

Chapter 3-1-1MECHANICAL METHODS OF CORROSION REMOVAL

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ALUMINIUM BASED ALLOYSSurface corrosion

1 Where corrosion does not exceed a depth of 0.13 mm (0.005 in), the tools and procedure specified in para 2 to 4 are suitable. Deeper corrosion will usually become 'pitting' or 'intergranular' (see para 5 to 12).

Tools and equipment

2 The tools and equipment required for the treatment of surface corrosion are as follows:

- 2.1 Bristle brush
- 2.2 Waterproof abrasive paper, 400 grade
- 2.3 Aluminium wool, grades 4 and 6
- 2.4 Scotchbrite non-metallic abrasive pads. The correct grade of pad is maroon in colour
- 2.5 Vacu-Blast equipment
- 2.6 Glass beads, size 75 microns (Vacu bead size L), or aluminium oxide size 80/120 or 120/150

Safety precautions

3 The following safety precautions must be observed:

- 3.1 Wear goggles during grinding and blasting operations (refer to Chapter 3-1-3).

Procedures

4 Carry out the procedures as follows:

- 4.1 Remove loose paint and corrosion products with a stiff bristle brush.
- 4.2 Remove adjacent paint as required.
- 4.3 Remove the corrosion with aluminium wool, waterproof abrasive paper, non-metallic abrasive pads or a Vacu-Blast machine to leave a smooth surface (refer to Chapter 3-1-3).
- 4.4 Ensure, by examination, that no sign of pitting or intergranular corrosion remains.
- 4.5 Check that metal removal limits have not been exceeded.
- 4.6 Reprotect immediately corrosion removal is completed.

Pitting on sheet and plate

5 For aluminium based alloy under normal conditions of stress, the tools, safety precautions and procedure are as specified in para 6 to 8.

Tools and equipment

6 The tools and equipment required for the treatment of pitting on sheet and plate are as follows:

- 6.1 Power drill.
- 6.2 Rubber or fabric grinding wheels, Tycro wheels.
- 6.3 Carbide-tipped scrapers.

- 6.4 Waterproof abrasive paper, 400 grade.
- 6.5 Aluminium wool, grades 4 and 6.
- 6.6 Scotchbrite non-metallic abrasive pads.
- 6.7 Vacu-Blast equipment.
- 6.8 Glass beads, size 75 microns and/or aluminium oxide size 80/120 or 120/150.

Safety precautions

- 7 The following safety precautions must be observed:
 - 7.1 Wear goggles during grinding and blasting operations (refer to Chapter 3-1-3).
 - 7.2 Ensure the grinding wheel is fully inserted into the drill.

Procedures

- 8 Carry out the procedures as follows:
 - 8.1 Open up corrosion pits with scraper, lift up loose corrosion and peel up any delamination.
 - 8.2 Grind out visible pitting using a grinding wheel in a standard power drill. Leave a saucer-shaped depression if possible. Blend out ridges.
 - 8.3 Finish with abrasive paper, aluminium wool or Scotchbrite pads, or use a Vacu-Blast machine with glass beads, size 75 microns (refer to Chapter 3-1-3).
 - 8.4 Check that the metal removal limits have not been exceeded.
 - 8.5 Reprotect immediately corrosion removal is completed.

Cracks and pits on high-strength alloys

9 High tensile stress increases the risk of stress corrosion in high strength alloys. Where removal of cracks or damage is permitted by the aircraft Topic 6, STI, or repair scheme, this must be carried out strictly within the limits stated in such instructions. If limits are exceeded, refer to the Engineering Authority or DA. Only tools and materials specified should be used, unauthorised machine tools may result in earlier completion of the task but at the cost of thermal damage to, and consequent weakening of the structure.

MAGNESIUM BASED ALLOYS

Surface and pitting corrosion on forgings, castings and sheet

Tools and equipment

- 10 The tools and equipment required are as follows:
 - 10.1 Power drill.
 - 10.2 Fabric or rubber bonded grinding wheels.
 - 10.3 Carbide-tipped scrapers.
 - 10.4 Stiff bristle brushes.
 - 10.5 Waterproof abrasive paper, 400 grade.
 - 10.6 Aluminium wool, grades 4 and 6.
 - 10.7 Scotchbrite non-metallic abrasive pads.

- 10.8 Vacu-Blast equipment.
- 10.9 Glass beads, size 75 microns.

Safety precautions

- 11 The following safety precautions must be observed:
 - 11.1 Wear goggles during grinding and blasting operations (refer to Chapter 3-1-3).
 - 11.2 Ensure the grinding wheel is fully inserted into the drill.

Procedures

- 12 Carry out the procedures as follows:
 - 12.1 Remove loose paint and corrosion deposits with a stiff bristle brush.
 - 12.2 Remove or blend out pitting with grinding wheels or scrapers. Alternatively, use a Vacu-Blast machine with glass beads size 75 microns (Vacu bead size L) to remove corrosion and clean out pits (refer to Chapter 3-1-3).
- Note...
 - Only glass beads are to be used during Vacu-Blast operations on magnesium based alloys.
- 12.3 Finish with abrasive paper, pads or aluminium wool taking care not to remove the original dark brown protective hard coat unnecessarily. Where a Vacu-Blast machine has been used, no further surface preparation should be necessary.
- 12.4 Check that material removal limits have not been exceeded.
- 12.5 Reprotect immediately.

FERROUS METALS

All types of corrosion

13 Steels in aircraft structures are normally plated with zinc or cadmium. The aim is to remove only the minimum amount of plating during corrosion removal treatment.

Tools and equipment

The tools and equipment required as as follows:

- 13.1 Power drill.
- 13.2 Grinding wheels.
- 13.3 Rotary files.
- 13.4 Wire brushes.
- 13.5 Abrasive paper 400 grade.
- 13.6 Vacu-Blast equipment.
- 13.7 Glass beads, size 75 microns, or aluminium oxide 80/120 or 120/150.
- 13.8 Oilstones.
- 13.9 320-grit aluminium-oxide abrasive with cloth buffing wheel.

Safety precautions

14 The following safety precautions must be observed:

14.1 Wear goggles during grinding and blasting operations (refer to Chapter 3-1-3).

14.2 Insert the grinding wheel fully into the drill.

14.3 Cadmium compounds, including dust created by disturbance of corrosion products on cadmium plated surfaces, are toxic. They can cause serious illness if ingested or inhaled. Where cadmium coated steels are involved the responsible officer is to assess the degree of hazard and initiate any special health precautions he considers necessary in addition to the mandatory health precautions. AP 100B-01 Order 1703 refers.

Procedure for unplated or zinc plated steels of low or medium strength

15 Carry out the procedures as follows:

15.1 Remove loose paint, surface corrosion and pitting by abrading with wire brushes, grinding wheels or abrasive paper as necessary. Alternatively, use a Vacu-Blast machine (refer to Chapter 3-1-3). Ensure that pitting is blended out. Ensure that metal removal limits have not been exceeded.

15.2 Reprotect immediately. A temporary protective may be used as an interim measure if the permanent scheme cannot be applied immediately.

Procedure for unplated or zinc plated high strength steels

16 Carry out the procedures as follows:

16.1 Remove loose paint and corrosion using an oilstone, abrasive paper, cloth buffing wheel with 320 grit aluminium oxide abrasive, or use a Vacu-Blast machine (refer to Chapter 3-1-3). Grinding wheels are likely to cause local overheating and should not be used; check relevant instructions for metal removal limits before blending out pitting.

16.2 Reprotect immediately.

Procedure for all cadmium plated steels

WARNING...

BECAUSE OF THE TOXICITY OF CADMIUM DUST, CADMIUM CONTAMINATED WASTE MATERIALS SUCH AS WET ABRASIVE PAPER AND VACU-BLAST ABRASIVE ARE TO BE TREATED AS INDUSTRIAL WASTE AND AS INSTRUCTED BY THE SUPERINTENDENT PROPERTY SERVICES AGENCY (PSA). PROTECTIVE CLOTHING THAT HAS BEEN CONTAMINATED IS TO BE BAGGED AND CLEARLY MARKED AS SUCH, AND RETURNED FOR CLEANING.

17 Carry out the procedures as follows:

17.1 Remove loose paint and corrosion by using Vacu-Blast machine for large flat areas, and by using abrasive paper, wet with water for small areas and intricate components.

17.2 Ensure completely dry and reprotect immediately. A temporary protective may be used as an interim measure if the permanent scheme cannot be applied immediately.

STAINLESS STEELS AND NICKEL BASED ALLOYSSurface and pitting corrosion

18 For stainless steels in the early stages of deterioration, the tools and procedure described in para 19 to 26 are suitable. When the corrosion of stainless steel components has proceeded far enough to destroy their protective film, they must be removed from the aircraft for restoration of the film). For details of passivation see Chap 3-1-2.

18.1 The tools and procedure of para 23 to 26 apply to alloys based on nickel, such as Nimonic alloys.

Tools and equipment

19 The tools and equipment required are as follows:

19.1 Stainless steel wire brushes.

19.2 Vacu-Blast equipment.

19.3 Glass beads, size 75 microns, or aluminium oxide size 80/120 or 120/150.

19.4 Waterproof abrasive paper, 500 or 600 grade.

19.5 Power drill.

19.6 Grinding wheels.

19.7 Steel wool, or better, stainless steel wool.

Safety precautions

20 The following safety precautions must be observed:

20.1 Wear goggles during grinding and blasting operations (refer to Chapter 3-1-3).

Procedure for the removal of surface corrosion

21 Carry out the procedures as follows:

21.1 Remove surface corrosion using stainless steel wire brushes or Vacu-Blast machine.

21.2 Examine closely for signs of pitting corrosion.

21.3 Reprotect immediately corrosion removal is completed.

Procedure for the removal of pitting corrosion

22 Carry out the procedures as follows:

22.1 Remove all traces of corrosion using Vacu-Blast equipment.

22.2 Finish with 500-600 grade waterproof abrasive paper.

22.3 If Vacu-Blast equipment is not available, use grinding wheels to remove pits and then blend out with stainless steel wool or 500-600 grade waterproof abrasive paper. Check relevant instructions for metal removal limits before blending out pitting.

22.4 Reprotect immediately the corrosion removal process is completed.

TITANIUM AND TITANIUM BASED ALLOYSSurface and pitting corrosion

23 Titanium and its alloys are highly resistant to corrosion by the atmosphere or sea water. Only after long contact with battery acid are they likely to corrode in an aircraft. Corrosion products may be removed with the tools and procedures specified in para 25 and 26. Corrosion products of titanium are grey-white, but films on titanium are more likely to be from corroded aluminium alloy, in contact with titanium. Coloured films produced by thickening of the natural oxide film at high temperatures are harmless and need not be removed. Titanium alloys can suffer from stress corrosion in marine atmospheres. Specialist advice must be sought if this is suspected.

Safety precautions

24 The following safety precaution must be observed:

24.1 Wear goggles during grinding and blasting operations (refer to Chapter 3-1-3).

Tools and equipment

25 The tools and equipment required are as follows:

25.1 Stainless steel wire brushes.

25.2 Waterproof abrasive paper 500-600 grade.

25.3 Vacu-Blast equipment.

25.4 Glass beads, size 75 microns, or aluminium oxide size 80/120 or 120/150.

Procedure

26 Carry out the following procedure:

26.1 Remove corrosion using stainless steel wire brushes, waterproof abrasive paper or light abrasive blasting.

Note...

Surface protection is unnecessary for titanium and titanium based alloys.

COPPER AND COPPER BASED ALLOYSSurface corrosion

27 Stains and tarnish have no effect on the strength of these metals and the oxides formed during initial corroding will retard further attack. Corrosion needs to be removed only for application of paint schemes. Any mechanical method may be used, according to the amount of corrosion and the quality of finish required.

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