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INTERIM FEDERAL SPECIFICATION

CLEANING METHODS AND PRETREATMENT OF FERROUS SURFACES FOR ORGANIC COATINGS

This Interim Federal Specification was developed by the Army Materials and Mechanics Research Center, AMXMR-TMS, Watertown, Massachusetts 02172, based upon currently available technical information. It is recommended that Federal agencies use it in procurement and forward recommendations for changes to the preparing activity at the address shown above.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the cleaning methods and pretreatment of ferrous metals for the application of organic coatings (paint, varnish, lacquer, enamel, etc.). In addition this specification covers the pretreatment of ferrous metal items containing small areas of zinc or aluminum surfaces or accessory fabricated parts of zinc or aluminum requiring treatment (see 6.1, 6.12, and 6.13).

1.2 Classification. This specification covers the following cleaning methods and surface pretreatment processes:

1.2.1 Surface cleaning shall be by the following methods as specified (see 6.3):

Method I - Mechanical or abrasive cleaning (sand, shot, grit, seed or vapor blasting, or tumbling) (for ferrous surfaces only)
Method II - Solvent (immersion, spray or vapor)
Method III - Hot alkaline (immersion, spray or electrolytic) (for ferrous surfaces only)
Method IV - Emulsion (with or without added water)
Method V - Alkaline derusting (for ferrous surfaces only)
Method VI - Phosphoric acid (alcoholic, detergent or solvent type with detergent)

1.2.2 Chemical conversion and pretreatment coatings shall be of the following types as specified (see 6.3):

Type I - Zinc phosphate
Type II - Iron phosphate
Type III - Organic pretreatment coating
Type IV - Non-aqueous iron phosphate

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications:

QQ-S-698 - Steel, Sheet and Strip, Low Carbon
QQ-Z-325 - Zinc Plating (Electrodeposited)
PPP-T-60 - Tape; Pressure Sensitive, Adhesive, Waterproof-for Packaging and Sealing

Federal Standards:

Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer and Related Materials; Methods of Inspection, Sampling and Testing

(Activities outside the Federal Government may obtain copies of Federal Specifications and Standards as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, Seattle, and Washington, D. C.)

(Federal Government activites may obtain copies of Federal Specifications and Standards and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specifications:

MIL-P-15328 - Primer, Pretreatment (Formula 117 for Metals)

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions, should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Material. All material used shall be as specified herein, on the drawings, or of a quality consistent with good commercial practice. Unless otherwise specified, Type III, shall conform to Specification MIL-P-15328 (see 6.14).

3.2 Preproduction approval (Type I only). Unless otherwise specified by the procuring agency, details of the proposed procedure, including chemicals and the equipment to be used by the contractor, shall be submitted in writing through the contracting officer to the bureau or agency concerned and written approval received prior to the commencement of production (see 6.4). The exact designation of any material proposed for use, together with the name of the manufacturer, shall be stated. The proposed procedure shall include a detailed method of control including limits for time, temperature, concentration, and all other pertinent details. No deviation from the approved process shall be permitted without prior written approval of the agency concerned through the contracting officer. Approval of process, materials, and equipment implies no guarantee of acceptance of the results obtained in use.

3.3 Cleaning method requirements (see 6.1 and 6.10).

3.3.1 Removal of soils and corrosion products. Following cleaning, the parts shall be thoroughly free of oil, grease, wax, dirt, scale, rust, and other foreign matter and shall show no visible signs of corrosion products when tested as in 4.2.3. If not specified the method or combination of methods used shall be selected to suit the nature and the degree of contamination present. Method I should be preceded by degreasing if necessary to assure a grease-free surface and followed by cleaning such as use of air or brushing to remove dust and metal particles. Method VI (phosphoric acid) may be used in lieu of Method I (abrasive blasting) to remove light rust or mill scale, unless specifically prohibited on the drawing or in the specification. Sulfuric or hydrochloric acid pickling shall not be used unless specifically approved or authorized by the drawing or specification for the item being processed. Pickling may not be approved for use on assemblies which may entrap acid, or when for any other reason acid pickling is considered inadvisable. Pickling chemicals shall be thoroughly rinsed from the surfaces before subsequent stages (see 6.4).

3.3.2 Rinsing. Adequate rinsing shall be done to remove any alkali or acid remaining from the cleaning operation. Special care shall be exercised in rinsing complex shapes. The water rinse after the cleaning operation shall be checked periodically for contamination as measured by total alkali or total acid respectively. The rate of overflow of the rinse shall be so regulated that the total alkali contamination does not exceed 0.5 ml. plus any total alkalinity correction factor in the water, or the total acid contamination does not exceed 0.5 ml. when tested as in 4.2.4. Method I (abrasive blasting) and method II (solvent) do not require a water rinse.

3.3.3 Drying. The final stage of each cleaning process shall be thorough drying except where the cleaning treatment is to be followed immediately by a Type I or Type II chemical conversion process. Care shall be exercised to assure that drying is complete especially in crevices, seams and other places which are generally the last to dry.

3.4 Processing requirements (Types I, II, and IV).

3.4.1 Cleaning. Cleaning shall be in accordance with 3.3.1..

3.4.2 Rinse after cleaning. Rinsing after cleaning shall be in accordance with 3.3.2.

3.4.3 Chemical conversion coating.

3.4.3.1 Type I. The properly cleaned articles shall be subjected to a balanced aqueous solution containing phosphoric acid, zinc, and accelerating agents until a uniform, insoluble, phosphate coating is produced.

3.4.3.2 Type II. The properly cleaned articles shall be subjected to a balanced aqueous solution containing phosphoric acid or acid phosphate salts with or without the addition of accelerating agents until a uniform insoluble phosphate coating is produced.

3.4.3.3 Type IV. The properly cleaned articles shall be subjected to a balanced non-aqueous solution containing trichlorethylene and phosphoric acid until a uniform phosphate coating is formed.

3.4.4 Rinse after phosphating (Type I and Type II only). Phosphating shall be followed by a clean water rinse in order to remove insoluble salts and unreacted phosphating material.

3.4.5 Final rinse.

3.4.5.1 Final rinse Type I and Type II. The final rinse in Type I and Type II processes shall contain a small amount of chromic acid or mixture of phosphoric and chromic acids, sufficient to maintain a bath pH of 2.5 to 4.0. This final rinse shall be checked by a standard free and total acid titration, as specified in 4.2.5, at least once every 3 hours and the bath discarded when the total acid reading rises to more than seven times the free acid reading. The rinse shall be discarded at least after every 24 hours processing time.

3.4.5.2 Type IV. The final rinse in a Type IV process shall be a condensate rinse by dip or spray before the item leaves the vapor zone.

3.5 General requirements.

3.5.1 Appearance.

3.5.1.1 Type I, zinc phosphate. Type I coating deposits shall be continuous, uniform in texture, evenly deposited and gray to black in color. The coating shall not be mottled in appearance nor show any smut, powder, corrosion products, or white stains due to dried phosphating solutions. There shall be a minimum number of contact marks from holders or racks. Nonuniformity of color due to heat treatment, composition of the basis metal, the degree of cold work performed on the basis metal or presence of brown or orange stains from the chromic rinse shall not be cause for rejection.

3.5.1.2 Type II, iron phosphate. Type II coating deposits shall be continuous, uniform in texture and evenly deposited. The coating shall be golden yellow to purple in color. There shall be no smut, powder, corrosion products, or white stains due to dried phosphating solutions. There shall be a minimum number of contact marks from racks or holders.

3.5.1.3 Type III, organic pretreatment. The dried organic pretreatment shall be smooth and uniform in appearance and free from discontinuities.

3.5.1.4 Type IV, non-aqueous phosphate. Type IV coating deposits shall be continuous, uniform in texture and evenly deposited. The coating shall be light gray in color. There shall be a minimum number of contact marks from racks or holders.

3.5.2 Phosphate coating weight (Type I, Type II, and Type IV only) (not applicable to incidental nonferrous surfaces). When tested as in 4.2.6 Type I minimum coating weight shall be 150 mg/sq ft for spray processes and 300 mg/sq ft for dip processes. Type II minimum weight shall be 25 mg/sq ft and Type IV 100 mg/sq ft. Unless otherwise specified the coating weight shall be tested at least every four hours.

3.5.3 Film thickness (Type III only). The dry film thickness shall be 0.0003 to 0.0005 inch when tested as in 4.2.7.

3.5.4 Application of organic coating. The organic coating shall be applied immediately after cleaning or pretreatment before the dried surfaces can show any rusting or other soiling. The temperature of the metal surface shall not be so high that blistering, poor adhesion or unsightly film results (see 6.15).

3.5.5 Paint thickness. For all tests requiring painted test specimens, the paint thickness (dry film) on all surfaces shall be as specified for the end item. When the paint thickness is not covered in the end item specification, the drawing or paint specification requirement in the order cited shall be followed.

3.5.6 Paint adhesion (all methods and types). Painted specimens shall show satisfactory paint adhesion when tested as in 4.2.8. Unsatisfactory adhesion shall be indicated by exposure of bare metal or underlying phosphate or organic pretreatment by any of the following conditions:

(a) Any area exceeding 1/8 inch average diameter.
(b) More than one area exceeding 1/16 inch average diameter.
(c) More than five areas any diameter.

3.5.7 Salt spray resistance (all types). After pretreatment and painting, the specimens subjected to the salt spray test as in 4.2.9 for the number of hours prescribed in the applicable drawing, end item specification, paint specification, or as otherwise specified, (see 6.7) shall show no more than 1/8 inch creepage, blistering, or loss of adhesion of the paint from the scribe mark. At all other points there shall be no more than a trace of film failure (No. 9-1, method 6451 of Fed. Test Method Std. No. 141), and not more than 5 scattered blisters none larger than 1 mm. (3/64 inch) in diameter on a 4 by 12 inch test panel or equivalent area of test specimen or item. On items or specimens having an area less than 48 sq. in., a proportionately smaller number of failed areas will be permitted.

3.5.8 Relief of hydrogen embrittlement. Unless otherwise specified parts having a hardness of Rockwell C40 to C48 shall be given a suitable heat treatment stress relief prior to acid cleaning or phosphate coating and, in addition, shall be heated after acid cleaning or phosphate coating for 15 minutes at 200 to 210°F. Parts having a hardness of Rockwell C48 or higher shall not be subjected to acid cleaning or phosphating.

4. SAMPLING, INSPECTION AND TEST PROCEDURES

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Test methods.

4.2.1 Tests shall be conducted as required in this specification. The right is reserved to make any additional tests deemed necessary to determine that the process meets the requirements of this specification.

4.2.2 Test specimens. Test specimens shall be prepared from actual production items or parts thereof, or if size is prohibitive from scrap parts of the same kind and finish (from the same manufacturing lot if possible) which have been rejected for causes other than phosphating, material composition, and/or heat treatment. Standard panels may be used when authorized. Specimens need not be identical in shape or size but shall be stamped, etched, or otherwise indelibly marked for identification as a test specimen. Standard panels, when used, shall be not less than 3 by 6 inches in size. If standard panels are used in lieu of test specimens for ferrous surfaces, the steel shall conform to Specification QQ-S-698 for Cold Rolled Carbon Steel Strip (ASTM Designation A109) or Cold Rolled Carbon Steel Sheets, commercial quality (ASTM Designation A-366) having a Rockwell "B" hardness of 55 to 75, and a surface roughness of 30 to 45 microinches (arithmetical average) as rolled; for aluminum surfaces use of 2014 or 2024 aluminum panels is considered acceptable; for zinc coated surfaces, the panels shall conform to class II, Type I of Federal Specification QQ-Z-325. All test specimens of standard panels shall be processed through all the cleaning, phosphating, painting and drying steps along with the items being processed.

4.2.3 Removal of soils and corrosion products.

4.2.3.1 Normal or open procedure. Following cleaning and prior to application of the phosphate coating or pretreatment coating at least two test specimens, at the conclusion of a maximum of each 4 hours production, shall be rinsed in running water and the surfaces then examined for discontinuity of the water film (water break). The surface shall then be dried and examined visually for rust, corrosion products, and soils. If the water film is discontinuous or the surface shows signs of corrosion products, all items processed since last acceptance shall be rejected and corrective action taken. After corrective action, testing shall be continued at least once every hour until the water film maintains its continuity. Testing frequency shall then revert to two test specimens at the conclusion of a maximum of each 4 hours production.

4.2.3.2 Enclosed system. Testing shall be as in 4.2.3.1 except the test specimens shall be visually examined only after the final rinse for signs of rust, corrosion products and soils. If the surface shows signs of corrosion products, all items processed since last acceptance shall be rejected and corrective action taken. After corrective action, testing shall be continued as in paragraph 4.2.3.1.

4.2.4 Rinsing. The water rinses after the cleaning operation shall be tested for contamination.

4.2.4.1 Total alkali contamination test. Take a 10 ml. sample of the rinse solution, dilute to 50 ml. with distilled water and add 5 drops of Bromcresol Green Indicator. Slowly add testing solution (N/10 HCl) from a burette until the color of sample changes from blue-green to pale yellow. This is the end-point and the number of ml. of acid testing solution used is the total alkali contamination.

4.2.4.2 Total acid contamination test. Take a 10 ml. sample of the rinse solution, dilute to 50 ml. with distilled water and add 5 drops of Phenolphthalein indicator. Slowly add alkaline testing solution (N/10 NaOH) from burette until the first permanent pink color is produced. This is the end-point and the number of ml. of alkaline testing solution used is the total acid contamination.

4.2.5 Final rinse. The final rinse shall be tested for total acid and free acid as follows:

4.2.5.1 Free acid test. Pipette a 10 ml. sample of the final rinse into a flask, add 5 drops of Bromphenol blue and slowly add testing solution (N/10 NaOH) from a burette until the first permanent blue color is produced. This is the end point and the number of ml. of testing solution used is expressed as free acid points.

4.2.5.2 Total acid test. Pipette a 10 ml. sample of the final rinse into a flask, add 5 drops of phenolphthalein and slowly add testing solution (N/10 NaOH) from a burette until the first permanent pink color is produced. This is the end point and the number of ml. of testing solution used is expressed as total acid points.

4.2.6 Phosphate coating weight (Type I, Type II, and Type IV only). Three test specimens (see 4.2.2), at the conclusion of a maximum of each 4 hours production, shall be selected by the inspector for the test. The clean, dry specimens shall be accurately weighed and the surface area of each calculated. The phosphate coatings shall be completely removed by immersion in a 5 percent (by weight) chromic acid solution at 165°F. for 15 minutes, rinsed, dried and weighed. This process shall be continued until constant weight is attained. The chromic acid shall be used one time only. The coating weight shall be determined from the formula:

$$\underset{(mg/ft^2)}{\text{Coating weight}} = \frac{(\text{Initial weight in gms} - \text{Final weight in gms}) \times 144{,}000}{\text{Total surface area in square inches}}$$

Four hours production shall be considered acceptable provided the average coating weight of the 3 specimens equals or exceeds the minimum coating weight required for the applicable type and not more than one sample falls below the minimum. The sample falling below the minimum shall be within 10% of the minimum requirement. If 2 or more specimens fail to comply with the minimum coating weight, the four hours production shall be reworked and corrective action taken until production is again acceptable. When determining the surface area of irregularly shaped objects, consideration and care should be taken to correctly determine the surface area of both the inner and outer surfaces of the test piece.

4.2.7 Film thickness. Film thickness shall be measured by a suitable instrument (see 6.8) which has been standardized on the same surface as that over which the organic finish has been applied.

4.2.8 Paint adhesion. Unless otherwise specified a minimum of two test specimens (see 4.2.2), from each day's production shall be run through all steps of the regular production process including painting. Adhesion on the painted test specimens should generally be determined within 24 hours drying for single coat applications. A two coat paint system should be tested within a maximum of 72 hours drying. Press a 2 inch length of a somewhat longer piece of water-resistant, pressure sensitive adhesive tape (3/4 inch width) conforming to Federal Specification PPP-T-60, Type II, Class 1 or 2, firmly onto a flat or cylindrical surface of the item, rubbing out all air bubbles under the tape. Allow approximately 10 seconds for the test area to return to room temperature. Grasp a free end of the tape and at a rapid speed strip it from the item by pulling the tape back upon itself at 180 degrees (in such a manner that the tape is folded back to back during the procedure). Observe for bared areas where the paint is removed. Disregard flecks of paint on tape where the underlying metal or phosphate coating is not visibly exposed. If any test specimen indicates failure all items processed since last acceptance shall be rejected and corrective action taken.

4.2.9 Salt spray resistance. Prior to initiation of production, or whenever a change in production or paint occurs, or when required by the procuring activity, a minimum of three test specimens (see 4.2.2), shall be run through all steps of the regular production process including painting. The specimens shall be dried at 120°F. in a forced draft oven for 24 hours or baked for the time and at the temperature specified in the applicable paint specification. The painted specimens shall be scored through using a sharp knife. In instances where more than one metal is used, each metal shall be scored. The specimens shall then be exposed to the 5% salt spray specified in Federal Test Method Std. 141 Method 6061 for the number of hours specified in the end item, drawing, or paint specification in the order cited (see 6.7). For the purpose of this test the significant surface on cylindrical items shall be an area 60° on either side of a scribe mark. Production shall not be initiated until results of the salt spray test are received, except at the contractor's risk. During production, one specimen (see 4.2.2), from each day's production shall be subjected to the salt spray test specified above, until five consecutive days' production have successfully passed the test. Sampling may then be reduced to one sample twice per week. If failure occurs, all items processed since last acceptance shall be rejected and corrective action taken. Sampling shall revert to one specimen from each day's production until five consecutive days' production have again successfully passed the test.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery is not applicable to this specification.

6. NOTES

6.1 Cleaning methods. Cleaning methods are intended primarily for use on ferrous metals for cleaning, rust removing, descaling, or surface etching purposes in conjunction with chemical pretreatment processes. Method I (abrasive blasting) is generally recommended to remove heavy rust and mill scale on metals with thicknesses of not less than 1/8 inch and in such instances may be coated without being given a conversion coating. Method VI (phosphoric acid) may be used to remove light to moderate rusting but is not considered an acceptable substitute for a chemical pretreatment process. The selection of the cleaning process is dependent on the type and amount of soil and corrosion products on the items.

6.1.1 Nonferrous surfaces. Certain cleaning processes in this specification may also be used on nonferrous surfaces, for example: solvent cleaning, vapor degreasing and emulsion cleaning. Care should be exercised to insure cleaning materials used have no detrimental effects on the items being cleaned.

6.2 Chemical conversion and pretreatment coatings.

6.2.1 Type I. Type I process is intended primarily for use as a general all purpose pretreatment prior to painting on tanks, trucks, sedans, ammunition and other items, as specified and is generally recommended where extreme climatic exposure is anticipated.

6.2.2 Type II and Type IV. Type II and Type IV processes are intended primarily for use where metal parts are to be formed after painting and for other end items as specified.

6.2.3 Type III. Type III is intended for use where size and shape preclude the use of Type I, Type II, or Type IV and where items containing mixed metal components are assembled prior to treatment or where lack of satisfactory equipment for Types I, II, or IV applications or preference makes this the treatment of choice.

6.3 Ordering data. Procurement documents should contain the following information:

(a) Title, number, and date of this specification.
(b) Method and type required (see 1.2).
(c) Approval (see 3.2).
(d) Process (see 3.2).
(e) Sampling and inspection (see 4.1).

6.4 Preproduction approval (Type I only).

6.4.1 Army. Unless otherwise specified, for the Army, details of the proposed procedure, chemicals, and equipment to be used should be submitted through the contracting officer to the U. S. Army Coating and Chemical Laboratory, Aberdeen Proving Ground, Maryland, 21005. However, the procuring agency may authorize immediate production provided the contractor's process complies with the procedure in 6.4.3. (In those instances where approval is granted by the procuring agency confirmation shall be obtained by the procuring agency from the U. S. Army Coating and Chemical Laboratory.)

6.4.2 Other activities. Preproduction approval will not be required for proposed processes for applying crystalline phosphate base coatings under Type I treatments on ferrous surfaces that correspond to the procedure outlined and described in 6.4.3. Unless otherwise specified, procedures, chemicals and equipment for Type I treatments which do not correspond to the procedures in 6.4.3 will require preproduction approval of the procuring agency.

6.4.3 Procedure (method of application of phosphate coating) (applicable to Type I only). The phosphate coating should be applied in equipment consisting of a minimum of five stages. Additional stages may be added at the option of the contractor provided that the five basic stages are retained. The minimum requirements for either spray or dip application are as follows:

Stage 1, cleaning. The cleaning method used should be in accordance with one of the methods of 1.2.1 or a combination thereof.

Stage 2, rinse. A clean water rinse with a constant overflow maintained by the continuous addition of fresh water entering from the bottom.

Note. This stage is not necessary when cleaning method I (abrasive blasting) or II (solvent) is used.

Stage 3, phosphating. The properly cleaned articles or items should be subjected to the phosphating solution (para. 3.4.3) for at least 3 minutes if the dip coating method is used or for at least 1 minute if the spray method is used.

The equipment used should be constructed of materials resistant to the action of the phosphating solution and should not contain copper alloy fittings or brazing where they may come in contact with the solution.

The phosphating bath should be operated at temperatures and concentrations designated by the suppliers. Dated records should be maintained noting the periodic analyses and additions to the solutions. Fog sprays should be provided on both dip tanks and spray equipment to prevent the solution from drying on the work surface prior to the subsequent water rinse.

Stage 4, water rinse. A clean water rinse with a constant overflow maintained by the continuous addition of fresh water entering from the bottom.

Stage 5, chromic acid rinse. A final hot rinse (125° to 180°F.) maintained at a pH of 2.5 to 4 through the addition of flake chromic acid or mixtures of chromic and phosphoric acids. The work should remain in the rinse for a minimum of 1 minute, except in spray processes where the time may be reduced to 30 seconds.

Failure to remove the water soluble chemical residue by rinsing, while its harmful effect on the paint coating is not immediately apparent, will result in early failure of the paint by blistering, flaking and rapid spread of corrosion products from a scratch.

After treatment the phosphated parts should not be handled with bare hands, oily or contaminated gloves.

6.5 Type II. The properly cleaned articles or items should be treated (para. 3.4.3.2) until a phosphate coating is produced which is insoluble in water and has a color varying from golden yellow to purple. The article or items should be exposed to the phosphating solution in a spray process for at least 1 minute or 3 minutes in an immersion process. The article should then be rinsed in clean water, followed by a second rinse in a dilute chromic acid or a combination chromic and phosphoric acid solution, and dried.

6.6 Type IV. The properly cleaned articles should be treated (3.4.3.3) in a trichloroethylene based bath containing phosphoric acid by immersion or spray method of application for at least 1 minute. The articles shall be distillate rinsed while still resident in the vapor zone and will be dry and ready to paint on cooling.

6.7 For convenient reference Table I contains examples of test requirements for specific paints, when applied over pretreatment coatings.

TABLE I - Test Requirements

Test	TT-E-516	MIL-L-11195	MIL-L-52043	TT-P-664
Dry film thickness, mils	0.9 - 1.1	0.9 - 1.1	0.9 - 1.1	0.9 - 1.1
Salt spray - Dry at 120°F.	24 hrs	24 hrs	24 hrs	24 hrs
Exposure time, hours	48	120	336	192
Adhesion - Air drying time, hours	1	1	1	1

6.8 The following instruments for measuring paint thickness have been found to be satisfactory:

Aminco - Brenner Magnegage -
American Instrument Company, Silver Spring, Maryland

Elcometer - Distributed by -
Gardner Laboratory, Inc., Bethesda, Maryland 20014

"G. E." gage, General Electric Company, Schenectady, New York

Lea gage - Lea Manufacturing Company, Waterbury, Connecticut

6.9 After application of chemical conversion coating or cleaning method, changes in appearance are to be expected. Type I, Type II, and Type IV phosphate coatings leave a chemical deposit. Type III leaves an organic coating. Cleaning methods leave the metal surface substantially bare. Alcoholic phosphoric acid and phosphoric acid containing a solvent and detergent (method VI) discolor the surface. Hot phosphoric acid with a detergent (method VI) etches the surface.

6.10 Cleaning material should be maintained at a concentration, temperature range and treatment time sufficient to remove all visible soils and corrosion products. The concentration of material should be measured and adjusted periodically (not less than once each shift) on the basis of established control procedures for applicable type. The bath should be discarded when the contamination is such that the concentration can not be adjusted with additional material. Table II lists the specification materials applicable to each cleaning method. The use of these materials is not mandatory unless specified by the procuring activity.

TABLE II
Specification material applicable to each cleaning method

Cleaning Method	Specification
Method I	--
Method II	O-T-236
	O-T-634
	P-D-680
	TT-T-291
	MIL-D-26847
	MIL-T-81533
Method III	P-C-436
	P-C-437
	P-C-535
	MIL-C-52412
Method IV	P-C-444
	MIL-C-11090
	MIL-C-22543
Method V	MIL-C-14460
Method VI	MIL-C-10578

6.11 Zinc phosphating materials (Type I). Material conforming to MIL-P-50002, Type II, should be procured by Government activities for use in producing coatings conforming to Type I of this specification.

6.12 This specification is not applicable to corrosion resistant ferrous metals such as the stainless steels.

6.13 When aluminum, zinc or other nonferrous metals are processed separately, reference should be made to the applicable pretreatment; for aluminum, use MIL-C-5541 or MIL-A-8625; for zinc plating use QQ-Z-325; for hot dip galvanizing use MIL-T-12879, etc.

6.14 Alternate organic pretreatment coatings (Type III). Coating Compound, Metal Pretreatment, Resin-Acid, MIL-C-8514 (ASG) (a smoother finish primarily for aircraft applications) or Primer Coating, Pretreatment, One-Package Wash Primer (for Steel, Aluminum and Magnesium), MIL-P-14504A, may be used in lieu of MIL-P-15328 when approved by the procuring agency.

6.15 In general, metal temperatures should be lower than 130°F. for cellulose lacquers and 160°F. for enamels unless the coating material has been specially formulated for the purpose. Temperatures from 60°F. to 120°F. are the most satisfactory.

6.16 For the purpose of reference in Federal Index of Specifications and Standards and for the purpose of assignment within GSA, "FSC 8010" in lieu of "FSC MFFP" will be used.

Military custodians:
Army - MR

Preparing activity:
Army - MR

Project No. MFFP-A031