AEROSPACE
MATERIAL SPECIFICATIONS
SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 2553

Issued 1-15-63
Revised

CLEANING, PACKAGING, AND ASSEMBLY OF CRITICAL SYSTEM COMPONENTS
Clean Area Procedure, 2500 Micron Max Particle Size

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. PURPOSE: To ensure that parts, assemblies, and components of critical aircraft and missile systems, such as oxidizer, fuel, pneumatic, and hydraulic systems, will be sufficiently free from contaminants that the system will function satisfactorily and, in the case of liquid oxygen systems, will not create an explosion hazard when in contact with liquid oxygen. When a higher degree of freedom from contamination is required, AMS 2552 should be specified.

3. MANUFACTURING PROCESSES:

3.1 Fabrication, Plating, and Preliminary Inspection: All normal fabricating, plating, and inspection operations are suitable provided that they are so conducted that all chips, fluxes, scale, and other materials foreign to the part can be completely removed during cleaning operations. Materials used to impregnate castings to prevent leakage shall, when so specified, be compatible with liquid oxygen as determined on specimens representative of the final condition and concentration of the impregnant.

3.2 Heat Treatment: All heat treatments, including stress relief after welding and brazing and baking after plating, shall be performed in such a manner as to minimize the formation of oxides on metal surfaces.

4. PROCEDURE: Final cleaning, inspection, packaging, and assembly operations shall be performed in a "Clean Area" as defined in 4.1.

4.1 Clean Area: Shall be a segregated area in which the atmosphere contains not more than 5 airborne particles between 175 and 700 microns, 1 particle between 700 and 2500 microns, and no particle larger than 2500 microns in any dimension per cu ft of air. Clean, lint-free outer-wear and gloves shall be worn. Equipment used to support and handle pieces shall be maintained free from dirt, fingerprints, unapproved lubricants, and other contaminants.

4.2 Final Cleaning: All parts, assemblies, and components shall be cleaned in accordance with the following:

4.2.1 Cleaning materials and processes used shall be compatible with the pieces being cleaned; processes used shall remove dust, dirt, grit, corrosion, grease, oil, scale except light heat discoloration from welding, and other contaminants.

4.2.1.1 Solutions used for cleaning and gases used for drying shall be of sufficient purity to prevent accumulation of undesirable residues after drying. Organic cleaning fluids other than highly chlorinated and/or fluorinated hydrocarbons shall not be used for cleaning pieces to be used in systems which will contain gases or liquified gases, unless so permitted.

Printed in U. S. A.

4.2.2 A water rinse sufficient to remove residual cleaning material shall follow immediately after each cleaning operation involving use of a water-rinsable solution. Water used for final rinsing shall have pH of 6.0 - 8.0 and specific resistance not lower than 50,000 ohm-centimeters.

4.2.3 Parts, assemblies, and components shall be dried immediately following the final rinse. Drying shall be accomplished by passing a stream of dry air or inert gas through and/or around the pieces or by oven drying; in oven drying, the temperature to which items are heated shall be not higher than 250 F (122 C), unless otherwise permitted. In no case shall the temperature be so high as to have a deleterious effect on any material present.

4.2.3.1 In the case of large tanks for which neither gas-stream nor oven drying is practicable, the interior of tanks may be considered dry when the moisture content of the gas contained within the tank is not greater than 1900 grains per cu ft (dew point +30 F (-1.1 C)), determined as follows:

4.2.3.1.1 Tank shall be purged and filled with gas having dew point of -30 F (-34 C) or below. Tank shall be closed and allowed to stand for 5 hours. At the end of this period, moisture content of the contained gas shall be determined.

4.4 Special Inspection: Each part, assembly, and component shall be capable of passing the following inspection after final cleaning.

4.4.1 Visual "daylight" inspection and black light (wave length 3200 - 4000 Angstrom units) inspection of all accessible surfaces which will be in contact with oxidizing fluids in service shall disclose no evidence of organic materials such as grease, oil, ink, and dye.

4.4.2 Examination of all accessible surfaces which will be in contact with the system fluid in service shall reveal no particulate contamination in excess of the following: 5 particles between 175 and 700 microns, 1 particle between 700 and 2500 microns, and no particles larger than 2500 microns in any dimension per sq ft of surface area or per piece for items having less than 1 sq ft surface area.

4.4.3 Parts with surfaces inaccessible to examination as in 4.4.2 shall be inspected as follows: Highly chlorinated and/or fluorinated hydrocarbon solvent (0.0005% max residue) shall be passed through the piece; volume of fluid used shall be 200 ml per sq ft of surface area but normally not more than 500 ml and in no case less than 150 milliliters. One half of the solvent used for the test and an equal volume of fresh solvent shall be evaporated to dryness. The residue from the solvent used for the test shall not exceed that of the control sample by more than 0.001 g per sq ft of part surface area. The other half of the test solvent shall contain not more than 5 particles between 175 and 700 microns, 1 particle between 700 and 2500 microns, and no particles larger than 2500 microns in any dimension per 100 ml of solvent. Not less than 0.75 sq ft of surface area will be required for these tests; washings from items of essentially equivalent configuration and size may be combined to provide the solvent volume to surface area ratio specified.

4.4.4 Other tests as agreed upon by purchaser and vendor may be used; and shall be used if the tests of 4.4.1, 4.4.2, and 4.4.3 could adversely affect the item or if the tests are impractical because of the nature of the item to be inspected.

4.4.5 Parts, assemblies, and components shall be dried immediately following the special inspection tests unless these tests have shown the need for recleaning.

4.5 Packaging: Shall be performed immediately after completion of the final drying operations except as specified in 4.5.1.

4.5.1 Items to be assembled as soon as practicable after final cleaning need not be packaged if they remain in the "clean area" prior to assembly.

4.5.2 Items not held in the "clean area" until assembled shall be wrapped with, or placed in bags made of, approved plastic material, preferably polyethylene not less than 0.006 in. thick; the material shall be of such cleanliness that items will not be recontaminated. The wrap or package shall be thoroughly purged with dry nitrogen or inert gas and joints and openings in the packages sealed; heat sealing is preferred but an approved tape may be used. One or more approved seals shall be placed over the heat-sealed portion of the package or over the tape in such a manner as to ensure breaking of the seal when the heat-seal is broken or the tape removed. The packaged item shall then be packaged a second time. A humidity indicator and a label showing applicable package marking shall be inserted between the two packages; label shall bear a statement "CLEANED AND PACKAGED PER AMS 2553". The second package shall then be purged and sealed in the same manner as the first. Approved cushioning material shall be provided to prevent damage to the plastic packaging material from protruding parts and sharp corners.

4.5.2.1 Prior to wrapping, closures of an approved material and design shall be applied to those openings specified on the drawing. Closures shall have one or more of the seals specified in 4.5.2 applied in such a manner as to ensure breaking of the seal when the closure is removed.

4.5.2.2 If size or weight makes it impractical to completely wrap an item, all critically clean openings shall be covered by approved closures. All other openings and critically clean surfaces shall be covered with clean aluminum foil secured with approved tape to provide a dust-proof closure. One or more of the seals specified in 4.5.2 shall be applied over the tape. If necessary, a second cover of rigid material shall be placed over the aluminum foil to protect the foil.

4.5.3 Items which are to remain uninstalled for 30 days or more and all items for spare part use shall, in addition to the above requirements, be sealed in water-vapor-tight rigid containers or in sealed bags of approved water-vapor-proof barrier material. Adequate bracing and cushioning shall be provided to prevent damage to the plastic packaging material and the item therein. Package features shall be in accordance with the applicable drawing or as otherwise specified by purchaser. The outer package shall bear a label showing "CLEANED AND PACKAGED PER AMS 2553" in addition to other identifying information. These packaging procedures need not be performed in the "clean area".

4.5.4 All handling during packaging shall be performed in a manner which will maintain the cleaned piece free from contamination in excess of that permitted by 4.4.

4.6 Assembly: Shall be performed as soon as practicable after completion of the final cleaning, drying, and inspection operations except on items packaged before being assembled.