

AN-M-8a

5 April 1948

Superseding

AN-M-8

15 September 1942

**AIR FORCE-NAVY AERONAUTICAL SPECIFICATION
METAL SPRAYING; PROCESS FOR**

This specification was approved on the above date by joint action of the Air Force and Navy Departments, for use in the procurement of aeronautical supplies and shall become effective not later than 5 October 1948. It may be put into effect, however, at any earlier date after promulgation.

A. APPLICATION.

- Ø A-1. Application.- This specification is drawn to present general requirements for the apparatus, material, and procedure to be used in metal spraying of aircraft parts for protection against corrosion and for building up worn metal surfaces. The specification is applicable to metal spraying as performed with coating material in wire or powder form.

B. APPLICABLE SPECIFICATIONS.

- Ø B-1. Publications.- The following publications of the issue in effect on date of invitation for bids shall form a part of this specification to the extent specified herein:

- Ø B-1a. Air Force-Navy Aeronautical Specifications.-

AN-W-20 Wire; Metal Spraying

C. EQUIPMENT.

C-1. General.- The equipment for metal spraying shall be constructed and arranged to provide uniform controlled application of metal coating. The complete processing equipment shall be subject to inspection by authorized Government inspectors who shall be given all necessary facilities to determine conformance with this specification.

- Ø C-2. Apparatus.- The apparatus shall consist of a metal spray gun, air cleaner, and equipment for preparation of surfaces for metal spraying.

C-2a. The metal spray gun shall be provided with two-stage oxygen and acetylene regulators capable of maintaining uniform delivery pressures at any desired setting in the pressure range from 5 to 50 psi, and shall be equipped with accurate indicating pressure gages.

C-2b. Air Cleaner.- An oil and water extractor shall be used in the air line to the metal spray gun in order to insure clean, dry air.

- Ø C-2c. Suitable surface preparation equipment shall be used to insure proper cleaning and surface preparation of the part to be sprayed.

AN-M-8a -2
(April 1948)

D. MATERIAL.

D-1. General.- All material used in the process of metal spraying shall be entirely suitable for the production of high quality protective and wear resistant surfaces.

E. PREPARATION OF PARTS.

E-1. Welding.- All welding operations shall be performed prior to metal spraying.

Ø E-2. Surface Preparation.- All surfaces to be sprayed with metal shall be suitably prepared by removing all foreign material and corrosion products, then roughening by sand blasting, machine tool operation, electric bonding, or combination of these methods.

Ø E-2a. Journals of Bearings.- The worn surfaces of bearing journals to be repaired or built up by metal spraying shall be undercut by machining, if necessary, to provide a thickness of deposited metal after finishing or fitting, not less than the minimum thicknesses of Table I. The undercut section should extend 1/4 inch or more beyond the bearing area whenever practicable, and the ends cut at acute angles such that the deposited coating shall be dovetailed or keyed to the shaft or journal. The undercut section shall be degreased prior to roughening.

TABLE I

Diameter of Shaft, in.	Minimum Thickness of Deposited Metal After Finishing, Inches			
	Reciprocating Rods and Light Duty Journals, etc.:	Heavy Duty Journals : Press Crankshafts, etc.:	Fits	
Less than 3	.030	.040	.020	
3 to 6	.040	.050	.030	
Over 6	.050	.060	.040	

Ø E-2b. Machine Tool Roughening.- If practicable, worn journals and bearing surfaces shall be roughened by cutting spiral or annular grooves in the undercut section and spreading and roughening the ridges or lands thus produced with a rotary roughening tool.

Ø E-2c. Blasting.- Surfaces which are to be metal sprayed for corrosion prevention shall be roughened by suction or direct pressure type blasting using one of the following type abrasives. The blast nozzle shall be held approximately 8 inches away from and perpendicular to the work being blasted.

Ø E-2c(1). Sand.- A hard silica type jagged or angular sand of approximately 40 mesh for corrosion prevention coatings is preferred. The sand shall be washed and dry, and shall not be reused without screening to remove fine particles. Sand which has been used for blasting any other groups of metals shall not be reused for blasting light alloys such as aluminum and magnesium or corrosion resisting alloys such as stainless steel and inconel.

Ø E-2c(2). Non-Metallic Abrasives Other Than Sand.- Silicon carbide and aluminum oxide types of abrasives with good cleavage fracture properties and of approximately 40 mesh for corrosion prevention applications are preferred. The reuse restrictions of paragraph E-2c(1) apply.

Ø E-2c(3). Angular Steel Grit.- Crushed chilled steel shot of approximately 50 mesh is preferred for corrosion prevention applications. The use of steel grit is restricted to non-corrosion resisting steels and irons.

AN-M-8a -3
(April 1948)

Ø E-2c(4). Scale Removal.- Heavy scale may be removed from steel parts by directing the blast nozzle at an angle of about 40 degrees to the work. However, after the scale has been removed, the work shall be roughened by blasting with the nozzle perpendicular to the work surface.

Ø E-2c(5). Pressure and Time.- The operating pressure and blasting time required for roughening vary with the type of equipment and abrasive used, the material being roughened and the degree of anchorage required. Caution shall be exercised in selection of blasting pressure and time to prevent excessive dimensional loss and warping of the work especially when structural parts, thin sections and soft materials are involved.

Ø E-3. Precautions.- The surface shall be kept absolutely clean. Handling shall be accomplished with gloved hands or by means of suitable holding devices. After a surface has been prepared, the application of spray metal shall be accomplished as soon thereafter as possible to avoid contamination.

F. PROCEDURE.

F-1. General.- Metal spraying shall be done in such a manner as to insure complete coverage and good mechanical adherence.

F-2. Coating Metal Surfaces.-

F-2a. In coating metal surfaces the spray gun shall be held from 4 to 6 inches away from the surface, and as nearly perpendicular to the surface as possible. The gun nozzle shall not be held at an angle less than 45 degrees to the surface as the fine particles will have a tendency to glide over rather than adhere to the surface.

F-2b. As the gun is passed over a surface a ribbon of metal is deposited which is heaviest at the center and tapers off to nothing at the edge. In order to apply a coating which is sufficiently level, each ribbon shall overlap the adjacent ribbon by approximately one-third the ribbon width.

F-2c. In applying several layers on sheet stock each successive coating shall be deposited at right angles to the preceding coating thus forming a criss-cross coating.

F-2d. Operating Cautions.- The determination of the speed of moving the gun back and forth across the surface depends greatly on the operator. The gun shall be moved fast enough to insure against depositing an excessively heavy coating, and slow enough to permit covering the entire surface.

F-2e. Qualities of Coating.- The sprayed coating shall be of fine texture and shall be free of unatomized particles of metal. Sprayed aluminum coatings of 0.002 to 0.004 inch thickness give satisfactory coverage and protection on aluminum alloy. Aluminum coatings thicker than 0.004 inch may flake when applied to aluminum alloy. Heavier coatings may be used on steel since better anchorage is obtained on steel than on aluminum alloy.

Ø F-2f. Worn spindles can best be built up by revolving in a lathe while spraying. The ends of the undercut section shall be sprayed first with the gun nozzle held at an angle of approximately 45° to the work. Sufficient passes shall then be made in each direction to insure thorough keying of the sprayed coating into the dovetail of each groove. Thereafter the gun shall be mounted on the tool post perpendicular to the work and spraying continued. Speeds of approximately 50 surface feet per minute and feeds of about 1/16 inch per revolution are preferred.

F-3. Treating After Spraying.-

F-3a. After metal spraying has been applied to a localized area the surrounding edges should be rubbed lightly with a suitable abrasive to remove any metal spray adhering outside of the sandblasted area.

AN-M-8a -4
(April 1948)

g F-3b. Potassium Dichromate Treatment.- Whenever possible, steel structural parts which have been spray coated with aluminum alloy and which are not to be primed shall be boiled for 30 minutes in a 15% solution of potassium dichromate (technical grade) to increase the resistance to corrosion. After boiling, all parts shall be thoroughly rinsed in fresh water and dried. This treatment shall not be applied to sprayed engine cylinders.

F-4. Safety Precaution.- Operators shall always wear a force-feed spray mask of an approved type when spraying zinc, cadmium, or lead, or when sandblasting. The toxic effect of zinc fumes is of a temporary nature while cadmium and lead are cumulative and are fully as dangerous to the operator as is silica dust. The toxic effects of aluminum are considered to be negative but all processing shall be done in a naturally well ventilated space and the breathing of any fumes in the concentrated form shall be avoided.

G. INSPECTION FOR DEFECTS.

G-1. General.- All parts metal coated in accordance with the process specifically authorized under this specification shall be subject to inspection by authorized Government Inspectors who shall be given all reasonable facilities to determine conformance with the requirements of this specification.

G-2. Visual Examination.- The Inspector shall make a visual examination of the processed surface for complete and uniform coverage. The coating shall be free of defects such as cracks, porosity, and lack of fusion. It shall have the appearance of having a uniformly and finely divided grain structure with no evidence of unatomized or unmelted particles.

H. NOTES.

H-1. Forms of Materials.- Coating materials in the following forms are generally employed with the metal spray gun:

g H-1a. Wire.- Aluminum, babbitt, brass, bronze, cadmium, copper, low carbon- high carbon- and corrosion resisting steel, lead, monel, nickel, tin and zinc wires are standard and are covered by Specification AN-W-20. Both .125 inch and .091 inch diameter wires are standard. When ordering replacement wire for spraying, it is necessary to order the size specified for the particular type of gun as maximum gun efficiency is obtainable only when the correct size wire is used.

H-1b. Metallic Powder.-

METAL	NOMINAL MESH	METAL	NOMINAL MESH
Aluminum	300	Bronze	300
Zinc	300	Tin	150
Brass	150	Lead	200
Copper	300	Nickel	300

NOTE: To eliminate foreign matter or large particles, metallic powder must be sifted through an 80 mesh screen.

H-2. Overheating.- The operating temperature of light metals may be checked as follows: If the operator can hold the back of his hand against the work for ten seconds, the temperature is satisfactory. If he cannot, the work is overheated and should be allowed to cool before proceeding.

g H-3. Superseding Data.- This specification supersedes Specification AN-M-8 and the current issue of Bureau of Aeronautics' Specification M-289a (Int.) for Air Force and Navy aeronautical use.

H-4. Publications.- When requesting publications, refer to both title and number.

AN-M-8a -5
(April 1948)

Ø H-4a. Sources.- Copies of Air Force-Navy Aeronautical Specifications, Drawings and Joint Army-Navy Specifications required for Government procurement and ANA Bulletins and the Index of ANA Standards, may be obtained upon application to the Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio; or to the Commanding Officer, U. S. Naval Air Development Station, Johnsville, Pennsylvania. ANA Specifications and Drawings are available for purchase from the above agencies, acting as agents for the Superintendent of Documents. The price may be obtained from the Index of ANA Standards or upon application to either of the above agencies, and payment shall be made by check or money order, payable to the Superintendent of Documents or the Treasurer of the United States.

NOTICE: When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

Ø Indicates changes which have been incorporated in this revision over the previous issue.