Process Specification for the Application of Electromagnetic Interference (EMI) Control Coatings

Engineering Directorate

Structural Engineering Division

JUNE 2026



National Aeronautics and
Space Administration

Lyndon B. Johnson Space Center
Houston, Texas

Process Specification for the Application of Electromagnetic Interference (EMI) Control Coatings

Prepared by: David Chubin — Digitally signed by David Chubin, Date: 2026.06.02 14:08:02 -05'00'

David Chubin
Materials and Processes Branch/ES4
Date

Reviewed by: ROBIN HETHERINGTON (affiliate) — Digitally signed by ROBIN HETHERINGTON (affiliate), Date: 2026.06.02 14:19:22 -05'00'

Robin Hetherington
Materials and Processes Branch/ES4
Date

Approved by: MARYJANE O'ROURKE — Digitally signed by MARYJANE O'ROURKE, Date: 2026.06.23 18:37:30 -05'00'

Mary Jane O'Rourke
Materials and Processes Branch/ES4
Date

REVISIONS		
VERSION	DESCRIPTION	DATE
Baseline	Original version	5/96
A	Reviewed and updated for accuracy; Author updated	07/20/99
B	General changes due to reorganization (changed EM to ES). Updated references in 7.0. Included coating thickness tolerance in 3.0, added pot life of coating solutions in 10.1, and added thickness of coating verification requirements in 11.3.	12/14/05
C	Minor format changes	3/26/10
D	Rearrangement of paragraphs to meet current PRC guidelines. Paragraph 1 renamed to Scope. Paragraph 2 renamed to Applicability. Added statement in 6.3 for the use of IPA to clean the substrate. Moved shelf-life requirements into a separate paragraph, removing it from the mixing statements. Clarified the drying of each coat by the presence of a matte finish in 6.6. Added statement for Process Qualification (section 7). Removed references to ABS in favor of a generic substrate (8.4). Removed example from definition of EMI in 10.0	6/19/2020
E	Minor wording changes on pgs 5 and 6. Allowance of 3M 2517 tape if 3M 250 is not available. Allowance of powder-free nitrile or cotton gloves for part handling.	6/2/2026

1.0 SCOPE

This specification provides requirements for the application of electromagnetic interference (EMI) control coatings on various substrates. EMI control coatings are commonly applied to electronic equipment enclosures to reduce their susceptibility to stray electromagnetic signals.

2.0 APPLICABILITY

This specification applies to the application of EMI control coatings to spaceflight and spaceflight-related hardware fabricated under the authority of JSC.

3.0 USAGE

APPLY EMI CONTROL COATING, THICKNESS = *x* mm, PER NASA/JSC PRC- 4003, CLASS *z*

This process specification shall be called out on the engineering drawing by identifying the surface(s) to be coated and using a drawing note with the following general format:

The material callout shall be in accordance with Section 5.0. Coating thickness tolerance shall be ±10%.

The "class" descriptor shall conform to one of the following definitions:

Class 1 Coating properties shall be verified by test
Class 2 Coating properties do not require verification by test

4.0 REFERENCES

The following references were used to develop this process specification:

SOP-007.1 Preparation and Revision of Process Specifications

JPR 8500.4 Engineering Drawing System Requirements

The following documents are called out as an extension of the requirements given in this specification:

JPR 5322.1 Contamination Control Requirements Manual

5.0 MATERIAL REQUIREMENTS

Specific/special tools, equipment, and materials shall be documented in the detailed process instructions for implementing this process specification. The coating shall be capable of protecting the hardware from EMI once applied to the substrate. The coating shall adhere to the substrate under normal usage conditions appropriate to the hardware.

6.0 PROCESS REQUIREMENTS

6.1 Pot Life of Coating Solutions

Catalyzed coating mixtures (or solutions) shall not be used if excessive curing has occurred. Approved DPI's shall provide guidelines to prevent the violation of the coating compound's maximum allowable pot life.

6.2 Environmental Conditions

All operations connected with surface coating shall be conducted in an area maintained at a temperature of 24 ± 5 °C with a relative humidity not exceeding 60 percent, unless otherwise indicated by an approved detailed process instruction. The application and curing must be performed in a Controlled Work Area as defined in JPR 5322.1. Special precautions must be taken to prevent contamination of surfaces before coating.

6.3 Substrate Cleanliness Requirements

IPA shall be used to clean all substrate surfaces prior to coating. All substrate surfaces shall be visibly clean and free of oils and grease. Cleaned parts shall be handled with clean, white cotton, lint-free gloves or powder-free nitrile gloves only.

6.4 Mixing of Coating Solution

Coating solutions shall be mixed immediately before use.

6.5 Shelf-life of Coating Solution

Unused coating mixtures may be stored for future use. However, they shall not be reused if excessive curing has occurred. Excessive curing of catalyzed coating mixtures (solutions) is considered to have occurred when more than one-third of the surface of the container used to mix the fluoroelastomeric solution is covered with solid particles or lumps immediately prior to coating.

6.6 Coating Application and Cure

Class 1 coatings shall be applied by spraying the coating solution on the substrate at a known flow rate in such a manner that the applied thickness may be reasonably controlled. All other coatings shall be applied either by brushing or spraying. The coating thickness tolerance shall be ±10%. Coatings may be built up by using multiple passes or coats. Each pass or coat shall be allowed to dry sufficiently, as indicated by the presence of a matte finish. Adequate dry time in between coats is necessary to preclude the trapping or entraining of excess solvent between individual passes or coats. Precautions shall be taken to ensure that newly applied coatings are sufficiently dried before being handled.

7.0 PROCESS QUALIFICATION

For work performed within the Structural Engineering Division, written procedures shall be used and they shall consist of Detailed Process Instructions (DPI's) selected for use from the DPI-4003 series of work instructions. No untested DPI shall be used to manufacture flight hardware.

8.0 PROCESS VERIFICATION

8.1 Test Coupons (Class 1 only)

Two test coupons of the same substrate material shall be coated by the same procedure used for the actual hardware immediately prior to coating the hardware. The same batch of coating material shall be used for both the test coupons and the flight hardware. The test coupon coating thickness shall be the same as that for the flight hardware.

8.2 Coating Appearance

The appearance of the coatings shall be visibly smooth and continuous without discoloration or excessive (i.e., more than 5% area) "cratered" or "spackled" textures.

8.3 Thickness of Coating (Class 1 only)

The thickness of the coating applied to test coupons shall be verified to satisfy the requirements of Section 3.0, USAGE, by means of a micrometer or other measuring device.

8.4 Coating Adherence (Class 1 only)

The adherence of the coating on the test coupons shall be tested according to the following test method:

a. Apply the coating to the substrate and allow to dry as specified in the applicable Detailed Process Instruction.

b. Make two parallel scratches, 3.0 cm (1.2 inch) apart, through the coating to the substrate with a sharp instrument.

c. Immediately apply a 2.5 cm (1.0 inch) wide strip of adhesive masking tape (Code No. 250, 3M Corp.; shelf life not to exceed 6 months) across the two scratches. Press the tape tightly and uniformly against the surface of the coating. Note that if 3M 250 tape is unavailable, 3M 2517 may be used as an acceptable substitute.

d. Remove the tape with one quick motion by pulling the tape back at about 180°.

e. Coating adherence shall be acceptable if the coating does not visibly become separated from the substrate.

The coating on the substrate coupon must adhere to the substrate surface according to engineering adhesion requirements specified above.

9.0 TRAINING AND CERTIFICATION OF PERSONNEL

Personnel performing coating and quality control activities shall be adequately trained for EMI control coating processes. Training shall involve each technician successfully coating at least three Class 1 test coupons for each Detailed Process Instruction (DPI) that addresses EMI control coatings.

10.0 DEFINITIONS

Electromagnetic Interference (EMI): The emission of electromagnetic radiation (radio waves and the like) signals that have the potential for interfering with the operation of unrelated electronic hardware.