated June 14, 2010

/s/ Cathy H. Mangum, Center Associate Director, July 23, 2015

APPENDIX A – DEFINITIONS

A.1 **Safety-critical product** is any item that meets any of the following conditions:

- a. Any fastener/nut/insert/retention device used in spaceflight project or non-spaceflight flight project hardware and associated ground support equipment as defined within the scope of LPR 5300.1. These projects include all spaceflight projects, sub-orbital flight tests supporting space flight programs, low-risk flight projects, risk reduction flights or flight experiments; flights of opportunity that are sub-orbital; involve sounding rockets; un-crewed aerospace vehicles; and major drop models or Unmanned Aerial Vehicles (UAV) as decided by LaRC Center Management. Excluded from this definition are flight projects involving experiments on aircraft.
- b. Any fastener or other component used in a Langley facility that is critically loaded/stressed (factor of safety is less than 4 on ultimate strength and 3 on yield strength) and whose failure can result in critical or catastrophic (Category I or Category II) injury/facility damage, as defined in LPR 1740.4. The factor of safety calculation shall be made by the appropriate engineering organization. The Facility Safety Head or Project Engineer shall contact cognizant center personnel (e.g., Model Systems SPE) for guidance to determine the appropriate engineering organization. A fastener is any single part which joins other structural elements and transfers loads from one element to another across a joint.
- c. All Pressure Vessel and System (PV&S) components which are not excluded by LPR 1710.40 or pressure system components used on flight projects as defined in A.1.(a).
- d. Stock items designated with a “QC” code.
- e. Metallic products/shapes that will be or potentially could be used to fabricate or assemble end items whose failure may result in personnel injury, facility damage, loss or damage to flight hardware or ground support equipment, or loss of mission.

A.2 Fastener An item such as a bolt (could be a tensile or shear bolt, shoulder bolt, screw, HiLok®, HiTigue®, or lockbolt), nut, nut plate or anchor nut, rivet, shear pin, helical or cylindrical insert, setscrew, washer, safety wire, cotter pin, etc., that joins or retains components or structural elements.

A.3 Examples of potential safety-critical items:

a. Fasteners:

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| (1) Bolt-Machine | (9) Screw-Self-Locking |
| (2) Key-Socket Head Screw | (10) Setscrew |
| (3) Nut-Plain, Hexagon | (11) Washer-Flat |
| (4) Nut-Self-Locking, Extended | (12) Washer-Lock |
| (5) Nut-Self-Locking, Hexagon | (13) Shear Pin |
| (6) Screw-Cap, Socket Head | (14) Load Bearing Washer |
| (7) Screw-Cap, Hexagon Head | (15) Threaded Inserts |
| (8) Screw-Machine | (16) Rivets |

b. High-pressure components include the following pipes, tubes, tube fittings, adapters, nuts, valves:

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| (1) Adapter-Straight, Pipe to Tube | (16) Tee-Tube |
| (2) Adapter-Straight, Tube to Hose | (17) Thread Piece-Union |
| (3) Bushing-Pipe | (18) Tube-Metallic |
| (4) Cap-Tube | (19) Union-Pipe |
| (5) Coupling-Pipe | (20) Union-Tube |
| (6) Cross-Pipe | (21) Valve-Angle |
| (7) Elbow-Pipe | (22) Valve Assembly-Relief and
Regulating |
| (8) Elbow-Pipe to Tube | (23) Valve Ball |
| (9) Elbow-Tube | (24) Valve-Check |
| (10) Nipple-Pipe | (25) Valve-Globe |
| (11) Nut Union | (26) Valve-Regulating, Fluid
Pressure |
| (12) Pipe-Metallic | (27) Valve-Safety Relief |
| (13) Plug-Tube Fitting, Threaded | |
| (14) Reducer-Tube | |
| (15) Sleeve-Flared, Tube Fitting | |

c. Metal plates and shapes include the following:

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| (1) Angle-Structural | (7) Plate-Metal |
| (2) Blade-Band Saw | (8) Round Rod |
| (3) Flat Bar Metal | (9) Tube Round |
| (4) Billet-Metal | (10) Channel-Structural |
| (5) Sheet-Metal | (11) Beams |
| (6) Strip-Metal | (12) Square Tubes |

ATTACHMENT B – ACRONYMS

CP	Center Procedure
LAPD	Langley Policy Directive
LARC	Langley Research Center
LF	Langley Form
LPR	Langley Procedural Requirements
MAQAL	Materials Analysis and Quality Assurance Laboratory
PAP	Product Assurance Plan

ATTACHMENT C – EXCEPTIONS

- C.1** Pressure system components (e.g., high-pressure piping systems) assembled into a system that is (1) designed, built, and tested in accordance with National Consensus Codes; (2) placed or to be placed into the Center's Configuration Management program; **and** (3) maintained in accordance with National Consensus Codes and Agency and Center policies are exempt from this policy.

NOTE: replacement component parts not tested with the initial assembled system are subject to this policy.

- C.2** Spaceflight products/systems manufactured and assembled by contractors at a site external to LaRC, which are undergoing design/specification reviews and government oversight, shall be exempt from this policy.
- C.3** Upon written request for exemption, safety officials from the Safety and Mission Assurance Office may review a specific product/system and grant a waiver from this policy. Users shall maintain the written waiver as evidence of compliance with this policy.
- C.4** Fasteners that are exceptions to the safety-critical provisions as defined in LAPD 5330.3, Appendix B. This includes non-safety-critical applications, aircraft fasteners, certain pressure system fasteners, and general building construction fasteners. Refer to LAPD 5330.3, Appendix B, for specifics.