

SPM 70-43-33 HEXAVALENT CHROMIUM FREE INORGANIC ALUMINUM PROTECTIVE COATING

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HIGHLIGHTS

HIGHLIGHT REFERENCE

DESCRIPTION OF CHANGE

tk70-43-33-380-801 [Technical Change: Added procedure to apply hexavalent chromium free inorganic bonded aluminum coating to surfaces which are subject to corrosion.](#)

TASK 70-43-33-380-801

1. General.

WARNING: REFER TO PRODUCT LABEL AND MANUFACTURER'S (MATERIAL) SAFETY DATA SHEET (SDS) FOR INSTRUCTIONS ON THE HAZARDS, STORAGE, SAFE HANDLING AND PROPER USE OF THIS PRODUCT.

CAUTION: DO NOT APPLY THIS PROCESS TO ALUMINUM, OR ALUMINUM ALLOY HARDWARE, OR ASSEMBLIES, UNLESS SPECIFIED DIFFERENTLY IN ENGINE/SHOP MANUAL.

A. This method is used to apply C03-133 hexavalent chromium free inorganic bonded aluminum coating to surfaces which are subject to corrosion.

NOTE: Do not apply this process if the seal coat is referred as the subsequent coating layer in Engine/Shop Manual.

2. Equipment and Settings.

Subtask 70-43-33-380-001

A. Spray Equipment (1) and Settings (2):

(1) Equipment.

(a) There must be a closed area with a satisfactory ventilation system using clean, dry air and with ambient temperature of the work area. Relative humidity of the work area must be between 35% and 65% during the application of C03-133 .

(b) Recommended Equipment. Spray gun, Devilbiss model JGK IN-641FX or equivalent, with nylon tipped

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needle and one of the two air cap numbers: air cap number 263 for 6-8 inches (152-203 mm) spray pattern or air cap number 265 for 8-12 inches (203-305 mm) spray pattern.

- (c) Recommended Equipment. Pressure tank, Devilbiss model QMR-HTS 1414-55p or equivalent, stainless steel fitted 5 gallon (19 liter) pot with high efficiency stainless steel mixer and air motor drive.
 - (d) Recommended Equipment. Fluid hose, Devilbiss H-1996-PHC-4548-XX or equivalent, (specify length) 0.375 inch (9.53 mm) inside diameter (ID) nylon lined.
 - (e) Recommended equipment . Air hose, Devilbiss H-1641-PNC-4527-XX (specify length), or equivalent, 0.312 inch (7.92 mm) ID with static grounding wire.
 - (f) Recommended equipment. Grounding wire for pressure pot, Justrite 8-501 or equivalent model, 3 grounding wires with clamps.
- (2) Recommended Settings.
- (a) Pressure Tank: 10-12 psi (69-82 kPa).
 - (b) Fluid Pressure: 5-7 psi (34.5-48 kPa).
 - (c) Atomizing Air Pressure: 40 psi (275 kPa).
 - (d) Spray Distance: 5-8 inches (127-203 mm) from the part while making up-and-down passes. Do not make passes in a circular motion.

Subtask 70-43-33-380-013

B. Burnishing Equipment:

- (1) Automated grit blast machine.
- (2) Only direct pressure grit-blast machine is permitted.

Subtask 70-43-33-380-014

C. A curing oven capable of heating the part up to 750°F (399°C).

3. Materials.

Subtask 70-43-33-380-002

Description	Consumable Code
Paint, Inorganic Bonded Aluminum, Non-Hexavalent Chromium	C03-133
Paint, Aluminum Coating, Touch-up	C03-039
Abrasive, Grit, Aluminum Oxide, 220 Mesh	C04-113
Abrasive Grit, Aluminum Oxide, 150 Mesh	C04-283
Abrasive Cloth	C10-010
Tape, Plastic	C10-021
Abrasive, Grit, Aluminum Oxide, 180 Mesh	C10-049
Abrasive Cloth, Aluminum Oxide Super-flexible	C10-187

4. Preparation Procedure.

Subtask 70-43-33-380-003

- A. Strip the old coating. Refer to [TASK 70-23-02-110-019](#), Stripping Method No.2 - Stripping Inorganic Bonded Aluminum Paint.
- B. If the part is inspected or repaired after coating was stripped, clean the part. Refer to [TASK 70-21-22-110-042](#), Cleaning Method No. 22 - Light Duty Aqueous Cleaning (Method No. 1) or [TASK 70-21-22-110-050](#), Cleaning Method No. 22 - Light Duty Aqueous Cleaning (Method No. 2).
- C. Mask all areas that are not to be coated. Refer to Engine/Shop Manual.
- D. Grit-blast the part. Refer to [TASK 70-21-04-120-A01](#), Cleaning Method No.4 Dry Abrasive Blast Cleaning, General - Method No. 4A - Aluminum Oxide 220 (Fine) Mesh or 120 (Medium) Mesh and use only one of the consumables that follow as abrasive media: C04-113 , C04-283 , or C10-049 unless specified differently in repair documents.
- E. Remove the grit blast particle remnants. Use dry, clean shop air or lint-free cloth soaked with water. Do not wipe with a solvent for this purpose.

NOTE: Do not touch prepared parts with your bare hands. Organic contamination can occur when the part is touched with bare hands. Use clean, white cotton gloves.

- F. If the part is not to be coated within 4 hours after surface preparation, store in a clean, sealed polyethylene bag.

5. Spray Application, Cure, and Burnishing Procedure.

Subtask 70-43-33-380-004

- A. Agitate the coating material C03-133 before and during the application of the coating to make sure that solids do not

collect at the bottom of the tank.

CAUTION: BURNISH THE FIRST CURED LAYER OF THE COATING C03-133. IF YOU DO NOT BURNISH THE FIRST CURED COATING LAYER OF C03-133, DAMAGE TO THE PART CAN OCCUR.

- B. Apply the coating. The thickness of the first cured coating layer before burnishing procedure must be 0.0008 to 0.0010 inch (0.020 to 0.025 mm) and as follows:
- (1) A minimum of 2 separately cured coating layers of C03-133 is needed to get the required thickness. The total thickness of the coating is to be 0.0015-0.0030 inch (0.038-0.076 mm) unless specified differently in the Engine /Shop Manual.
 - (2) Complete the burnishing procedure after the curing of the first coating layer and before the application of the second coating layer.

NOTE: C03-133 is highly affected by the relative humidity of the environment which can clog the spray gun and the gun can have unsatisfactory spray performance for next spray application. The spray gun should be cleaned immediately with water after coating application to prevent clogging.

NOTE: For the cylindrical parts like fan mid shafts, rotation of the part during the application is recommended to have a homogeneous coating layer and to prevent wet over flash dry pass.

NOTE: It is recommended to use a smaller tank and gravity flow feeding system on top of the spray nozzle. It is recommended to use a mixer to prevent the separation of the particle solutions and binder.

- C. Unless specified differently in the Engine/Shop manual, use the equipment settings given in [Subtask 70-43-33-380-001](#), Equipment and Settings (paragraph 2.A.) as follows:
- (1) Spray-apply the first coating layer of C03-133 with necessary number of passes.
- D. Remove the masking, plugs, caps, and sealing fixtures from the part. Make sure that the coating is not damaged.

Subtask 70-43-33-380-005

- E. Alternative Procedure Available. Air-dry the coating at room temperature until the coating has a uniform gray color.

Subtask 70-43-33-380-006

- E. Alternative Procedure. If the relative humidity is more than 60%, dry the part in an oven at 150-200°F (65-93°C) for 30-60 minutes to accelerate the drying procedure.

Subtask 70-43-33-380-007

- F. Cure the coating at 600-750°F (316-399°C) for 15 minutes minimum in an oven. Let the part temperature decrease to room temperature.

NOTE: Temperatures reflect metal temperature necessary to dry and bake the coating satisfactorily.

- G. Control the thickness to be 0.0008-0.0010 inch (0.020-0.025 mm).

Subtask 70-43-33-380-023

- H. Wipe the cured coating at any selected area with a clean cloth wetted with water. If any color appears on the cloth, the coating is not cured sufficiently. Remove and re-apply the coating. Refer to [Subtask 70-43-33-380-003](#), Preparation Procedure.

Subtask 70-43-33-380-015

- I. If there are imperfections such as runs, sags, overlapping passes on the surface after curing as shown in [Figure 1](#), rub the surface with abrasive hand pad C10-010 or equivalent to remove imperfections. Control the thickness to be 0.0008-0.0010 inch (0.020-0.025 mm).

NOTE: This coating material dries fast. Overlapping passes during the application of the first coating layer can cause imperfections on the surface. Refer to Figure 1.

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Figure 1 Example of Surface Imperfections

Subtask 70-43-33-380-008

CAUTION: MANUAL BURNISHING IS NOT PERMITTED.

J. Burnish the first cured coating layer as follows:

- (1) Mask all areas that are not to be burnished with C10-021 or hard masking. Refer to Engine/Shop Manual.

Subtask 70-43-33-380-016

CAUTION: EXCESSIVE GRIT-BLASTING CAN DAMAGE THE COATING.

- (2) Burnish the part by abrasive blasting. Refer to [TASK 70-21-04-120-A01](#), Cleaning Method No.4 Dry Abrasive Blast Cleaning, General - Method No. 4A - Aluminum Oxide 220 (Fine) Mesh or 120 (Medium) Mesh. Use the equipment given in [Subtask 70-43-33-380-001](#), Burnishing Equipment (paragraph 2.B.) and do as follows:
 - (a) Use one of the abrasive media: C04-113 , C04-283 , or C10-049 .

CAUTION: EXCEEDING MAXIMUM PERMITTED AIR PRESSURE CAN DAMAGE THE COATING, REQUIRING REMOVAL AND REAPPLICATION.

- (b) It is recommended to use abrasive blast air pressure at 8.9-11.9 psi (62-82 kPa) for direct pressure equipment.
- (c) Stand-off distance is recommended to be at minimum of 1.5 inches (38 mm).
- (d) The recommended angle to the surface being blasted is 45-65 degrees.
- (e) Burnish the coated area for the minimum time or pass to produce complete coverage. Make sure that the grit blast surface coverage is sufficient to make the cured coating fully electrically conductive.

(3) Check the electrical resistance of the coating as follows:

Subtask 70-43-33-380-017

- (a) Take multiple electrical resistance measurements of the burnished coating layer. For the electrical resistance measurements, minimum of 3 readings are required at representative locations of each coating required area, unless specified differently in Engine/Shop Manual, which may require a change in any of the following blasting parameters such as pressure, nozzle traverse rate, stand-off distance, angle of nozzle relative to part surface, etc. The electrical resistance of the burnished coating layer must be less than 1 ohm per 1.00 inch (25.4 mm) between two test points, separated by a distance of 1.00 inch (25.4 mm) to 2.00 inches (50.8 mm). Use spherical tip electrodes to prevent the damage to the coating.

Subtask 70-43-33-380-018

- (b) If the electrical resistance of the coating is more than 1 ohm per 1.00 inch (25.4 mm), repeat [Subtask 70-43-33-380-016](#) (paragraph 5.J.(2)) thru [Subtask 70-43-33-380-017](#) (paragraph 5.J.(3)(a)) to burnish further, and electrical resistance check.
- (c) Visually examine the burnished coating layer. Make sure that the coating layer is uniform and not damaged or removed.
- (d) If the electrical resistance is more than 1 ohm per 1.00 inch (25.4 mm) after burnishing further, or the coating is visually not satisfactory, remove and reapply the coating. Refer to [Subtask 70-43-33-380-003](#), Preparation Procedure.

Subtask 70-43-33-380-019

- K. Clean the part with clean, dry shop air or lint-free cloth soaked with water before the application of the second coating layer. Do not use solvent for this purpose.

Subtask 70-43-33-380-020

CAUTION: DO NOT BURNISH THE SUBSEQUENT COATING LAYERS. ONLY THE FIRST CURED COATING LAYER IS BURNISHED. IF YOU BURNISH THE SUBSEQUENT COATING LAYERS, DAMAGE TO THE PART CAN OCCUR.

- L. Apply and cure the subsequent coating layer. Repeat [Subtask 70-43-33-380-004](#), Spray Application, Cure and Burnishing Procedure, [Subtask 70-43-33-380-004](#) (paragraph 5.A.) thru [Subtask 70-43-33-380-015](#) (paragraph 5.I.).

Subtask 70-43-33-380-021

- M. Visually examine the cured coating layer after each curing operation. Make sure that there are no cracks, pinholes, runs, sags, inclusions of foreign material, or other surface imperfections. If the coating is visually not satisfactory, remove and re-apply the coating. Refer to [Subtask 70-43-33-380-003](#), Preparation Procedure.
- N. Check the final thickness of the coating to be 0.0015-0.0030 inch (0.038-0.076 mm).

Subtask 70-43-33-380-022

- O. If the final thickness of the coating is less than 0.0015 inch (0.038 mm), repeat [Subtask 70-43-33-380-020](#) (paragraph 5.L.) thru [Subtask 70-43-33-380-022](#) (paragraph 5.O.) to get the required thickness 0.0015-0.0030 inch (0.038-0.076 mm).

6. Quality Assurance.

Subtask 70-43-33-220-001

- A. Visually examine the coating as follows:
 - (1) The cured coating must be uniform and free from surface imperfections such as cracks, pinholes, sags, inclusions of foreign material or other surface imperfections.
 - (2) The cured coating must have a uniform gray color.
- B. Curing check must be done according to [Subtask 70-43-33-380-023](#) (paragraph 5.H.) after each curing step.
- C. Adhesion bend test must be done to make sure that the equipment and process parameters are adapted sufficiently to the application and reproduction of these coatings.
 - (1) Bend test must be performed prior to processing parts in any of the following situations and as required by local quality organization:
 - (a) The surface preparation and/or coating system is newly installed.

- (b) The surface preparation and/or coating system has not been utilized within a twelve month period.
 - (c) The surface preparation and/or coating system equipment is dismantled and repositioned.
 - (d) The surface preparation and/or coating system equipment receives a major overhaul or replacement of a major component.
 - (e) Equipment settings are modified.
- (2) Panel configurations and tests requirements are given as follows:
- (a) Test panels must be approximately 3.00 X 4.00 X 0.063 inches (76.2 X 101.6 X 1.60 mm) in size. Initial surface finish of test panels before surface preparation must be 63 microinches (1.6 micrometers) maximum. Test panels must have smooth edges and rounded corners. The test panels must be made from AISI 4130 alloy steel and must be annealed condition.
 - (b) Test panels must be coated together with the parts with same application parameters.
 - (c) Bend the coated test panels through an angle of $90^\circ \pm 5^\circ$, around a 0.125 ± 0.005 inch (3.18 ± 0.13 mm) bend radius. Spring-back to less than 90° is permitted.
 - (d) Inspect the test panels. No less than 90% of the coating along the axial lines on the convex panel surface must be free from chipping or peeling.

7. Touch-up Procedure.

Subtask 70-43-33-380-009

NOTE: This touch-up procedure does not give the same corrosion protection as the original coating.

A. Defective areas can be touched up with inorganic bonded aluminum paint C03-039 . Not more than 5% of the total coated area is permitted to be touched-up.

- (1) Sand the area to be touched up with 180 grit aluminum oxide abrasive cloth or paper such as C10-187 or equivalent.
- (2) Clean the area with clean, dry shop air.
- (3) Wipe the cleaned area with a clean, lint-free cloth.
- (4) Shake the container of C03-039 fully before application to keep the material from collecting at the bottom.
- (5) Brush or spray the touch-up coating C03-039 onto the prepared area.

Subtask 70-43-33-380-010

- (6) Alternative Procedure Available. Let the touched-up part dry for 8 hours at room temperature to cure fully.

Subtask 70-43-33-380-011

- (6) Alternative Procedure. Cure the touched-up part at 600-650°F (315-343°C) for 15 minutes minimum. Let the part temperature decrease to room temperature.

Subtask 70-43-33-380-012

- (7) Examine the bond and cure of the touch-up coating as follows:
 - (a) Immerse the touched-up area into water at room temperature or flow water over the touched-up area for one minute. If the coating is not removed or softened, the coating is satisfactory.
 - (b) Rub the touched-up area with a clean cloth soaked with Jet-B fuel or lubricating oil (MIL-PRF-7808) for one minute. If the coating is not removed or softened, the coating is satisfactory.

NOTE: The coating is also resistant to steam cleaning. The touch-up coating may not be an exact color match for the original coating, but the color is very close to that of the original coating after it cures.

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