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MILITARY SPECIFICATION

CHEMICAL AGENT RESISTANT COATING (CARC)

SYSTEM APPLICATION PROCEDURES AND QUALITY

CONTROL INSPECTION

This specification is approved for use within the USA Belvoir Research, Development, and Engineering Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This document covers the general requirements for application and inspection of the chemical agent resistant coating (CARC) system used on tactical military equipment. It is intended for use as a guide in selection of the appropriate materials and procedures, and as a supplement to information available in the below referenced cleaning, pretreating of, and coating specifications. The document also includes information of touchup/repair, health and safety guidelines, environmental restrictions, stock numbers for CARC and CARC-related materials, and application equipment and techniques.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

FEDERAL

TT-C-490 - Cleaning Methods and Pretreatment of Ferrous Surfaces for Organic Coatings.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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TT-P-28	- Paint, Aluminum, Heat Resisting (1200 °F).
TT-T-266	- Thinner, Dope and Lacquer (Cellulose Nitrate).

MILITARY

MIL-T-704	- Treatment and Painting of Material.
MIL-M-3171	- Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on.
MIL-C-5541	- Chemical Conversion Coatings for Aluminum and Aluminum Alloys.
MIL-C-8507	- Coating, Wash Primer (Pretreatment) for Metals, Application of (for Aeronautical Use).
MIL-C-8514	- Coating Compound, Metal Pretreatment, Resin-Acid.
MIL-A-8625	- Anodic Coatings, for Aluminum adn Aluminum Alloys.
MIL-C-10578	- Corrosion Removing and Metal Conditioning Compound (Phosphoric Acid Base).
MIL-P-14105	- Paint, Heat-Resisting (for Steel Surfaces).
DOD-P-15328	- Primer (Wash), Pretreatment (Formula No. 117 for Metals)(Metric).
MIL-C-22750	- Coating, Epoxy-Polyamide.
MIL-S-22805	- Spray Kit, Self-Pressurized.
MIL-P-23377	- Primer Coating, Epoxy-Polyamide, Chemical and Solvent Resistant.
MIL-C-46168	- Coating, Aliphatic Polyurethane, Chemical Agent Resistant.
MIL-P-52192	- Primer Coating, Epoxy.
MIL-P-53022	- Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free.
MIL-P-53030	- Primer Coating, Epoxy, Water Reducible, Lead and Chromate Free.
MIL-C-53039	- Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant.
MIL-T-81772	- Thinner, Aircraft Coating.
MIL-R-81294	- Remover, Paint, Epoxy and Polyurethane Systems.
MIL-P-85582	- Primer Coatings: Epoxy, VOC Compliant, Chemical and Solvent Resistant.

FEDERAL STANDARDS

FED-STD-141	- Paint, Varnish, Lacquer and Related Materials: Method of Inspection, Sampling, and Testing.
FED-STD-595	- Colors.

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(Copies of specifications, standards, handbooks, drawings, publications, and other Government documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 117 - Salt Spray (FOG) Testing.
B 244 - Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
B 499 - Measurement of Coating Thickness by the Magnetic Method: Non-Magnetic Coatings on Magnetic Basis Metals.
D 1193 - Standard Specification for Reagent Water

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

Rule 102 - Photochemically Reactive Solvents
Rule 1107 - Manufactured Metal Parts and Products Coatings
Rule 1124 - Aerospace Assembly and Component Coating Operations

(Application for copies should be addressed to the South Coast Air Quality Management District, 9150 E. Flair Drive, El Monte, CA 91731.)

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC-SP5 - White Metal Blast Cleaning
SSPC-SP6 - Commercial Blast Cleaning
SSPC-SP10 - Near-White Blast Cleaning

(Application for copies should be addressed to the Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213.)

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

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2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, (except for associated detail specifications, specifications sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Definition. Application of the CARC system consists of four distinct steps, each of which is critical to the performance of the overall system; cleaning, pretreating, priming, and topcoating. The cleaning and pretreating procedures are standard methods required in any finishing process; however, wash primer drying/reaction must be completed when used under CARC or adhesion may be affected. The anticorrosive primers are epoxies, and the topcoats are polyurethanes for exterior surfaces and an epoxy for interior surfaces. Except for the epoxy topcoat, all of the coatings in the CARC system are Qualified Products List (QPL) items; that is, there is a list of approved suppliers which must be used for product procurement. In addition, each batch of polyurethane topcoat must be checked by the specification preparing activity (SPA) for validation of the spectral reflectance (camouflage properties). The local safety office, preventative medicine activity, and local medical support facility must be consulted prior to initiating CARC application. For guidance, see Appendix B. For miscellaneous requirements, see 3.8. Pertinent specifications are listed in table 1.

TABLE I. The CARC system.

Process	Ferrous Metal	Non Ferrous Metal
Cleaning	TT-C-490 MIL-T-704	TT-C-490 MIL-T-704
Pretreating	TT-C-490, I (Zn phosphate) TT-C-490, II (Fe phospate) TT-C-490, III (wash primer)	DOD-P-15328 (wash primer) MIL-C-8514 (wash primer) MIL-C-5541 (chromate conversion) MIL-A-8625 (anodize)
Priming	MIL-P-52192 MIL-P-53022 MIL-P-53030	MIL-P-23377 MIL-P-53022 MIL-P-53030 MIL-P-85582
Topcoating	MIL-C-22750(interior only) MIL-C-46168 MIL-C-53039	MIL-C-22750 (interior only) MIL-C-46168 MIL-C-53039

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3.2 Cleaning. Surfaces which are not clean will produce poor paint adhesion, with subsequent paint loss in service, leaving the metal unprotected from the environment. Therefore, removal of grease, oil, an other organic contaminants shall be accomplished using appropriate solvent/chemical cleaning methods. Cleaning materials/methods which may be effective against one type of contaminant may be ineffective against others; therefore, multiple cleaning methods may be required to provide a clean surface. Surface oxides, rust, weld spatter and other inorganic contaminants shall be removed prior to pretreatment using appropriate mechanical/chemical cleaning methods. Unless otherwise specified, the surface should be thoroughly cleaned according to MIL-T-704 or TT-C-490. Cleaning shall be accomplished by chemical methods (such as solvent cleaning, alkaline cleaning, acid cleaning, pickling, descaling with hydride or paint stripping), by elecrochemical cleaning methods (such as electropolishing, electrolyte alkaline, or electrolytic pickling), or by mechanical means such as blasting, chipping, wire brushing, or grinding. After cleaning, all surfaces shall be kept free from dirt, dust, finger marks, and other contaminants. Meticulous cleaning prior to painting operations cannot be over-emphasized since this factor is of prime importance in obtaining a satisfactory coating meeting the requirements of this specification.

3.2.1 Ferrous metal sufaces. Unless otherwise specified, ferrous metal surfaces to be painted shall be blast cleaned in accordance with Steel Structures Painting Council (SSPC) Specification SSPC-SP6 to remove millscale, products of corrosion, dirt, casting, sand, slag, and other foreign substances. Also, when stated, blast-cleaning shall be in accordance with specifications SSPC-SP5 or SSPC-SP10, as required (see Steel Structures Painting Council Manual, Volume 2, SSPC-SP6 for more information). Blast-cleaned surfaces shall be pretreated and given a prime coat as soon as possible after cleaning and in no case more than four hours later. If more than four hours pass before coating, the blasted surface must be inspected and found free of corrosion or foreign matter, and pass the water break test (see 4.3.3.1) prior to pretreatment and priming. Blasting shall not be used on surfaces which could be damaged, such as machine parts and sheet metal thinner than 0.0625 inch (16 gage U.S. Standard).

3.2.1.1 Exemptions from abrasive blasting. Blasting is optional on components painted for protection during limited storage, from which the paint will be worn off as soon as the equipment is placed in use. Examples are track assemblies, track roller assemblies (including mounting frames), interiors of weld-type box sections, bulldozer components (including rippers, scarifiers, ejectors, push plates, blades, bowls, and buckets), scrapers and crane shovels, interiors of cement mixer drums, and interiors of aggregate driers. However, these surfaces shall be dry and free from oil, grease, dirt, and rust prior to painting.

3.2.1.2 Vehicles. Ferrous metal surfaces of vehicles shall be cleaned for painting in accordance with 3.2.1 except as specified herein. Surfaces that cannot be cleaned by blasting may be cleaned to base metal by such alternate means as three dimensional/abrasive cleaning, chipping, powered wire brushing, or grinding to the required degree specified for commercial sand blasting. Sheet metal and sheet metal parts of eight gage and thinner may be cleaned to

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bare metal by acid pickling in accordance with TT-C-490, with a maximum of five percent sulfuric acid included. However, chemical cleaning may not be approved for use on assemblies which may entrap acid/alkalai or when for any reason chemical cleaning is considered inadvisable.

3.2.2 Zinc surfaces. Zinc surfaces, including zinc-coated ferrous material, shall be thoroughly cleaned as specified in 3.2.

3.2.3 Aluminum and aluminum-alloy surfaces. These surfaces shall be thoroughly cleaned as specified in 3.2.

3.2.4 Magnesium alloy surfaces. Magnesium alloy surfaces shall be cleaned in accordance with MIL-M-3171.

3.2.5 Cleanliness. After cleaning, all surfaces shall be kept free from dirt, dust, fingerprints, and other contaminants until treated as specified in 3.3. Prior to pretreatment, the surface must pass the water break test described in 4.3.3.1.

3.3 Pretreating. Chemical surface treatments for metallic substrates provide improved adhesion fo subsequent coatings and temporary protection from corrosion. For best results, the pretreatment shall be applied as soon as possible after proper cleaning (see 3.2). The two most common types are straight conversion (either chromate or phosphate) and organic (vinyl wash primer) modified conversion.

3.3.1 Ferrous metal, zinc or cadmium surfaces. These surfaces shall be treated as soon as possible after cleaning as specified in 3.2 with one of the following:

3.3.1.1 Zinc phosphate. Conforming to TT-C-490, type I.

3.3.1.2 Iron phosphate. Conforming to TT-C-490, type II. (Not to be used in TACOM contracts.)

3.3.1.3 Wash primer (DOD-P-15328 and MIL-C-8514). Conforming to TT-C-490, type III.

3.3.1.3.1 Preparation. Organic pretreatment is intended for use on clean metal surfaces of all types as a treatment prior to the application of the primer system. MIL-C-8514 is the preferred pretreatment for aluminum and aluminum alloy. It is not intended as a permanent protective primer in itself although some protection is afforded for up to 24 hours. To insure best results, the pretreatment should be coated with primer as soon as practicable, but no more than 24 hours later. Otherwise, it shall be stripped and the finishing process started again. The material is sufficiently dry for recoating one hour after application. The pretreatment should not be applied to wet surfaces or in rainy weather. The dry film thickness should be from 0.3 to 0.5 mil. Prepare MIL-C-8514 for application in accordance with MIL-C-8507. To prepare DOD-P-15328, the resin component should be well stirred with care taken that all settled pigment is completely dispersed. The acid component should be added

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slowly with stirring, continuing until a complete blending of the mixture is assured. The pretreatment is then ready for use. If the resin component is thickened or gelled, do not add the acid component until fluidity has been restored. This can be achieved by warming it up. The pretreatment is most effective when freshly mixed and must be used within 8 hours after the addition of the acid component. The quantity of pretreatment mixed for use shall be the amount required for immediate application. The acid component is not thinner. It is a necessary activator and must be used exactly as directed. The dry film shall resist removal with the fingernail.

3.3.2 Aluminum surfaces. Aluminum surfaces shall be treated as soon as possible after cleaning as specified in 3.2 with one of the following:

3.3.2.1 Anodize conforming to MIL-A-8625.

3.3.2.2 Chemical conversion conforming to MIL-C-5541.

3.3.2.3 Wash primer conforming to DOD-P-15328 or MIL-C-8514 (see 3.3.1.3).

3.3.3 Magnesium alloy surfaces. Prior to painting, magnesium alloy surfaces shall be treated in accordance with MIL-M-3171, type I or III. Treated surfaces that become scratched in handling shall be touched up in accordance with MIL-M-3171, type I.

3.4 Priming. The primer shall be applied to a clean, dry surface as soon as possible after cleaning and pretreating. The ambient temperature should be between 60 and 90 °F, but the primers may be applied outside this range without adverse effects, provided appropriate quality control checks are preformed (see 4.3). The paint and surface shall be approximately the same temperature, and application shall be by brush or spray, depositing a continuous, adherent, dry film which is smooth, even, and free from runs, sags, or other defects which might interfere with the application and adhesion of subsequent coats (see 4.3.3.8). If paint heaters are used to assist in application, the substrate to be coated must be at the minimum ambient temperature of 60 °F. Dipcoating is not recommended for the two component chemically reactive coatings of the CARC system. The five anticorrosive primers are epoxies, and all are two component products. They are applied to metal substrates to provide corrosion resistance and a surface to which the CARC topcoat will firmly adhere. As two component products, they dry by a two stage process of solvent evaporation and chemical crosslinking, and they have a finite potlife, typically 8 hours. Environmental conditions, particularly temperature and relative humidity, will effect potlife, curing, and adhesion. For ordering information (NSN) see Appendix A; for health, safety and environmental information, see Appendix B; and for application equipment and techniques, see Appendix C. The specific information below for the five primers is summerized in table II.

3.4.1 Primer coating, epoxy-polyamide, chemical and solvent resistant (MIL-P-23377, type I).

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3.4.1.1 Description. This primer specification covers a chromate containing two-component, epoxy-polyamide primer. The primer provides a chemical and solvent resistant base coat. The specification contains formulations which allow for standard pigments (type I) and low infrared reflective pigments (type II). Type II primer is used under camouflage aircraft colors. It also differentiates the formulations based on the class of solvents used, allowing standard solvents (class 1), electrostatically sprayable solvents (class 2) and a 350 grams/liter compliant solvent (class 3). The class 3 formulation meets the 350 g/l (2.9 pounds per gallon) volatile organic compound (VOC) content requirement by use of 1,1,1 trichloroethane (see 3.4.1.6).

3.4.1.2 Use. This primer is intended for use on pretreated aluminum alloy surfaces as a corrosion inhibitive, chemical resistant primer. It is compatible with CARC topcoats.

3.4.1.3 Preparation. The components shall be thoroughly stirred prior to and after admixing. Reduction of component I (pigmented solution) with component II (clear solution) shall be one volume to one volume. Component II shall always be added to component I, and this procedure shall not be reversed. The temperature of each component shall be 65 to 95 °F before mixing.

3.4.1.4 Reduction. The admixed primer shall be reduced to a spraying viscosity of 16 to 18 seconds through a number 2 Zahn cup by adding MIL-T-81772 type I or II for class 1 and 2 and an inhibited grade of 1,1,1 trichloroethane, such as Dow's Chlorothene SM, for class 3. The reduced primer should be stirred and strained and allowed to stand at room temperature for 30 minutes before use.

3.4.1.5 Application. All surfaces to be painted must be thoroughly cleaned as specified in 3.2 and pretreated as specified in 3.3. To insure a chemically clean surface, perform the test in 4.3.3.1. Failure to comply with 4.3.3.1 is sufficient cause to do additional cleaning. The primer should be sprayed with one full wet coat and need only be set to touch before applying the topcoat. This is usually between 30 minutes and 1 hour, depending on conditions. The admixed primer must be used within 8 hours after mixing to insure performance. The dry film thickness should be between 0.6 to 0.9 mils. The largest factor affecting cure is temperature. The optimum temperature range is from 65 to 95 °F. At 70 °F, the dry to touch time is 30 minutes and the surface is dry to handle within 6 hours when checked according to FED-STD-141, method 4061.1. The effect of decreasing temperature within a facility's painting area will double the cure time for each 10 degree drop in temperature under 70 °F. The cure time can be accelerated by a heated atmosphere.

3.4.1.6 Comments. The primer furnished under this specification shall be products which are authorized by the qualifying activity for listing on the Qualified Products List (QPL) (see 6.6). For health, safety and environmental concerns, see Appendix B. For class 3 formulations, do not use spray equipment containing any aluminum components to apply coatings formulated with 1,1,1 trichloroethane. Prior to use 1,1,1 trichloroethane, ensure compliance with local and state environmental restrictions.

3.4.2 Primer coating, epoxy (MIL-P-52192).

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3.4.2.1 Description. This primer is an air-drying or baking chemical agent resistant epoxy based primer. The formulation contains lead and chromate pigments, and it provides for two compositions, G and L, which are based on their solvent content. Composition G is allowed for general use when air pollution regulations are not applicable. Composition L solvents must be specified in areas where regulations controlling the types of solvents emitted into the atmosphere are enforced. Composition L solvents will not meet VOC requirements. This is a two component package with a pigmented epoxy resin (part A) and a polyamide catalyst (part B).

3.4.2.2 Use. It is intended for use on pretreated ferrous surfaces. It has good exterior durability and is a primer for use with CARC topcoats.

3.4.2.3 Preparation. Thoroughly mix each of the components separately. Then, mix four parts of component A to one part of component B by volume and stir until well blended. The temperature of each component shall be 65 to 95 °F before mixing.

3.4.2.4 Reduction. If necessary, the admixed primer can be reduced for spraying up to 20 percent by volume with MIL-T-81772 type I or II or Xylene. The thinned primer shall be stirred thoroughly, strained and allowed to stand 30 minutes prior to use.

3.4.2.5 Application. All surfaces to be painted must be thoroughly cleaned as specified in 3.2 and pretreated as specified in 3.3. To insure a chemically clean surface, perform the test in 4.3.3.1. Failure to comply with 4.3.3.1 is sufficient cause to do additional cleaning. After completion of the 30 minute waiting period, the primer shall be sprayed to a dry film thickness between 1.0 and 1.5 mil with one full wet coat. The primer need only be set to touch before applying the topcoat. This is usually between 30 minutes and 1 hour, depending on conditions. The admixed primer must be used within 8 hours after catalyzing to insure performance. The largest factor affecting cure is temperature. The recommended temperature for application is between 60 and 100 °F. At 70 °F, the dry to touch time is 10 minutes and dry to handle within 1-1/2 hours as determined in FED-STD-141, method 4061.1. The effect of decreasing temperature within a facility's painting area will double the cure time for each 10 degree drop in temperature under 70 °F. Whenever it is desireable to shorten the drying time, the primer may be baked at 300 °F for 20 minutes or at a lower temperature for a longer period of time.

3.4.2.6 Comments. The primer furnished under this specification shall be products which are authorized by the qualifying activity for listing on the Qualified Products List (QPL) (see 6.6).

3.4.3 Primer, epoxy, corrosion inhibiting, lead and chromate free (MIL-P-53022).

3.4.3.1 Description. This specification covers a flash drying, corrosion inhibiting epoxy primer for ferrous and nonferrous metals. It is formulated lead and chromate free and will satisfy hydrocarbon emissions as defined in Rule

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102 of the South Coast Air Quality Management District. It is a two package system consisting of a pigmented epoxy resin (part A) and a polyamide catalyst (part B).

3.4.3.2 Use. This primer is intended for use on properly cleaned and pretreated ferrous and nonferrous surfaces. It is an acceptable primer system to use with CARC topcoats and provides a lead and chromate free formulation.

3.4.3.3 Preparation. The components shall be thoroughly mixed prior to and after admixing. Mix four parts of part A to one part of part B by volume and stir until well blended. The temperature of each component shall be 65 to 95 °F before mixing.

3.4.3.4 Reduction. If necessary, the admixed primer can be reduced for spraying up to 20 percent by volume with MIL-T-81772, type I or II or TT-T-266. The thinned primer shall be stirred thoroughly, strained and allowed to stand 30 minutes prior to use.

3.4.3.5 Application. All surfaces to be painted must be thoroughly cleaned as specified in 3.2 and pretreated as specified in 3.3. To insure a chemically clean surface, perform the test in 4.3.3.1. Failure to comply with 4.3.3.1 is sufficient cause to do additional cleaning. After completion of the 30 minute waiting period, the primer shall be sprayed to a dry film thickness between 1.0 and 1.5 mil with one full wet coat. The primer need only be set to touch before applying the topcoat. This is usually between 15 and 45 minutes in accordance with FED-STD-141, method 4061.1, depending on conditions. The admixed primer must be used within 8 hours after catalyzing to insure performance. The largest factor affecting cure is temperature. The recommended temperature for application is between 60 and 100 °F. At 70 °F, the dry touch time is 15 and 45 minutes and dry to handle time is 90 minutes. The effect of decreasing the temperature within a facility's painting area will double the cure time for each 10 degree drop in temperature under 70 °F.

3.4.3.6 Comments. The primer furnished under the specification shall be products which are authorized by the qualifying activity for listing on the Qualified Products List (QPL) (see 6.6).

3.4.4 Primer coating, epoxy, water reducible, lead and chromate free (MIL-P-53030).

3.4.4.1 Description. This primer is a water reducible, air-drying, corrosion-inhibiting epoxy primer. It is a two component system with a pigmented polyamide (component A) and a clear epoxy (component B). The primer is formulated lead and chromate free and contains no more than 340 grams per liter (2.8 pounds per gallon) of volatile organic compounds as applied, in accordance with Rule 1107 of the South Coast Air Quality Management District.

3.4.4.2 Use. The primer is intended for use on pretreated ferrous and nonferrous substrates and is compatible with CARC topcoats.

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3.4.4.3 Preparation. Thoroughly stir component A until uniform. Mix one volume of component B with three volumes of component A until a smooth homogeneous mixture is achieved. The temperature of each component shall be 65 to 95 °F before mixing.

3.4.4.4 Reduction. Reduce the admixed primer with deionized water to a spraying viscosity of 20 seconds in a number 2 Zahn cup. The thinned primer shall be stirred thoroughly, strained and allowed to stand for 30 minutes prior to use.

3.4.4.5 Application. All surfaces to be painted must be thoroughly cleaned as specified in 3.2 and properly pretreated as specified in 3.3. To insure a chemically clean surface, perform the test in 4.3.3.1. Failure to comply with 4.3.3.1 is sufficient cause to do additional cleaning. After completion of the 30 minute waiting period, the primer shall be sprayed to a dry film thickness between 1.0 and 1.5 mils with one full wet coat. The primer need only be set to touch (FED-STD-141, method 4061.1) before applying the topcoat but all water must have evaporated. This is usually between 30 minutes and one hour depending on conditions. The admixed primer must be used within 6 hours after catalyzing to insure performance. The largest factor affecting cure is temperature. The recommended temperature for application is between 60 and 100 °F. At 70 °F, the dry to touch time is 30 to 60 minutes and the dry to handle time about 2 hours. The effect of decreasing the temperature within a facility's painting area will double the cure time for each 10 degree drop in temperature under 70 °F. Due to the fact that the primer is a water-reducible system, a high relative humidity will retard the cure time while a low relative humidity will accelerate the process. Pot life is shortened by temperature increase.

3.4.4.6 Comments. The primer furnished under the specification shall be products which are authorized by the qualifying activity for listing on the Qualified Products List (QPL) (see 6.6). Since the sprayed primer contains water, care must be taken to insure the surface is dry to touch before application of urethane topcoats. Premature topcoating may lead to an undesirable reaction between water evaporating from the primer and the catalyst component of the urethane being applied.

3.4.5 Primer coatings: Epoxy, VOC compliant, chemical and solvent resistant (MIL-P-85582).

3.4.5.1 Description. This is an epoxy based, water-reducible, chemical and solvent resistant primer. It is furnished in a standard formulation (type I) and a low infrared reflective formulation (type II). The primer consists of a pigmented resin solution (component A) and a curing agent solution (component B). Component A requires the use of chromate (hexavalent) as part of the pigment solids. It contains no more than 350 grams per liter (2.9 pounds per gallon) of volatile organic compounds (VOC) as applied in accordance with Rule 1124 of the South Coast Air Quality Management District.

3.4.5.2 Use. The primer is intended for use on pretreated nonferrous substrates and compatible with CARC topcoats.

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3.4.5.3 Preparation. The epoxy primer shall be prepared by first thoroughly mixing each of the components separately. The two components are then mixed in the volume ratio specified by the manufacturer. The temperature of each component shall be 65 to 95 °F before mixing.

3.4.5.4 Reduction. Reduce the admixed primer with water according to the manufacturer's recommended procedure using water conforming to type IV of ASTM D 1193 to approximately 20 seconds in a number 2 Zahn cup. The thinned primer shall be stirred thoroughly, strained and allowed to stand for 30 minutes prior to use.

3.4.5.5 Application. All surfaces to be painted must be thoroughly cleaned as specified in 3.2 and properly pretreated as specified in 3.3. To insure a chemically clean surface, perform the test in 4.3.3.1. Failure to comply with 4.3.3.1 is sufficient cause to do additional cleaning. After completion of the 30 minute waiting period, the primer shall be sprayed to a dry film thickness between 0.6 and 0.9 mils with one full wet coat. The primer need only be set to touch (FED-STD-4061.1) before applying the topcoat. This is usually between 30 minutes and 1 hour depending on conditions. The admixed primer must be used within 6 hours after catalyzing to insure performance. The largest factor affecting cure is temperature. The recommended temperature for application is between 60 and 100 °F. At 70 °F, the dry to touch time is within one hour and the primer is dry to handle within 6 hours. The effect of decreasing the temperature within a facility's painting area will double the cure time for each 10 degree drop in temperature under 70 °F. Due to the fact that this is a water-reducible system, a high relative humidity will retard the cure time while a low relative humidity will accelerate the process.

3.4.5.6 Comments. The primer furnished under this specification shall be products which are authorized by the qualifying activity for listing on the Qualified Products List (QPL) (see 6.6). Since the sprayed primer contains water, care must be taken to insure the surface is dry to touch before application of urethane topcoats. Premature topcoating may lead to an undesirable reaction between the water evaporating from the primer and the catalyst component of the urethane being applied.

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TABLE II. General application guidelines for epoxy primers.

SPECIFICAITON	MIXING	REDUCTION	APPLICATION
MIL-P-23377	1-1 volume mix Add Comp II to Comp I Temp 65-90 °F prior to mixing	16-18 sec with #2 Zahn cup Stir and strain Set 30 minutes before use	Spray with one full coat Wait 30-60 minutes prior to topcoating Use within 8 hours Thickness 0.8-1.2 mils* Apply at 65-95 °F
MIL-P-52192	Four parts Comp A to one part Comp B Add B to A Temp 65-95 °F prior to mixing	If necessary, reduce up to 20% Stir and strain Set 30 minutes before use	Spray with one full coat Wait 30-60 minutes prior to topcoating Use within 8 hours Thickness 1.0-1.5 mils Apply at 60-100 °F
MIL-P-53022	Four parts Comp A to one part Comp B Add B to A Temp 65-95 °F prior to mixing	If necessary, reduce up to 20% Stir and strain Set 30 minutes before use	Spray with one full coat Wait 15-45 minutes prior to topcoating Use within 8 hours Thickness 1.0-1.5 mils Apply at 60-100 °F
MIL-P-53030	Stir Comp A until uniform One part of Comp B with three parts of Comp A Add B to A Temp 65-95 °F	20 sec with #2 Zahn cup using deionized water Stir and strain Set 30 minutes before use	Spray with one full coat Wait 30-60 minutes prior to topcoating Use within 6 hours Thickness 1.0-1.5 mils High humidity retards cure, low humitidy accelerates cure Make sure surface is dry of water prior to top-coating
MIL-P-85582	Stir separate components Mix as specified by manufacturer Temp 65-95 °F prior to mixing	20 sec with #2 Zanh cup using deionized water Stir and strain Set 30 minutes before use	Spray with one full coat Wait 30-60 minutes prior to topcoating Use within 6 hours Thickness 0.8-12 mils* Apply at 60-100 °F High humidity retards cure, low humidity accelerates cure Make sure surface is dry of water prior to top-coating

* For Aluminum-Steel Assemblies. If aluminum only, 0.6-0.9 mil is acceptable.
Note: Times prior to topcoating are for 70 °F. At 60 °F, doubling the time may be necessary to get adequate curing for topcoating.

TERMS: mils = .001 inches

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3.5 Topcoating. The three CARC topcoats provide chemical agent resistance and color for the system. In addition, the polyurethanes (exterior surfaces) provide camouflage protection to visible and near infrared means of detection, while the epoxy (interior surfaces) provides a smooth, easily-cleaned surface which is resistant to wear. The CARC topcoats inhibit absorption of chemical agents into the paint film and allow the decontamination process to be simplified. These coatings also offer increased abrasion and impact resistance, improved weathering performance, and prolonged service life. The topcoat shall be applied to a freshly primed substrate as soon as practical. The drying time between coats shall be 24 hours or less under favorable conditions, but in no case less than the time specified for the recoating or self-lifting test of the material specifications. The applicator must extend drying times to compensate for low temperatures and high humidity. If topcoating proceeds after 24 hours, scuff sanding followed by a solvent wipe or a primer mist coat is required. Adhesion testing (see 4.3.3.6) shall be used to monitor intercoat adhesion. As with CARC primers, application should be by brush or spray, the paint and substrate should be approximately the same temperature, and ambient temperature should be between 60 and 90 °F (see 3.4). The specific information below for the three topcoats is summerized in table III.

3.5.1 Coating, aliphatic polyurethane, chemical agent resistant (MIL-C-46168).

3.5.1.1 Description. This specification covers both camouflage and non-camouflage, chemical agent resistant, aliphatic polyurethane coatings for use as a finish coat on military combat equipment. It is two component, lead and chromate (hexavalent) free, and is available in three types. Type II meets South Coast Air Quality Management District (SCAQMD) Rule 102. Type III has a maximum package VOC content of 420 gm/l (3.5 lb/gallon) through the use of 1,1,1 trichloroethane. Type IV is a high solids formulation with the same VOC requirement as type III.

3.5.1.2 Use. MIL-C-46168 is intended to provide a film which can be easily and effectively decontaminated after exposure to liquid chemical agents. It is applied over any of the five epoxy primers described in 3.4 or a completely cured and thoroughly cleaned existing enamel finish. For TACOM contracts, recoating alkyd finishes with CARC is prohibited. It should not be applied over an existing lacquer finish. As a camouflage topcoat, it should be applied to exterior surfaces and interior surfaces routinely visible from the outside; e.g., door ramps, hatches, etc.

3.5.1.3 Preparation. Component A shall be thoroughly mixed by stirring or agitation to a smooth, homogeneous state. Care must be exercised to redisperse any pigment which may have settled to the bottom of the container. Component A which contains grit or seeds after thorough mixing or which has thickened abnormally should not be used. Component B shall be a clear to pale yellow liquid which is free of crystals or sediment. A cloudy, milky, or crystalline gel indicates that the catalyst is contaminated and should not be used. If the container for component B is swollen, do not open it. Dispose of it as a hazardous waste. Both components should always be measured because accuracy is very important. MIL-C-46168 should be mixed four parts by volume of component A with

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one part by volume of component B. Always add component B to component A. Components from different manufacturers shall not be mixed. After combining the two components, the coating should be thoroughly mixed into a smooth, homogenous state and allowed to stand for 30 minutes, if possible.

3.5.1.4 Reduction. If necessary for spray application, MIL-C-46168, type II and type III may be reduced up to one part by volume of the applicable solvent with four parts by volume of the mixed coating. The applicable solvent for type II is MIL-T-81772, type I. The applicable solvent for type III is 1,1,1 trichloroethane (Dow Chlorothene SM or equivalent). If type IV is to be reduced for application, the applicable solvent is MIL-T-81772, type I, unless otherwise specified. Care must be exercised to follow the manufacturer's instructions to insure that the VOC of the coating as applied remains at or below the required level of 420 gm/l (3.5 lb/gallon). After reduction, MIL-C-46168 (except colors Aircraft Green and Interior Aircraft Black) shall be strained through a paint filter to remove any impurities. While thinning should not be necessary for brush application, the admixed coating can be reduced as above if required.

3.5.1.5 Application. Spray application can be accomplished with one full wet coat. For satisfactory camouflage properties, it is necessary to apply the coating to a minimum dry film thickness of 1.8 mils. Under certain temperature and humidity conditions, for more even results, it may be advisable to apply two coats of a minimum thickness of 0.9 mils each and allow solvent flash off between coats. Component B is water sensitive and caution must be taken to ensure water or high humidity does not come in contact with the coating. Mixed coating must be used within eight hours and cannot be stored. Pot life is shortened by temperature increase. Once opened, component B must be used that day or stored in a sealed dry air/airless container. Curing time increases with lower temperature or higher humidity, and decreases with higher temperature or lower humidity. At temperatures of 70 °F and above, MIL-C-46168 will dry within the specification requirements when tested in accordance with FED-STD-141, method 4061.1 (set to touch in approximately 15 minutes, dries hard in 90 minutes, dries through in four hours, with a complete cure within seven days). A 60 °F, MIL-C-46168 requires twice as long to cure. Do not use MIL-C-46168 on items attaining temperatures in excess of 400 °F, such as manifolds, exhaust pipes, and mufflers; use MIL-P-14105. Do not apply MIL-C-46168 to a surface which is contaminated with moisture.

3.5.1.6 Comments. MIL-C-46168 is a Qualified Products List (QPL) item, and procurement must be from an approved supplier. In addition, there is a batch validation requirements which specified that a sample from every batch must be approved for visible and near infrared reflectance properties (see 6.6). Type II is the standard formula, and types III and IV are alternate formulations for use where VOC regulations limit solvent emissions to 420 gm/l (3.5 lbs/gallon) or less. To avert undesireable reactions, spray lines used for epoxy paints should not be used for polyurethanes without complete flushing or cleaning with solvents. Do not use spray equipment containing any aluminum components to apply coatings containing 1,1,1 trichloroethane, because a hazardous reaction can occur. MIL-C-46168 is applied under camouflage pattern painting (CPP)

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guidelines in 3-color patterns, normally containing Green 383, Brown 383, and Black. For further information on patterns, contact the Belvoir Research, Development and Engineering Center, ATTN: STRBE-JD, Fort Belvoir, VA 22060-5606.

3.5.2 Coating, aliphatic polyurethane, chemical agent resistant (MIL-C-53039).

3.5.2.1 Description. This specification covers both camouflage and non-camouflage, chemical agent resistant, aliphatic polyurethane coatings for use as finish coats on military combat equipment. It is a single component, moisture cured finish which is lead and chromate (hexavalent) free, and has a maximum VOC of 420 gm/l (3.5 lbs/gallon) as packaged.

3.5.2.2 Use. MIL-C-53039 is intended to provide a film which can be easily and effectively decontaminated after exposure to liquid chemical agents. It is applied over any of the five epoxy primers described in 3.4 or a completely cured and thoroughly cleaned existing enamel finish. For TACOM contracts, recoating alkyd finishes with CARC is prohibited. As a camouflage topcoat, it should be applied to exterior surfaces and interior surfaces routinely visible from the outside; e.g., door ramps, hatches, etc.

3.5.2.3 Preparation. Thoroughly mix by stirring or agitation to a smooth, homogeneous state. Care must be exercised to redisperse any pigment which may have settled to the bottom of the container. Any package which shows evidence of grit, seeds, skins, abnormal thickening or excessive pigment settling shall not be used.

3.5.2.4 Reduction. If necessary for spray application, MIL-C-53039 may be reduced up to one part by volume of the applicable solvent with four parts by volume of the coating. The applicable solvent for areas requiring VOC compliance is 1,1,1 trichloroethane (Dow Chlorothene SM or equivalent), and for all other areas the solvent is MIL-T-81772, type I. After reduction, MIL-C-53039 shall be strained through a paint filter to remove any impurities. While thinning should not be required for brush application, the coating may be reduced as above, if required.

3.5.2.5 Application. Spray application can be accomplished with one full wet coat. For adequate camouflage properties, it is necessary to apply the coating to a minimum dry film thickness of 1.8 mils. Under certain temperature and humidity conditions, for more even results, it may be advisable to apply two coats of a minimum thickness of 0.9 mils each. The coating is water sensitive and caution must be taken to insure water or high humidity does not come in contact with the coating at any time. Once opened, MIL-C-53039 must be used within eight hours unless stored in a vat under a nitrogen or argon blanket, or in a sealed dry air/airless container. Curing time increases with lower temperatures or humidity, and decreases with higher temperature or humidity. At temperatures of 70 °F and above, MIL-C-53039 will dry within the specification requirements in accordance with FED-STD-141, method 4061.1 (set to touch in approximately 15 minutes, dries hard in 90 minutes, dries through in four hours,

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with a complete cure within seven days). At 60 °F, MIL-C-53039 requires twice as long to cure. Do not apply to items attaining temperatures in excess of 400 °F, such as manifolds, exhaust pipes, or mufflers, use MIL-P-14105. Do not apply MIL-C-53039 to a surface which is contaminated with moisture.

3.5.2.6 Comments. MIL-C-53039 is a Qualified Products List (QPL) item, and procurement must be from an approved supplier. In addition, there is a batch validation requirement which specifies that a sample from every batch must be approved for visible and near infrared reflectance properties (see 6.6). This coating, when applied as packaged or reduced with exempt solvent, meets VOC regulations for solvent emission of 420 gm/l (3.5 lbs/gallon) or less. To avert undesirable reactions, spray lines used for epoxy paints should not be used for polyurethanes without complete flushing or cleaning with solvents. Do not use spray equipment containing any aluminum components to apply coatings containing 1,1,1 trichloroethane, because a hazardous reaction can occur. MIL-C-53039 is applied under camouflage pattern painting (CPP) guidelines in 3-color patterns, normally containing Green 383, Brown 383, and Black. For further information or patterns, contact the Belvoir Research, Development and Engineering Center, ATTN: STRBE-JD, Fort Belvoir, VA 22060-5606.

3.5.3 Coating, epoxy-polyamide (MIL-C-22750).

3.5.3.1 Description. This specification covers the requirements for a two-component, epoxy-polyamide coating for use as a finish coat on the interior surfaces of military combat equipment. The coating is available in two types, standard (type I) and low infrared reflectance (type II). The solvent system meets SCAQMD Rule 102.

3.5.3.2 Use. MIL-C-22750 is intended to provide a film which can be easily and effectively decontaminated after exposure to liquid chemical agents. It is applied over any of the five epoxy primers described in 3.4 or a completely cured and thoroughly cleaned existing enamel finish. It should not be applied over existing lacquer finish. Since epoxy-polyamide paint films are sensitive to ultraviolet radiation and tend to chalk upon exposure to sunlight, MIL-C-22750 should be applied only to interior surfaces.

3.5.3.3 Preparation. Component I shall be thoroughly mixed by stirring or agitation to a smooth homogeneous state. Care must be exercised to redisperse any pigment which may have settled to the bottom of the container. Component I which contains evidence of pigment flotation, coarse particles, or objectionable settling, which cannot be readily despersed, shall not be used. Component II shall be homogeneous, clear, and free from suspended matter. MIL-C-22750 shall be mixed one part by volume of component I with one part by volume of component II. Always add component II to component I. Components from different manufacturers shall not be mixed, nor shall components from different color kits be mixed. After combining the two components, the coating should be thoroughly mixed into a smooth, homogeneous state.

3.5.3.4 Reduction. If necessary for spray application, MIL-C-22750 may be reduced up to one part by volume of MIL-T-81772, type II, with 2 parts by volume

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of mixed coating. The thinned paint shal be thoroughly stirred, strained through a paint filter to remove any impurities, and allowed to stand at room temperature for 30 minutes before using. The spraying viscosity shall be approximately 16 to 18 seconds through a number 2 Zahn cup.

3.5.3.5 Application. After completion of the 30 minute waiting period, spray a mist coat of the MIL-C-22750 over the primer and allow to dry for 30 minutes. It should be thin, discontinuous and translucent (not full hiding). Application of the mist coat helps to prevent bleeding of the primer. Follow this step with a full, wet coat to a total dry film thickness of 1.3 to 1.7 mils. For aircraft, apply two coats to a total dry film thickness of 2.0 to 2.4 mils. Thick films of epoxy coating are less likely than other coatings to run or sag, so care must be taken not to exceed recommended film thickness limits. Mixed coating must be used within 8 hours and cannot be stored and pot life is shortened by higher temperatures. Curing time increases with lower temperature and decreases with high temperatures. At temperatures of 70 °F and above, MIL-C-22750 will dry within specification requirements in accordance with FED-STD-141, method 4061.1 (set to touch in one hour, dry hard in seven hours, and complete cure in seven days). At 60 °F these drying times are approximately doubled.

3.5.3.6 Comments. The responsible technical activity is the Naval Air Development Center, ATTN: Code 6062, Warminster, PA 18974 (see 6.6). While the standard specification finishes do not meet VOC emission limits, high solids formulations meeting the performance requirements of MIL-C-22750 and VOC limits are available from the Belvoir Research, Development and Engineering Center, ATTN: STRBE-VO, Fort Belvoir, VA 22060-5606. To avert undesireable reactions, spray lines used for both epoxy and polyurethane paints must be completely flushed or thoroughly cleaned before switching. MIL-C-22750 is the CARC for interior surfaces, and is normally applied in gloss white (Color #17875), semigloss green (Color #24533 or #24410), or semigloss gray (color #26307), but can be obtained in any color or gloss required.

TABLE III. Application characteristics for CARC topcoats.

SPECIFICAITON	MIXING	REDUCTION	APPLICATION
MIL-C-46168	Stir Comp A until uniform Four parts Comp A with one part Comp B Add Comp A Set 30 minutes if possible	If necessary, reduce up to 20% Stir and strain	Spray with one full coat Temp/humidity may dictate 2 coats Comp B is water sensitive so don't let water/humidity come in contact with coating Use Comp B the day the can is open or completely reseal Use within 8 hrs; apply at minimum thickness of 1.8 mils Curing time increases with low and high humidity

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TABLE III. Application characteristics for CARC topcoats. (Con'd)

SPECIFICAITON	MIXING	REDUCTION	APPLICATION
			Curing time decreases with high temp and low humidity At 70 °F, cure for one week At 60 °F, cure time is approximately doubled.
MIL-C-53039	Stir or agitate until uniform Paint containing grit, seeds, skins, abnormal thickening or excessive pigment settling shall not be used	If necessary, reduce up to 20% Stir and strain	Spray one full coat Temp/humidity may dictate coats Coating is water sensitive so don't let water or high humidity come in contact with the coating Once opened, use within 8 hours. Apply at minimum thickness of 1.8 mils Cure time increases with low temp and low humidity Cure time decreases with higher temp and high humidity At 70 °F, cure for one week At 60 °F, cure time is approximately doubled
MIL-C-22750	Comp I must be throughly mixed One part of Comp II with one part of Comp I Add II to I Remix	If necessary, up to 30% 16-18 sec. with #2 Zahn cup Stir and strain Let stand 30 minutes	Apply mist coat over primer and wait 30 minutes (Prevents bleeding of primer) Spray with one full coat to 1.3-1.7 mils Use within 8 hours At 70 °F, sure for one week At 60 °F, cure time is approximately doubled

TERMS: mils = .001 inches

3.6 Application to previously painted and fulled cured surfaces. When touching up damaged areas or applying a CARC topcoat to an existing topcoat, the procedure to be followed depends upon the type and condition of the existing finish. Items previously coated with lacquers or vinyls must be stripped down to the epoxy primer if present, or to the substrate if not, unless it can be demonstrated that satisfactory overcoating with CARC is possible. Polyurethane

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topcoats can be applied over fielded alkyd (fully cured) topcoats (except for TACOM contracts) or previously painted epoxy and polyurethane topcoats. Epoxy topcoats (interior surfaces only) can be applied over fielded alkyd (fully cured) topcoats or previously painted epoxy topcoats.

3.6.1 Surface preparation. Scratches or other light damage to polyurethane or epoxy topcoats will require scuff sanding at the immediate blemish area. Damage or corrosion extending to the substrate will require sanding and repriming. All traces of corrosion must be abraded from the substrate. The surface immediately surrounding exposed substrate should then be sanded, using a feathering-in technique. That is, sand away paint film (primer and topcoat) so that the thickness of the film is smoothly tapered from bare metal/substrate to the top of the paint film. Sanding of any type is followed by wiping down exposed area to be painted using a clean rag wet with MIL-T-81772 thinner to remove all loose sanding debris, mill scale, grease, oil (including fingerprints), and diesel/gasoline residue. Do not use other petroleum or alcohol-based thinners or cleaning agents of any kind. All areas sanded down to bare metal shall be treated (sponged or damp wiped) with MIL-C-10578 or wash pretreatment on steel, or MIL-C-5541 on aluminum. Do not apply any of these products to coated surfaces. The minimum area allowed for touch-up shall be agreed upon for each contract between the Government and the applicator.

3.6.2 Finishing procedures.

3.6.1.2 Epoxy primer. Choose the appropriate primer and prepare per 3.4. Apply evenly in one coat over the pretreated substrate and apply over portions of the exposed original primer coat using feathering-in technique; i.e., tapering off quantity applied to a fine edge. Do not apply epoxy primer beyond the feathered edge.

3.6.2.2 CARC topcoat. Ensure that the surface to which the topcoat is applied is clean and dry. The surface temperature should be between 60 °F and 90 °F at application and for a period of time sufficient to assure adequate cure prior to exposure to adverse conditions. Apply evenly to blend with the original surface around the area to be touched up using the feathering-in technique. Allow epoxy primer to dry a minimum of 1 hour or until dry to touch before topcoating. For MIL-P-53030, all water must evaporate prior to topcoating. If the primer has dried for more than 24 hours, it should be lightly scuff sanded and solvent wiped to promote adhesion. For TACOM contracts, the primer may be cured for up to three months prior to topcoating as long as the primed surface is kept clean and passes the adhesion test described in 4.3.2.6. Application of CARC topcoats to surfaces previously painted with CARC (e.g., in repair of light topcoat damage) may proceed while the original coat is still tacky. Polyurethane which has fully cured should be thoroughly cleaned prior to refinishing. Epoxy which has fully cured should be cleaned, scuff sanded, and solvent wiped prior to refinishing. CARC can also be applied over a fully cured alkyd finish which is sound (i.e., no corrosion detectable nor any substrate visible). It shall be thoroughly cleaned of absorbed/deposited carbon, salt, fuel, oil, hydraulic/transmission fluid, fingerprints and wax. Scuff sand to

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remove any chalk, then solvent wipe prior to application of new topcoat. Do not apply CARC topcoats to surfaces which will be subjected to temperatures in excess of 400 °F, such as exhaust systems or turbochargers.

3.6.2.3 Application methods. Rework (application of CARC topcoats to sound existing topcoat) shall use the conventional techniques of spraying or brushing. For touchup, suggested procedures include brushing (see appropriate application section of primer and topcoat descriptions) or sponging/wiping (suggested for small areas requiring wash primer). Spray application by conventional techniques can be difficult, but a small, self-pressurized spray kit is available for touchup (see Appendix A).

3.6.2.4 Film thickness. The total thickness of previous coatings shall be checked prior to reworking. Limitations on maximum film thickness to be topcoated shall be determined by an adhesion test on the existing coating per 4.3.6. It is recommended that a total of 20 mils not be exceeded. For aircraft, the coating thickness (existing plus rework) shall not exceed 8 mils. The maximum film thickness shall be 9 mils on a porous, cast item. If thicker prior coatings are experienced, adhesion failure and coating fissuring may result. Cracking (fissuring) of the topcoat due to too thick a film can be subtle and difficult to find (magnification is often necessary) but is cause for rejection due to chemical agent permeability.

3.6.3 Safety. For general health and safety guidance, see Appendix B.

3.7 CARC dos and don'ts.

a. Mix thoroughly - 55 gallon drums must be put on a drum tumbler for at least 6 hours before use. A paint shaker for smaller sized containers saves time and eliminates stirring by paddle.

b. Keep moisture away from MIL-C-46168 component B and MIL-C-53039, either by the use of a very dry (-32 degrees dew point air dryer) air, desiccant air dryer on air line, or nitrogen blanket.

c. Use a separate piece of equipment for epoxy primer and for the urethane topcoat, or thoroughly flush all lines used for both coatings when switching.

d. Clean equipment thoroughly and in accordance with manufacturer's instructions for use, and before prolonged storage.

e. Rotate inventory of material first in, first out. CARC has a definite shelf life, especially the B component of MIL-C-46168.

f. Be sure to remove all thinner from coiled hoses before storage. Leave thinner in a pumping system.

g. When chlorinated hydrocarbon solvents are used, be sure equipment is certified for its use.

h. When automated equipment such as robots is used, be sure to use meter mixing equipment, strict viscosity control, material quality control, and total system supervision must be maintained.

i. Store material in a clean, dry, temperature controlled, OSHA approved storage facility (see 3.8.8).

j. Insist on operator training in operation, maintenance and storage of equipment.

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k. Do not use material directly from the container unless thoroughly agitated and mixed. Component A polyurethane topcoat settles out rapidly when allowed to stand at rest.

l. Do not apply the coating to a surface which is contaminated with moisture.

m. Do not allow thinner to stand in the material hoses. The epoxy and the polyurethane material residue will react even though thinner or solvent is present and block up mixed material hoses.

n. Do not spray in unventilated areas without proper EPA and OSHA approved spray equipment (see Appendix B).

o. Do not spray epoxy primer or CARC on a dirty surface. Remove all surface rust, oil, dirt, and loose paint before applying epoxy primer or CARC.

p. Do not leave component A or B of polyurethane topcoat in air-operated pumps for more than two hours.

q. Do not leave mixed material in hoses, cups, pumps for longer than 2 hours when not in use.

r. Do not allow painters to dictate the spray method used. Management should select the most cost effective method and train painters to use the appropriate method.

s. Use of commercially available chemical accelerators is strictly prohibited.

3.8 Miscellaneous requirements.

3.8.1 Camouflage (exterior). Unless otherwise specified, all material except aircraft shall have a base topcoat of the color Green 383. The system used shall be compatible with and provide good adhesion for subsequent coatings used to provide the camouflage patterns. CARC shall be topcoated only with CARC.

3.8.2 Surfaces not requiring paint. Fabrics, plastics, rubber working parts of machinery, lubrication fittings and other surfaces not normally painted shall not be painted unless required by the specification for the end item. Such surfaces shall be masked or protected during treatment and painting to prevent damage to them. If the paint would not interfere with their function, protection is not required and overspray is allowed.

3.8.3 Engines and other heated areas. Engines shall be cleaned and treated as specified herein and painted in accordance with the applicable engine specification. When cleaning and painting of manifolds, exhaust pipes, mufflers, and other parts subject to high temperatures in excess of 400 °F are specified in the applicable engine specification, the paint shall conform to MIL-P-14105 or TT-P-28, as applicable.

3.8.4 Sealing. Unless otherwise specified in the end item specification, sealing of the interiors of gear cases or similar compartments and reservoirs shall be in accordance with the applicable sealant specification. The sealer shall be applied prior to assembly and shall withstand immersion in lubricating oil, hydraulic fluids, and cutting compounds for the operating temperatures and atmospheric conditions specified for the end item, without wrinkling, blistering, peeling, or loss of adhesion.

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3.8.5 Electrical components. Electrical components of equipment not otherwise governed by applicable specifications shall be treated and painted in accordance with the contractor's standard practice.

3.8.6 Use of steel wool. Steel wool shal not be used in lieu of emery or garnet abrasives to clean aluminum or magnesion alloy surfaces unless adequate precautions are taken to remove steel contaminates.

3.8.7 Welding, soldering and brazing. Unless otherwise specified, welding, soldering and brazing shall not be permitted on an assembly after it has been painted with CARC finishes. If it is necessary to perform one of these procedures after an item is coated, the finish must be completely removed to the substrate. If the backside is CARC painted, it too must be stripped to bare metal. Two recommended methods for removal are the use of plastic media blasting at approximately 40 PSI or the use of a paint remover such as MIL-R-81294, type I. After the procedure is finished, the stripped surfaces shall be cleaned, pretreated and repainted (see 3.6).

3.8.8 Handling and storage. Keep CARC components away from heat, sparks, and open flame. Store in tightly closed containers and protect from moisture and foreign materials. At maximum storage temperatures noted below, material may slowly undergo chemical changes with hazard and may result in components not being usable. Although ideal storage range is 70 - 75 °F (21 - 24 °C), normal storage temperature (min/max) is 32 - 122 °F (0 - 50 °C). CARC components which are stored at temperatures below the minimum cited above are not degraded, but they must be returned to useable temperature (60 - 90 °F/16 - 32 °C) before using. Guaranteed shelf life is 12 months from date of manufacture at 77 °F (25 °C).

3.8.8.1 Shelf life. If CARC is received from GSA or through supply system after the labled shelf life expiration date, do not except it. If a unit accepts CARC that is expired it must submit a report of discrepancy (ROD) to the appropriate agency immediately.

3.8.8.2 Heat, light, moisture. If container of material is exposed to heat, it can pressurize and burst. If moisture enters a container of component B of MIL-C-46168, the contents will react to produce carbon dioxide, which will result in pressure building up inside the container. Do not reseal if contamination is suspected. If the paint reaches minimum temperatures of 32 °F or below, it will thicken; however, upon rewarming it is usable. The temperature range specified (60 - 90 °F/16 - 32 °C) must be attained throughout the paint before mixing and applying.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor/depot is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor/depot may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government.

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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 General inspection requirements. All equipment being processed shall be inspected at the various stages of cleaning, surface treating, electroplating, and application of other types of finishes and coatings, to ascertain that each process is done in strict accordance with this specification or other referenced specifications. The inspections and tests covered in this section shall not be considered restrictive. Any condition not in full accord with the applicable drawings and specification shall be regarded as defective.

4.3 Examination. The end item treatment and painting shall be examined for the defects specified in table IV.

TABLE IV. Examinations.

Item Number	Defects	Reference Paragraph
101.	Cleaning not as specified.	3.2
102.	Ferrous metal surfaces to be painted not prepared as specified.	3.2.1
103.	Surfaces not components exempted from abrasive blasting not prepared for painting as specified.	3.2.1
104.	Ferrous metal surfaces of vehicles not cleaned for painting as specified.	3.2.1
105.	Zinc surfaces not cleaned as specified.	3.2.2
106.	Aluminum surfaces not cleaned as specified.	3.2.3
107.	Aluminum-alloy surfaces not cleaned as specified.	3.2.3
108.	Magnesium alloy surfaces not cleaned as specified.	3.2.4
109.	All surfaces not kept clean after cleaning as specified.	3.2.5
110.	Ferrous metal surfaces not treated as specified.	3.3.1
111.	Zinc surfaces not treated as specified.	3.3.1
112.	Cadmium surfaces not treated as specified.	3.3.1
113.	Aluminum surfaces not treated as specified.	3.3.2
114.	Magnesium alloy surfaces not treated as specified.	3.3.3
115.	Primer coatings not prepared as specified.	3.4
116.	Primer coatings not reduced as specified.	3.4
117.	Primer coatings not applied as specified.	3.4
118.	Topcoats not prepared as specified.	3.5
119.	Topcoats not reduced as specified.	3.5
120.	Topcoats not applied as specified.	3.5
121.	Previously painted surfaces not treated as specified.	3.6
122.	Base topcoat not Green 383 as specified (except for aircraft.	3.8.1
123.	Surfaces not requiring paint should not be painted unless required by the specification for the end item.	3.8.2
124.	Engines not cleaned and treated as specified.	3.8.4

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TABLE IV. Examinations. (Cont'd)

Item Number	Defects	Reference Paragraph
	Major	
125.	Sealings not as specified.	3.8.4
126.	Electrical components of equipment not otherwise governed by applicable specifications not treated and painted as specified.	3.8.5
127.	Steel wool usage not as specified.	3.8.6
128.	Welding not as specified.	3.8.7
129.	Soldering not as specified.	3.8.7
130.	Brazing not as specified.	3.8.7
131.	Handling of CARC components not as specified.	3.8.8
132.	Storage of CARC components not as specified.	3.8.8

4.3.1 Test specimens. Unless otherwise specified, panels may be used instead of parts, provided they are of the same metal as the manufactured parts and have been coated in the same manner at approximately the same time. For TACOM contracts, testing must be done on actual production items.

4.3.2 Pre-production test surfaces. To determine suitability of the coating mixes with prevailing application parameters i.e., atmospheric conditions, painting techniques, equipment, thinning and mixing ratios, etc., and to determine the adequacy of production procedure, practice surfaces (with the specified pretreatment) should be prepared daily prior to actual painting. Separate surfaces should be prepared (coated) for each coating operation i.e., wash primer, pretreatment plus primer and pretreatment plus primer plus topcoat. Test surfaces either on actual parts or representative panels approximately 10 x 15 inches to 10 x 20 inches for each coating shall be prepared. These surfaces shall be coated with the 10-inch dimension positioned vertically and the 15 to 20 inches horizontally. They shall be observed for blushing, sagging, blisters, improper wet film thickness or other in-process defects detectable during or shortly after application and appropriate adjustments/corrections made. The final successfully coated test surface used to validate each batch/block of production coating application shall be evaluated and recorded.

4.3.3 Tests. Materials, prior to their use, shall be inspected, sampled and tested in accordance with the applicable specification and standard to determine compliance with the requirements of the particular specification. When purchasing camouflage paint (MIL-C-46168 and MIL-C-53039), QPL suppliers must be used, and production samples from each batch of each paint manufactured shall be submitted to the US Army Belvoir Research, Development and Engineering Center, ATTN: STRBE-VO, Fort Belvoir, VA 22060, for testing. The submission of these samples is for validation of the paint for spectral reflectance and gloss characteristics. With this information, the inspector will have the means, along with the painting procedures, to accept or fail an end product.

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4.3.3.1 Condition of surface. All surfaces shall be examined just prior to painting to assure that the previously cleaned and pretreated surface is dry and free from soil or contamination of any kind. Immediately prior to painting, the surface must be subjected to a water break test. A mist of distilled water shall be atomized on the surface, employing any convenient small atomizing device. If the water droplets tend to coalesce into large lenses lasting for 25 seconds (without a sudden flashout), the surface shall be considered as having satisfactorily passed the water break test. If the water gathers into droplets within 25 seconds (if the surface shows a "water break" within that time), the surface shall be considered as having failed the test. If the water forms a continuous film by flashing out suddenly over a large area, this shall be considered evidence of the presence of an impurity on the surface such as free alkali, residual detergent, etc., and the surface shall be considered as having failed the test. Failure to support an unbroken water film shall be sufficient cause to do additional cleaning. If more than four hours have passed since performing the water break test, re-examine the surface for corrosion, foreign matter or oily residues and repeat the water break test prior to pretreatment. After testing, all moisture must be removed (by clean forced air for example, blown over the entire item) to ensure a clean, dry surface for painting. Be aware that cleaning materials which may be effective against one type of contaminant may be ineffective against others. Multiple cleaning procedures may be required to provide the required water break free surface.

4.3.3.2 Solvent wipe. The solvent wipe test shall be performed daily to establish that the CARC finish coats are adequately catalyzed and completely cured. Topcoat solvent wipe test shall be performed after a minimum of 168 hours air drying. If the temperature of the test item drops below 60 °F, additional time must be allowed before the test is performed. Thoroughly wet a rag with acetone or methyl ethyl ketone (MEK) and briskly rub the painted surface for ten seconds. This will remove any dry spray or overspray from the surface. Wet another clean dry rag with acetone or MEK and briskly rub the same area for another ten seconds. Evidence of actual paint removal; that is, the topcoat is removed down to the primer, is evidence of an unacceptably catalyzed topcoat or an uncured film. These items can be rejected and reworked per 3.6 or allowed further cure time and the wipe test repeated. In the latter case, the tested area must be reworked in accordance with 3.6 to repair any areas of topcoat removal. This test must be performed in a well ventilated area while wearing gloves to prevent skin contact with the solvents.

4.3.3.3 Dry film thickness. The upper limits on film thickness are not mandatory for surface areas on which such limits are impractical to maintain; for example, contoured areas. However, film thickness should be controlled in these areas, to prevent excessive deposition of paint. Film thickness tests shall be performed on uniform coated surfaces. Thickness testing shall be performed using a conventional nondestructive measuring device such as a magnetic tester per ASTM B 499, an eddy current tester per ASTM B 244, or other acceptable standard methods. Recommended thickness requirements per individual coat for CARC primers and topcoats are listed in table II. The ranges listed may vary outside these limits as long as the remaining quality assurance

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provisions specified in section 4 are met. Be aware that previously applied coatings to the test area must be identified prior to topcoating, such as repair or rework areas. These previous coatings must be measured and recorded in sequence to accommodate each progressive coating thickness determination.

TABLE V. Dry film thickness (mils).

DOD-P-15328	0.3 - 0.5
MIL-P-23377	0.8 - 1.2 1/
MIL-P-52192	1.0 - 1.5
MIL-P-53022	1.0 - 1.5
MIL-P-53030	1.0 - 1.5
MIL-P-85582	0.8 - 1.2 1/
MIL-C-46168	1.8 min.
MIL-C-53039	1.8 min.
MIL-C-22750	1.3 - 1.7

1/ Except for aircraft, then 0.6 - 0.9

Rejection will not be made based on the recommendations of table V, but on subsequent performance failure of another quality assurance provision of section 4.

4.3.3.4 Marring. Marring and surface lightening due to handling is characteristic of camouflage coatings and does not impede camouflage or the infrared properties of MIL-C-46168 or MIL-C-53039. This is typical of low gloss and low sheen coatings, and is especially prevalent in dark colors. It is not grounds for re-work unless the film has been damaged down to the substrate.

4.3.3.5 Camouflage requirements and batch validation. Only suppliers approved and listed on the applicable QPL for MIL-C-46168 or MIL-C-53039 can supply CARC camouflage. In addition to the QPL requirement, the spectral reflectance is verified by the Belvoir Research, Development and Engineering Center, ATTN: STRBE-VO, Fort Belvoir, VA 22060-5606 on each batch of paint manufactured. A copy of the certification from Fort Belvoir shall be made available to inspectors for each batch of paint applied. Slight visual color differences are expected between manufacturers or batches and are not grounds for equipment rejection as long as a batch certification is on hand from Fort Belvoir and there are no film defects such as blushing or hazing, or a dry film color which is obvioulsy not as specified (i.e., caused by improper mixing or application).

4.3.3.6 Adhesion. Periodic checks shall be made of the overall adhesion of the CARC system, both primer to substrate and intercoat. Where possible, testing shall be performed daily on a production item in an area of uniform film thickness (see 4.3.3.3), after a minimum of 168 hours drying time. The precise location for the adhesion test shall be in an obscure location and be acceptable to the cognizant Government quality assurance representative. Perform the adhesion test in accordance with FED-STD-141, method 6301.2, adhesion (wet) tape

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test. Where impractical to immerse the test specimen, a wet sponge shall be fastened to the surface. The test area shall have a minimum diameter of three inches. After the tape is removed, examine the test area for visible evidence of coating removal (removal of overspray is not a test failure) which shall constitute failure. Rejected items shall be reworked in accordance with 3.6.

4.3.3.7 Corrosion-resistance. Corrosion resistance shall be demonstrated on steel specimens (parts or representative 4 x 12-inch panels) after application of the primer. The minimum test frequency to be per technical data package or every 30 days. After complete curing (168 hours at 68 °F or equivalent) the parts or representative panels shall be subjected to a 336 hour 5 percent salt spray test per ASTM B 117. If panels are used, seal the edges with wax or other suitable material. Rust visible to the unaided eye on the panel or actual parts shall be cause for rejection. Failure at edges and other sharp corners shall not be cause for rejection. Failure to meet the corrosion resistance requirement shall be cause for rejection of parts coated since previous test period.

4.3.3.8 Workmanship. When visually inspected, the coating shall be a smooth, continuous, adherent film which is free of such surface imperfections as runs, sags, blisters, orange peel, blushing, streaks, craters, blotches, brush marks, fish eyes, seediness or pinholes.

5. Packaging

This section is not applicable to this specification.

6. Notes

6.1 Intended use. The chemical agent resistant coating (CARC) system of primers and topcoats is designed for use on the exterior and interior of tactical military equipment where resistance to absorption of liquid chemical agents is required. It may also be used where severe exposure situations require a coating with excellent durability and corrosion resistance. The coatings and theri characteristics are listed in table VI.

TABLE VI. Coating characteristics.

Specification	Primer Category		Toxic Metals	VOC Catogery		
	Pre-treated ferrous	Pre-treated nonferrous	Lead and chromate free	Federal 3.5 lb/gal	SCAQMD 1124 2.9 lb/gal	SCAQMD 1107 2.8 lb/gal
MIL-P-23377		X		X (Class 3)	X (Class 3)	
MIL-P-52192	X					

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TABLE VI. Coating characteristics. (Cont'd)

Specification	Primer Category		Toxic Metals	VOC category		
	Pre-treated ferrous	Pre-treated nonferrous	Lead and chromate free	Federal 3.5 lb/gal	SCAQMD 1124 2.9 lb/gal	SCAQMD 1107 2.8 lb/gal
MIL-P-53022	X	X	X	*	*	*
MIL-P-53030	X	X	X	X	X	X
MIL-P-85582		X		X	X	
MIL-C-22750	N/A	N/A	*	*	*	*
MIL-C-46168	N/A	N/A	X	X (Type III & IV)		
MIL-C-53039	N/A	N/A	X	X		

*This requirement is not addressed nor required by the specification, but products are available which meet appropriate performance requirements of the document and the noted regulatory standard. Contact appropriate preparing activity for more information.

6.2 Color chips. Color chips for CARC finishes are available from two sources. Chips for the camouflage colors in MIL-C-46168 and MIL-C-53039 are obtained from the Belvoir Research, Development and Engineering Center, ATTN: STRBE-VO, Fort Belvoir, VA 22060-5606, and are intended to be used by paint manufacturers in calibrating their instruments. These calibrated chips from Fort Belvoir are not intended to be used for visual color inspections, but to assist paint formulators in color development work. Camouflage colors have a batch validation requirement which should eliminate the need for inspection by color chips (see 4.3.3.5). Therefore, for visual inspection purposes, color chips can be obtained by using the five digit color number of FED-STD-595. See appendix A for the equivalent color numbers. The non-camouflage colors, found in MIL-C-46168, MIL-C-53039 and MIL-C-22750 shall match the appropriate color chips from FED-STD-595. These chips can be purchased from the General Services Administration, Specification Section, 7th and "D" Streets, S.W., Washington, DC 20407.

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6.3 Technical data. Procurement documents should specify the type of finish required (see 3.1), the color of the topcoat if other than those in the 3-color pattern (see 3.5), and what type of blast cleaning per MIL-T-704 if required. Camouflage painting and marking of Army materiel shall conform to the requirements of AR 750-58.

6.3.1 Stock numbers. National Stock Numbers (NSN's) are listed in Appendix A for CARC and CARC-related items, including topcoats, primers, pretreatments, thinners, and miscellaneous items.

6.4 Health and safety. These issues, including facilities, worker safety procedures and equipment, toxic and hazardous waste management, and occupational health requirements, are discussed in Appendix B.

6.5 Equipment. General guidelines and a brief list of things to do and not to do can be found in Appendix C.

6.6 Preparing activity responsibility. The preparing activity responsible for MIL-C-22750, MIL-P-23377, and MIL-P-85582 is the Naval Air Development Center, ATTN: Code 6062, Warminister, PA 18974. The preparing activity for MIL-P-52192, MIL-P-53022, MIL-P-53030, MIL-C-46168, and MIL-C-53039 is the U.S. Army Belvoir RDE Center, ATTN: STRBE-VO, Fort Belvoir, VA 22060-5606.

6.7 Subject term (key word) listing.

Application procedures
Chemical agent resistant coating (CARC)
Quality control inspection

Custodian:
Army - ME

Preparing activity:
Army - ME

Project 8010-A340

Review activity:
Army - AR, EA, AL

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APPENDIX A

NATIONAL STOCK NUMBERS

TABLE I.

Chemical agent resistant coating (CARC) colors for MIL-C-46168, type II.

Colors	ONE QUART KIT (NSN)	ONE GALLON KIT (NSN)	FIVE GALLON KIT (NSN)
1. Light Green, 34089	8010-01-141-2421	8010-01-128-6957	8010-01-131-6256
2. Forest Green, 34083	8010-01-144-9888	8010-01-144-9874	8010-01-144-9881
*3. Green 383, 34094	8010-01-160-6741	8010-01-162-5578	8010-01-160-6724
*4. Brown 383, 30051	8010-01-160-6744	8010-01-160-6745	8010-01-160-6746
5. Dark Green, 34082	8010-01-141-2412	8010-01-130-3343	8010-01-131-0611
6. Olive Drab, 33070	8010-01-141-2413	8010-01-130-3344	8010-01-131-6258
7. Field Drab, 33105	8010-01-141-2414	8010-01-130-3345	8010-01-148-3662
8. Earth Yellow, 33245	8010-01-141-2415	8010-01-130-3346	8010-01-131-0612
9. Sand, 33303	8010-01-141-2416	8010-01-130-3347	8010-01-131-6259
10. Earth Red, 31090	8010-01-141-2417	8010-01-130-3348	8010-01-131-6260
11. Earth Brown, 30097	8010-01-141-2418	8010-01-134-0383	8010-01-132-4968
12. Desert Sand, 30315	8010-01-142-0132	8010-01-131-6253	8010-01-135-9985
*13. Black, 37030	8010-01-141-2419	8010-01-131-6254	8010-01-131-6261
14. Aircraft Green, 34031	8010-01-141-2420	8010-01-131-6255	8010-01-131-6262
15. Olive Drab, 34088	8010-01-146-2650	8010-01-055-2319	8010-01-144-9875
16. Aircraft Gray, 36300	8010-01-144-9882	8010-01-127-8908	8010-01-144-9876
17. Aircraft White, 37875	8010-01-144-9883	8010-01-144-9872	8010-01-144-9877
18. Aircraft Red, 31136	8010-01-144-9884	8010-01-144-9873	8010-01-144-9878
19. Aircraft Black, 37038	8010-01-144-9885	8010-01-146-2646	8010-01-144-9879
20. Int. Aircraft Black (With Glass Beads), 37031	8010-01-144-9886	8010-01-146-2647	8010-01-146-4376
21. Insignia Blue, 35044	8010-01-144-9887	8010-01-146-2648	8010-01-144-9880
22. Int. Aircraft Gray, 36231	8010-01-170-7583	8010-01-146-2649	8010-01-170-0132
23. Aircraft Yellow, 33538	8010-01-235-5078	8010-01-235-8059	8010-01-235-5079

*Basic three-color CARC camouflage coatings

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TABLE II. Chemical agent resistant coating (CARC) colors for MIL-C-53039.

Colors	ONE QUART KIT CAN	ONE GALLON KIT CAN	FIVE GALLON KIT CAN
*1. Green 383, 34094	8010-01-229-7546	8010-01-229-9561	8010-01-299-7547
*2. Brown 383, 30051	8010-01-229-7543	8010-01-229-7544	8010-01-229-7545
*3. Black, 37030	8010-01-229-7540	8010-01-229-7541	8010-01-229-7542
4. Sand, 33303	8010-01-234-2934	8010-01-234-2935	8010-01-234-2936
5. Aircraft Green, 34031	8010-01-246-0717	8010-01-246-0718	8010-01-246-0719

*Basic three-color CARC camouflage coatings

TABLE III. Chemical agent resistant coating (CARC) colors for MIL-C-22750.

Color	TWO QUART KIT	TWO GALLON KIT
1. White, 17925	8010-01-053-2647	8010-01-082-2439
2. Green, 24533	8010-01-211-9645	
3. Black, 37038	8010-01-030-7254	
4. White, 37875	8010-00-148-7042	
5. Gray, 16081	8010-01-053-2658	8010-00-082-2437

TABLE IV. Heat resistant paint colors for MIL-P-14105.

COLOR	QUART CAN	GALLON CAN
1. Green 383, 34094	8010-01-235-2693	8010-01-235-4164
2. Brown 383, 30051	8010-01-235-2694	8010-01-235-2695
3. Black, 37030	8010-01-235-4165	8010-01-235-4166

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TABLE V. Chemical agent resistant coating (CARC) primers.

SPECIFICATION	QUART KIT	GALLON KIT	5 GALLON KIT
1. MIL-P-23377,* TYPE I	8010-00-935-7080	8010-00-082-2450	8010-00-082-2477
2. MIL-P-23377,* TYPE II		8010-01-048-6539	
3. MIL-P-52192		8010-00-082-1714	
4. MIL-P-53022	8010-01-193-0516	8010-01-193-0517	8010-01-187-9820
5. MIL-P-53030	8010-01-193-0519	8010-01-193-0520	8010-01-193-0521
6. MIL-P-85582, TYPE I	8010-01-218-0856	8010-01-218-7354	

*Actual volume of MIL-P-23377 is double the column headings.

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TABLE VI. Miscellaneous items.

SPECIFICATION	QUART	GALLON	5 GALLON	55 GALLON
1. MIL-T-81722, TYPE I		8010-00-181-8080	8010-00-181-8079	8010-00-280-1751
2. MIL-T-81772, TYPE II		8010-01-200-2637	8010-01-212-1704	
3. DOD-P-15328	8030-00-850-7076	8030-00-281-2726		
4. SPRAY KIT, SELF-PRESSURIZED, MIL-S-22805		4940-00-803-6444		

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APPENDIX B

HEALTH, SAFETY AND ENVIRONMENTSL CONSIDERATIONS

A. General guidance. The following general guidance is based on information from the Army Surgeon General. The local safety office, Preventive Medicine Activity, and local medical support facility must be consulted prior to initiating CARC painting. There are three basic health hazards in CARC coatings:

1. Solvents - The solvents present in paint are the primary reason for current safety requirements. Thinner, MIL-T-81772, may contain cellosolve acetate (2-ethoxy, ethylacetate), which requires some additional protection for large scale production line operations.

2. Hexamethylene diisocyanate - This is an allergen contained in component B of polyurethane paint. Precautions must be taken to limit skin contact and vapor inhalation.

3. Lead and chromate pigments - Several of the paint and primer specifications allow or require the use of lead or chromate pigments. Both of these pigments can be toxic after repeated exposure and resulting body accumulation. Precautions must be taken to limit skin contact and vapor inhalation. The Army is working to eliminate lead and chromate from all coating specifications. If current OSHA facility guidelines are being met, no additional protection is needed for CARC application. If current guidelines are not being met, some additional costs to meet these guidelines are to be expected, but do not accrue solely from the requirement to apply CARC paint. Based upon findings for realistic assessment of vapor and aerosol hazards associated with CARC spray finishing operations, no significant change in respiratory protection is warranted by conversion to CARC. Medical surveillance is required for anyone who works more than 30 days per year in either paint spraying operations or in brush or roller application when respiratory protection is required. For additional information, contact your local industrial hygienist or Commander, Army Environmental Hygiene Agency, ATTN: HSHB-MO-IT, Aberdeen Proving Ground, MD 21010-5422.

B. Respiratory protection for all paint systems, (alkyd, CARC, oil, resin, etc.)

1. Spray painting indoors - An approved airline respirator is the standard respirator to be worn when paint spraying; however, alternatives are permitted when spray operations are not conducted in a confined space and statistically valid sampling results document the personal exposure levels. In painting areas where respiratory devices are required, no unprotected presonnel shall enter until 30 minutes after completion of painting operations.

a. Large vehicular or walk-in booths.

(1) If the diisocyanate concentration is below the standard, a full face piece chemical cartridge respirator with a paint prefilter.

(2) If the solvent concentration is less than 10 times the standard, a paint-spray respirator is required.

(3) If the pigment containing lead or chromate concentration is less than 10 times the standard, an organic vapor respirator with a high efficiency particulate air (HEPA) filter is required.

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b. Spray cabinet or conveyor-type booths.

(1) If the contaminant (solvent, pigment or diisocyanate) concentration is below the standard, no respiratory protection is required.
(2) If the diisocyanate concentration exceeds the standard, an airline respirator is required.
(3) If the solvent concentration exceeds the standard, but is less than 10 times the standard, a paint-spray respirator is required.
(4) If the pigment containing lead or chromate concentration exceeds the standard, but is less than 10 times the standard, an organic vapor respirator with a HEPA filter is required.

2. Spray painting outdoors.

a. If in a confined space, an airline respirator is required.
b. If not in a confined space, a paint-spray respirator is required.

3. Brush or roller paint, indoors or outdoors.

a. Not in a confined space, no respiratory protection is required. After atmospheric sampling to confirm levels is conducted by local preventative medicine personnel or industrial hygienist, and if operational parameters do not vary.
b. In a confined space, an approved airline respirator is required.

NOTE 1. Approved respirators which provide more protection than the recommended device may be substituted in accordance with TB MED 502. For a list of approved full facepiece chemical cartridge respirators with high efficiency prefilters see NIOSH Publication No. 86-101, Certified Equipment List.

NOTE 2. A confined space, for the purpose of determining respiratory protection required during operations, is defined as:

a. General.

(1) Any area where dilution ventilation cannot take place or air flow is obstructed; or
(2) Under or in vehicles/equipment.

b. Indoors - not in spray paint booths.

(1) Less than 10,000 cubic feet; or
(2) Ceiling height less than 16 feet; or

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(3) Touch-up paint area contains partitions, balconies or other structural barriers to the extent that the obstruct cross ventilation; or

(4) Outside air is not mechanically destributed at a minimum rate of 3.5 cfm per square foot of the bay/room/area where touch-up painting takes place.

c. Outdoors.

(1) Where two or more sides are blocked by buildings, partitions, or barriers; or

(2) Under a canopy or roof less than 16 feet in height.

C. Personal protection.

1. The requirements for non-CARC paint systems consist of cloth gloves, cloth overalls, eye protection, and a head covering. Protective equipment shall be stored in a clean and sanitary area outside of the paint spraying area. The cloth overalls should be removed and hygienic showers taken prior to changing into street clothing if any of the coatings, to include primer, contain lead or chromate pigments. The use of gloves is limited to protecting hands from overspray and paint adherence. The solvents used for thinning the alkyd enamels are not absorbed through the skin; therefore, impervious gloves are not required.

2. The same requirements may hold for CARC finishes depending on the solvents present in the coating. If the solvents cellosolve or cellosolve acetate are present, the additional requirement for impervious gloves is required. Cellosolve and cellosolve acetate acetate are no longer allowed in the CARC finishes MIL-C-46168 and MIL-C-53039 or in the thinner MIL-T-81772. However, supplies of paint and thinner containing cellosolve/cellosolve acetate may still exist in the field or in warehouses and the only solution is to have personnel consult the accompanying Material Safety Data Sheets. If cellosolve or cellosolve acetate is absent, cloth gloves to preclude adherence of the paint to the hands are acceptable. It should be noted that it is very difficult to clean CARC from butyl rubber gloves; therefore, a silicone rubber glove is recommended when cellosolve acetate is present.

3. The use of barrier creams is acceptable; however, their usefulness in preventing the absorption of solvent through the skin is not documented. If a solvent with a threshold limit for skin is being used, then impervious gloves must be used. Barrier creams are useful in preventing the adherence of paints to the skin and in combating the 'dryness' associated with the defatting action of most solvents; however, solvents must never be used to remove paint/coating from the skin.

4. Potential health hazards after painting.

a. Hexamethylene diisocyanate does not present a health hazard after CARC has been applied unless heated to the point of thermal decomposition.

b. Solvents, to include cellosolve acetate if present, may be released during drying. The vapor concentrations measured at civilian paint operations indicate levels well below current standards. The solvent vapors are typically irritating to the eyes and have unpleasant odors. If excessive solvent vapor concentrations are suspect in the drying area, the local preventative medicine/industrial hygiene personnel should be contacted.

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c. Welding and cutting on items painted with any kind of paint should not be done until the paint has been abraded to substrate. This includes the back side, if it has been painted.

d. Normal precautions should be taken when sanding or grinding on painted surfaces. Particular safeguards are required if the topcoat or primer contains lead.

e. Protective clothing and equipment required for spraying will also be worn during cleanup.

f. Appropriate housekeeping procedures will be established to include, as a minimum, daily sweeping of paint booths, floors, and walls. Paint residue will be swept up and placed in proper containers for disposal. All associated equipment will be wiped down daily. Barrels with lids should be used for dirty and clean rags and be labeled and used accordingly.

D. Environmental considerations.

1. This document will only review federal requirements, as state and local requirements are too varied. Before initiating CARC spray application operations, the local Environmental Coordinator, Directorate for Facilities Engineers, must be contacted and the provisions of AR 420-47 met.

2. Volatile organic compound (VOC) emissions for paint and coating applications arise from solvent evaporation of initial spray, overspray, and the final coating film as it dries/cures. This is regulated by the Clean Air Act requirements. For assistance in determining emissions, contact the Army Environmental Hygiene Agency (AEHA), ATTN: HSHB-ME-A, Aberdeen Proving Ground, MD 21010-5422.

3. The EPA has designated a number of materials as hazardous. Among the designated materials are a number of paint constituents such as certain solvents (xylene, and 1,1,1 trichloroethane to name a few) and pigments (such as lead and chromate). These solvents or pigments can be present in uncured paint including overspray as well as in sludge in the sump of water wash type spray booths. Actual handling and disposal procedures must be determined in conjunction with AR 420-47 and the local Environmental Coordinator, Directorate for Facilities Engineers.

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APPENDIX C

APPLICATION EQUIPMENT AND TECHNIQUES

A. FACILITIES. The paint booth is the major facility consideration in painting, as it is needed whenever anything more than touch up painting is planned. There are several types ranging in size from several cubic feet to large structures which are free standing booths. The size and location of a particular paint booth will depend upon the specific situation. Due to Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) requirements, any large scale (more than touch up) painting of CARC must be done in a paint booth.

1. Spray booths can be classified into two basic designs based on direction of airflow.

a. Sidedraft booths have horizontal airflow. These booths take advantage of momentum of spray mist and can be used when painting small to medium articles. Large articles may be painted in vehicular booths which also have horizontal airflow.

b. Downdraft booths have vertical airflow. These booths permit greater protection while allowing more freedom of movement for the painter.

2. Spray booths range in size from small bench models to chambers capable of holding a large airplane. Size of a spray paint booth is determined by the requirement for adequate space to permit painters easy access to top and sides of the object. If the object is transported by conveyor, the booth must be sufficiently long to allow coating within the time the object remains inside the booth.

3. Booth exhaust air filters must be replaced by plant environmental control presonnel or responsible operating personnel. The spray booth can be equipped with filter doors or fresh air inlets to reduce dust. Air should enter the booth at low velocity (200 fpm or less) and in the same direction as it is being exhausted to avoid unnecessary turbulence.

4. The booth air cleaning section not only removes paint mist from exhaust air but acts as a means of air distribution within the booth. There are several types:

a. Baffle type. An arrangement of metal baffles is simplest and provides a constant flow of air. Mist removal and clean-up difficulties limit its use to low production applications.

b. Dry filter. These booth combine low cost with highly efficient paint mist removal, but have the disadvantage of variable airflow. Airflow continuously decreases to a point where filters require replacement. Used filters shall be free of solvent before disposal or a fire hazard will be created.

c. Water wash. The incorporate various combinations of water curtains and sprays to scrub paint mist from exhaust air. They have advantages of constant airflow, inherent fire protection, and high mist removal. This is the most efficient system, but requires a greater cost. Maintenance requirements can be reduced if the booth is lined with a strippable coating, air filters are disposable, and glass shields over booth lights are cleaned and coated with a light layer of white petroleum grease.

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5. Robotics. Facilities where large volumes of identical equipment will be painted should consider the use of robotics. Robotics produce exact and precise results, repeatedly. Also, robots remove people from the potentially hazardous paint booth environment.

6. Drying ovens. In cooler climates, drying ovens may be required to speed CARC curing process. Care must be taken to prevent overbaking, since this can interfere with adhesion of any subsequent coats of paint.

7. Preheat booth cool down booth. In locations where temperatures can drop below 60 °F (16 °C), preheat booths should be available to raise the temperature on the equipment surface to the ideal temperature range (60 - 90 °F/16 - 32 °C) or to prevent condensation on vehicles during transition before applying CARC. Likewise, in areas where temperatures rise above 90 °F (32 °C) cool down booth should be available to reduce the surface temperature to the ideal range.

B. EQUIPMENT.

1. Spray guns.

a. Application. Spray gun equipment can be used for any type of finish and on any surface. It does not replace the brush for certain operations, yet there are definite types of work it can do more easily and better than the brush. The spray gun is obviously a tremendous time-saver and its use is recommended when a large volume of work is encountered. The spray gun is particularly adaptable to touch-up and maintenance work when the ability to blend old and new surfaces is important. Spray application of any finish type requires respiratory equipment. The proper operation of spray guns and auxiliary equipment is not difficult to learn, but the necessity exists for training operators. Only through such training can the full flexibility and operation of spray guns be realized.

b. Selection. A paint spray gun is a mechanical means of bringing compressed air and paint together, atomizing or breaking up the paint stream into a spray, and ejecting it for the purpose of applying a coating. The three major types of system are conventional air spray, airless or airless electrostatic spray, and air assisted airless spray. As with the selection of a booth, the best choice will depend upon the specific situation.

(1) Conventional air spray. A spray gun uses compressed air to atomize the paint and direct it toward the surface. The air and paint enter the gun separately and leave in a controlled spray pattern. An external mix gun mixes the air and fluid outside the air cap, and an internal mix gun mixes them within the air cap. A bleeder-type gun has a continuous leakage of air from some part of the gun. This prevents building up air pressure within the hose and permits its use with small compressing systems that are not equipped with an automatic pressure-controlling device. The trigger is a bleeder-type gun controls only the flow of fluid. A nonbleeder-type gun is one in which the trigger controls the passage of both air and fluid. Some type of pressure-controlling device must be used with it. A suction-feed gun is designed to feed the fluid into the air stream through a vaccum created by the air stream flowing past the fluid source (aspiration). A pressure-feed gun feed fluid into the air stream by means of pressurizing the fluid container.

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(2) Airless spray electrostatic spray. Paint flows from the supply source to an airless gun. The paint is forced through a small orifice under very high pressure, atomizing the liquid as it is discharged from the gun. If electrostatic assisted, the paint particles are charged at the same time by a high voltage potential applied at the gun. The particles are then attracted to the grounded surface.

(3) Air assisted airless spray. Air assisted airless spray operates at pressures under 950 pounds per square inch (psi), compared to airless spray/electrostatic spray which operates at 1,500 to 2,500 psi. Low pressure (10 to 30 psi) compressed air is added to the spray by an air cap. Thus, materials can be atomized with full spray patterns at low pressure, increasing efficiency and ease of handling.

(4) Comparison of types. The following table compares several of the characteristics of the preceding systems:

TABLE I. Application method comparison.

Item	Atomization	Application Speed	Atomization Efficiency	Transfer Efficiency
Air Spray	"Class A" Finish.	Slow, but easily handled.	Large amounts of overspray.	30%
Airless/Electrostatic Spray	Deposits paint quickly.	Fast, but needs an experienced painter.	Less overspary	55%
Air Assisted Airless Spray	Very efficient	Medium, in speed and in control.	Little overspray	65%

c. Selection of air caps, needles and nozzles.

The performance of an air gun with any kind of material depends primarily on the selection of the proper air cap, fluid needle, and fluid tip (or nozzle). Manufacturers identify combinations of these parts intended to be used together, and their recommendations should be followed with respect to the proper combination for a particular material. Occassionally, changing the type of feed will necessitate a different combination of air cap, fluid tip, and fluid needle.

d. Spray gun techniques.

(1) Holding the gun. The gun must be held perpendicular to the work, and six to 10 inches from the surface.

(2) Making the proper stroke. The stroke is made with a free-arm motion, keeping the face of the air cap parallel with the surface being painted at all points of the stroke. The ends of the stroke are feathered out by triggering the gun; that is, by beginning the stroke before pulling the trigger, and releasing the trigger just before ending stroke. Arcing the gun during the stroke results in an uneven application and excessive overspray at the end of the stroke.

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(3) Spraying corners. Spray within one or two inches of a corner. Then, holding the gun at a 45 degree angle to the painted surface, spray both sides of the corner at once. Spraying in another manner wastes material and causes overspray on the adjacent side.

(4) Speed of gun travel. Most guns are capable of applying the paint at a rate that is beyond the operator's skill in application. Adjust the gun to operate at a maximum speed consistent with material, rate of flow, surface, and individual skill.

(5) Dusting. Bleeder-type guns act as dusters simply by allowing the continuously escaping air to clean the painting surface. Nonbleeder-type guns emit air alone through the first half of the trigger travel, and can therefore be used as dusters. The point at which the trigger starts to release paint can readily be felt. For large-scale or continuous dusting, special dusting guns handling only air are available.

(6) Masking. When spray, cover or mask all parts such as windows, gage, lubrication fittings, instruments, and other parts which are not to be painted.

e. Care of equipment. A spray gun is an instrument that has been designed and machined to close tolerances. Handle it with care so that the balance between the functional parts is not destroyed. Spray guns and related equipment require cleaning immediately after use. Paint that has hardened in a gun or hose is extremely difficult to remove, and usually causes a malfunction of the equipment. Be sure that the solvent used to clean the equipment is one in which the finishing material is soluble. Be sure to read the instructions that come with the pressure can regarding preservation of the nozzle.

2. Brushes and rollers.

a. Application. While spray application of CARC is the preferred procedure in most circumstances, there are occasions when other methods may be employed. Brush or roller application may be appropriate when the volume of work does not justify setting up the spray apparatus, spray equipment is not available or is inaccessible, masking procedure is extensive, overspray would cause problems, or the necessary respirators or personal safety equipment is not available.

b. Selection and use. Choose the brush which is appropriate for the job. Factors to consider are the material, the surface, and the area to be painted. Use of rollers in CARC application will be impractical in many cases. Brushing should be done rapidly, because CARC will become tacky within a short time. Thinning after combining the two components may be required.

c. Cleaning and storage. In order to keep paint brushes soft and pliable, they should be cleaned immediately after use. Once the material has been allowed to stand overnight, no amount of cleaning will restore the original pliability or remove the hardened material from the heel of the brush. Solvents or thinners used with the material just applied by the brush are the best possible cleaners. After cleaning, never stand brushes, wet or dry, on their bristles. They will become permanently bent or distorted, and the brush will be ruined. Brushes that are not frequently used should be thoroughly cleaned with the appropriate solvent, dried, and stored in a wrapper to retain their shape. For care of rollers, follow the manufacturer's instructions.

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C. CLEANUP AND DISPOSAL.

1. Failure to clean equipment properly after CARC application can result in damage to equipment. Once epoxies and polyurethanes dry in spray lines or spray guns, the equipment may be unrepairable. Solvents have little effect on dried CARC.

2. Polyurethane and epoxy coatings cannot use the same spray lines. The catalysts (component B) of the epoxies and the catalyst for polyurethane rapidly react when mixed and form a soft plastic. When plural component paint equipment is used, separate lines for the catalysts are strongly recommended to prevent equipment damage.

3. Spray equipment is cleaned by running solvent through lines. This procedure is the same as that used for other paints, but care must be taken to ensure that all paint is cleaned from equipment. Cleaning of polyurethane application equipment cannot be overemphasized. Application equipment must be thoroughly cleaned immediately after use in accordance with manufacturer's instructions for use, an before any prolonged storage. Failure to clean equipment properly will result in loss of that equipment.

4. Disposal of unuseable CARC components or mixtures, waste material (including material spilled or leaked), and all material used in cleanup must be done in accordance with Federal, State and local environmental control regulations for hazardous waste. Consult the installation environmental office for guidance. Empty containers must be handled carefully because of residue and flammable solvent vapors.

D. EQUIPMENT GUIDELINES.

1. General consideration in selection.

a. As a general statement, air spray guns and pressure pots are the least expensive, but the most inefficient equipment available. Air spray guns and pressure pots cannot change colors quickly, and they are difficult to clean. They are immobile and heavy, unless cart mounted. They have a limitation on how far work is from the object to be sprayed, and they can be dangerous if over pressurized, have a faulty gasket, or the C clamps are not tightened sufficiently.

b. Air spray and pressure pots must be cleaned thoroughly to prevent cured material from flaking off the sides of the pressure pot and being deposited on the work surface, unless liners are used inside the pot. Air spray and pressure pots are messy and wasteful, since original containers must be opened and poured into them, and reducing solvent must be added. The unused portion must be thrown away and treated as toxic waste.

c. The use of air spray cup guns is also inexpensive, but they can be difficult to clean. Air vent holes on the top of the cup must be kept open and the reactive material must be cleaned thoroughly from the neck of the cup. The cup cannot be turned upside down, or the material flows out of the cup.

d. If a cup method is used, a remote cup is recommended. This method is much more maneuverable, and material is kept out of the seals in the cup.

e. Air spray and diaphram pumping unit can be used. This method is inexpenxive. The pumping unit fits on a 5 gallon pail - no pressure is on the

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material, and no air is applied to the material. It can pump 1 gallon or 5 gallons, and it is easily cleaned. Color change is quicker than with pressure pots. Its drawback is it can only be used with a maximum of 25 feet of air and material hose.

2. Specific operation suggestions.

a. Mix CARC thoroughly. Drums must be put on a drum tumbler for at least six hours before use.

b. Keep moisture away from MIL-C-46168 component B and MIL-C-53039 either using dry air (-32 degrees dew point dryer), a desiccant air dryer on airline, or a nitrogen blanket.

c. Use separate equipment for epoxy primer and for urethane topcoat.

d. Clean equipment thoroughly and in accordance with manufacturer's instructions for use and before prolonged storage.

e. Rotate inventory of material, first in, first out.

f. Remove all thinner from coiled hoses before storage. Leave thinner in pumping system.

g. When using chlorinated hydrocarbon solvents, be sure that equipment is certified for its use.

h. When using automated equipment, such as robots, use meter mixing equipment to obtain strict viscosity control, material quality control and total system supervision control.

i. Store material in clean, dry, temperature controlled OSHA approved storage facility.

j. Ensure that operators of equipment are trained in operation, maintenance, and storage.

k. Store airless or air-assisted-airless tips in solvent after using to keep them clean and free from material blockage.

l. Use tip protectors on airless spray guns.

m. Maintain a continuous electrical ground on all equipment to prevent static buildup which could produce a spark and ignite material. Approved grounding connections must be used.

n. Maintain clean, dry air to the air motor on air-opreated equipment.

o. When spray guns are not being used, for instance during lunch or break time, place tip only of spray gun into a solvent bath.

p. Locate material filters on outbound side of pressure pots and pumps.

q. All air-operated equipment must have air regulators.

r. Use ball valves between systems components so that components can be serviced without material leaking on floor.

s. Use filters that allow for drainage into waste containers so that filters can be clean and serviced properly.

t. Clean material filters on scheduled basis.

u. Filter as close to spray gun as possible.

v. Provide swivel unions between system components such as spray guns, hoses, filters and pumps for ease of disconnect.

w. Keep spray pattern 90 degrees to surface to be sprayed.

x. Move spray gun at a constant speed, maintaining a constant distance and angle to the work place to achieve an even coating.

y. File all manufacturer's service and spare parts list breakdowns for future reference and for odering spare parts.

z. Place catalyst pumps in down position to prevent crystallization.

aa. Remove thinner from material hoses. Do not allow it to stand.

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Epoxy and urethane material residue will react and block mixed material hoses even though thinner or solvent is present.

bb. Do not unplug airless/electrostatic or air assisted airless tips with sharp objects. They are brittle and will distort spray pattern.

cc. Remove components A and B of urethane topcoat promptly from air-operated pumps.

dd. Remove mixed material from hoses, cups and pumps within 2 hours when not in use.

ee. Do not use quick disconnects on material lines. They will become inoperable because of material hardener.

ff. Do not restrict air flow to air operated equipment.

gg. Use high pressure plumbing on high pressure systems.

hh. Use manufacturer's recommended paint and air hose on paint systems.

ii. Agitate and thoroughly mix CARC. Component A in particular settles out rapidly when allowed to rest.

jj. Use only fluid pressure and air pressure necessary to atomize material. Excessive pressures cause excessive overspray and waste.

kk. When spray painting, avoid moving spray gun back and forth in an arc. This method causes excessive paint buildup in center of arc an thin edges on outer reaches.

ll. Wear proper and approved breathing apparatus when spray painting.

mm. Do not spray in unventilated areas without EPA and OSHA approved spray equipment.

nn. Do not spray CARC on dirty surface. Remove all surface rust, oil, dust, and loose paint before applying CARC.

oo. Do not direct spray device at anything other than object to be sprayed.

pp. Do not remove spray guns, hose, filters and/or systems components while under pressure. Be sure that all components are at atmospheric pressure when disconnecting them from the system.

qq. Make sure that shop air and breathing air systems are separate and cannot be accidentally hooked up together.

rr. Use of paint pots with constant agitation systems can reduce settling of the mixed coating.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER: MIL-C-53072(ME)

2. DOCUMENT TITLE: Chemical Agent Resistant Coating (CARC), System Application Procedures and Quality Control Inspection

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ USER
- ☐ MANUFACTURER
- ☐ OTHER *(Specify)*: _____

b. ADDRESS *(Street, City, State, ZIP Code)*

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional

b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional

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8. DATE OF SUBMISSION *(YYMMDD)*

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