

TECHNICAL MANUAL
FOR
**Corrosion Prevention and Control Procedures
for US Navy Expeditionary Ground Equipment**



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FOREWORD

This technical manual is a tailored manual for NAVFAC Expeditionary Programs Office (NEPO) that leverages U.S. Marine Corps Corrosion Prevention & Control providing corrosion prevention and control procedures for Expeditionary Ground Equipment. All graphics are property of the U.S. Navy and should be attributed in case of reproduction.

This manual consists of six chapters and two appendices as follows:

[Chapter 1](#) - General Information and Safety Precautions

[Chapter 2](#) - General Discussion of Corrosion

[Chapter 3](#) - CPAC Procedures for Expeditionary Equipment

[Chapter 4](#) - Cleaning Procedures

[Chapter 5](#) - Corrosion Assessment Methods

[Chapter 6](#) - General CPAC Materials and Procedures

[Appendix A](#) - Corrosion Control Chemicals, Lubricants, Materials, and Supplies

[Appendix B](#) - Example CPAC Procedures for Deployment

[Glossary](#)

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SAFETY SUMMARY

GENERAL SAFETY NOTICES

This manual describes physical and chemical processes which may cause injury or death to personnel, or damage to equipment if not properly followed. This safety summary includes general safety precautions and instructions that must be understood and applied during operation and maintenance to ensure personnel safety and protection of equipment. Prior to performing any task, the WARNINGS and CAUTIONS included in that task shall be reviewed and understood.

The following general safety notices supplement the specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein. Should situations arise that are not covered in the general or specific safety precautions, the commanding officer or other authority will issue orders as deemed necessary to cover the situation. No work shall be undertaken on energized equipment or circuits until approval of the commanding officer is obtained, and then only in accordance with Naval Ships' Technical Manual (NSTM) S9086-KC-STM-010/Chapter 300.

DO NOT REPAIR OR ADJUST ALONE

Under no circumstances shall repair or adjustment of energized equipment be attempted alone. The immediate presence of someone capable of rendering first aid is required. Under no circumstances shall any person reach into or enter an enclosure for the purpose of servicing or adjusting equipment except in the presence of someone who is capable of rendering aid. Before making adjustments, be sure to protect against grounding. If possible, adjustments should be made with one hand, with the other hand free and clear of equipment. Even when power has been removed from equipment circuits, dangerous potentials may still exist due to retention of charges by capacitors. Circuits must be grounded and all capacitors discharged prior to attempting repairs. Equipment should be deenergized and properly tagged out according to the ship's Standard Operating Procedures.

TEST EQUIPMENT

Make certain test equipment is in good condition. If a metal-cased test meter must be held, ground the case of the meter before starting measurement. Do not touch live equipment or personnel working on live equipment while holding a test meter. Do not ground any measuring devices; these devices should not be held when taking measurements.

INTERLOCKS

Interlocks are provided for safety of personnel and equipment and should be used only for the purpose intended. They should not be battle shorted or otherwise modified except by authorized maintenance personnel. Do not depend solely upon interlocks for protection. Whenever possible, disconnect power at the power distribution source.

MOVING EQUIPMENT

Personnel shall remain clear of moving equipment. If equipment requires adjustment while in motion, a safety watch shall be posted. The safety watch shall be qualified to administer CPR, have a full view of the operations being performed, and have immediate access to controls capable of stopping equipment motion.

SAFETY SUMMARY - Continued**FIRST AID**

An injury, no matter how slight, shall never go unattended. Always obtain first aid or medical attention immediately, and file an injury report in accordance with OPNAVINST 5102.1 series, subj: Mishap Investigation and Reporting.

RESUSCITATION

Personnel working with or near high voltage shall be familiar with modern approved methods of resuscitation. Such information may be obtained from the supporting Medical Department or the Local Chapter of the Red Cross. Should someone be injured and stop breathing, begin resuscitation immediately. A delay could cost the victim's life. Resuscitation procedures shall be posted in all electrically hazardous areas.

KEEP AWAY FROM LIVE CIRCUITS Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside equipment with the high voltage supply turned on. Under certain conditions, dangerous potential may exist when the power control is in the off position, due to charges retained by capacitors. To avoid casualties, always remove power, discharge and ground a circuit before touching it.

HAZARDOUS MATERIAL STORAGE AND HAZARDOUS WASTE DISPOSAL

Before using any paints, thinners, solvents, detergents, or other chemicals, familiarize yourself with and adhere to all manufacturers', local, state and federal standards/regulations regarding safe storage, use, and the disposal of these products. Consult the Material Safety Data Sheet (MSDS), or your local Hazardous Materials Officer or Industrial Hygienist as needed.

PROPER VENTILATION

Cleaners, solvents, paints, and corrosion preventive compounds all require adequate ventilation to be used safely. In many cases, simply working outdoors is adequate ventilation. When working in enclosed vehicles, shelters, or cabinets, ensure that there is adequate ventilation for the materials being used. If adequate ventilation cannot be provided, then respirators must be worn. Consult with your local Safety Officer or Industrial Hygienist.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Some type of Personal Protective Equipment, or PPE, is usually required when performing corrosion control procedures. PPE may include ear protection, eye protection, gloves, respirators, or other equipment. Select the appropriate PPE for the job you are performing.

OXYGEN EQUIPMENT, FITTINGS, AND REGULATORS

Do not use oil-based cleaning/preservative compounds around oxygen, oxygen fittings, or oxygen regulators since fire or explosion may result.

SAFETY SUMMARY - Continued

EXPLOSION AND SPARK PROOF ELECTRICAL EQUIPMENT

Use of electrical equipment (e.g., drills and sanders) may present an explosive hazard when explosive solvent vapors are present. Use explosive spark-proof equipment when needed, and make sure they are properly grounded.

GENERAL PRECAUTIONS

The following general precautions are to be observed at all times.

1. Install and ground all electrical components associated with this system/equipment in accordance with applicable Navy regulations and approved shipboard practices.
2. Ensure that all maintenance operations comply with Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, OPNAVINST 5100.19 series.
3. Observe precautions set forth in NSTM S9086-KC-STM-010/Chapter 300 with respect to electrical equipment and circuits.
4. Ensure that protective guards and shutdown devices are properly installed and maintained around rotating parts of machinery and high voltage sources.
5. Do not wear loose clothing while working around rotating parts of machinery.
6. Ensure that special precautionary measures are employed to prevent applying power to the system/equipment any time maintenance work is in progress.
7. Do not make any unauthorized alterations to equipment or components.
8. Before working on electrical system/equipment, use the correct tag out procedure and check with voltmeter to ensure that system is not energized.
9. Consider all circuits not known to be "dead," "live" and dangerous at all times.
10. When working near electricity, do not use metal rules, flashlights, metallic pencils, or any other objects having exposed conducting material.
11. Deenergize all equipment before connecting or disconnecting meters or test leads.
12. When connecting a meter to terminals for measurement, use range higher than expected voltage.
13. Before operating equipment or performing any tests or measurements, ensure area is dry of water or other liquid conductive material and that frames of all motors and starter panels are securely grounded.
14. Ensure that area is well-ventilated when using cleaning compound or solvent. Avoid prolonged breathing of fumes and compound or solvent contact with skin or eyes.

SAFETY SUMMARY - Continued**WARNINGS AND CAUTIONS**

Specific warnings and cautions applying to the system/equipment covered by this manual are summarized below. These warnings and cautions appear elsewhere in the manual following paragraph headings and immediately preceding the text to which they apply. They are repeated here for emphasis.



A **WARNING** highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury, death, or long-term health hazards to personnel. (Page 1-1)



Washdown additive concentrate can cause eye irritation. Wear chemical splash proof goggles, and a face shield if needed, when mixing or using at full strength. If material contacts eyes, flush with plenty of fresh water. Follow instructions on MSDS. Loss of vision/eyesight is possible if disregarded. (Page 4-2)



High pressure water can cause debris to become airborne. Wear chemical splash proof goggles and/or a face shield for eye protection. High temperature water/steam can cause burns. Wear water proof, heat resistant gloves. (Page 4-3)



Keep cleaners out of eyes. Use splash proof goggles to prevent material from being splashed into eyes when being mixed and/or applied. In addition to goggles, a plastic face shield may also be used. The face shield is not to be used in lieu of goggles. If material contacts eyes, flush with plenty of water and follow instructions on MSDS. Loss of vision/eyesight possible if disregarded. (Page 4-4)



Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear

air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded. (Page 4-5, page 6-9, page 6-11)



Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded.

Avoid breathing vapors from sealants. Do not use sealants in poorly ventilated areas. Respiratory problems are possible if disregarded. (Page 6-1)



Wire brushing can create flying debris. Wear appropriate eye and hand protection when wire brushing. Follow instructions on MSDS. Loss of vision/eyesight is possible if disregarded. (Page 6-3)



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Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded.

CPCs can be flammable. Keep containers away from steam lines, electronic equipment, or other heat sources. Do not disperse spray in the presence of flames, hot surfaces, or other sources of ignition. Do not incinerate or puncture can. Serious injury or possible death by fire may be possible if disregarded. (Page 6-4)

CAUTION

A CAUTION highlights an essential operating or maintenance procedure, practice, statement, etc., which, if not strictly observed, could result in damage or destruction of equipment or loss of mission effectiveness. (Page 1-1)

CAUTION

Operating units may occasionally consider use of alternative cleaners and fresh water washdown additives on their equipment. Some cleaning products are corrosive to some types of metals, or may damage non-metal components. When in doubt, test the product first on a very small area or on a scrap component. Contact the NAVFAC Expeditionary Programs Office prior to any unauthorized product use. Accelerated corrosion may result if disregarded. (Page 4-1)

CAUTION

Do not spray water on electronics or communications equipment or electrical connectors, since this may force water into these items. Clean these items by hand. Equipment damage may result if disregarded. (Page 4-2, page 4-4)

CAUTION

Washdown additives should not be used at undiluted full strength on aluminum components, since they could cause increased pitting in crevices if disregarded. (Page 4-3)

CAUTION

Do not permit sodium bicarbonate solution to enter battery cells.

Never use a wire brush to clean battery or battery posts. Use appropriate post and terminal cleaning tool, when cleaning is required. Spark hazard possible if disregarded.

Battery mats should only be installed in vehicles with steel battery boxes. The combination of water and a battery mat in an aluminum battery box may possibly cause accelerated corrosion of the aluminum.

If water gets into a battery box with a Battery Mat installed, the mat can wick up and retain the water for a long time. This could result in accelerated corrosion under the mat. If the battery box design on a vehicle is such that water (rain or surf) frequently gets into the box, do not use the Battery Mat, or plan to remove it and dry it out periodically. (Page 4-6)

CAUTION

Many products that are called "RTV silicone rubber" sealants can produce acetic acid as they cure. This acid, which smells like vinegar, can be corrosive to bare metals. Use only RTV sealants that are labeled as MIL-A-46146, or those that are marked non-corrosive. Corrosion of metals may result if disregarded. (Page 6-1)

CAUTION

These thread treatments and anti-seize compounds should not be confused with thread locking compounds. Thread locking compounds are intended to prevent fasteners from loosening due to vibration. If an equipment TM calls for the use of a thread-locking compound, or if self-locking fasteners are used, then the anti-seize treatments described here should not be used. Fastener loss may result if disregarded. (Page 6-2)

CAUTION

Amlguard is not to be used inside electrical connectors, since it dries to a hard film that would interfere with electrical contacts. Connection could seize together if caution is disregarded. (Page 6-5)

CAUTION

Do not use MIL-PRF-81309, Type II, PMS-3 or Amlguard CPCs where the use of ultra-thin film CPC Type III is intended. Electrical hazard could result if caution is disregarded. (Page 6-6)

CAUTION

Do not use abrasive material or wire brush on new aluminum connectors to prevent damage to protective plating. Use only enough force to clean away corrosion on existing connectors. Premature metal failure may result if disregarded. (Page 6-10)

CAUTION

Care should be taken not to damage tool-gripping surfaces while attempting to loosen connector. Destruction of connector is possible if disregarded. (Page 6-10)

CAUTION

Rust Inhibiting Compounds should not be applied directly to rubber seals, gaskets or other rubber materials. Damage may occur if caution disregarded. (Page 6-13)

CAUTION

Do not use CLP on rubber or other elastomeric parts such as O-rings. CLP contains solvents, which may degrade these parts if caution disregarded. (Page 6-14)

CAUTION

Particular attention must be paid to ensure Oil Passages are not covered with RTV Silicone Sealant. (Page 6-21)

CAUTION

This line item is for use only by personnel qualified to open and work in electronics and communications equipment. (Page 6-22)

CHAPTER 1

GENERAL INFORMATION AND SAFETY PRECAUTIONS

1-1. SAFETY PRECAUTIONS.

General safety precautions and warnings applicable to hazardous materials can be found in the [Safety Summary](#) in the front matter of this manual. Specific warnings and cautions appear in the manual prior to the paragraphs and procedural steps for which they apply.

1-1.1 Warning, Caution, and Note Usage. Warnings, cautions, and notes appearing throughout this manual are of utmost importance to the safety of personnel, ship, and equipment. Warnings and Cautions are used in this manual to highlight operating or maintenance procedures, practices, conditions or statements which are considered essential to protection of personnel (WARNING) or equipment (CAUTION). Warnings and Cautions immediately precede the step or procedure to which they apply. Warnings and Cautions consist of four parts: heading (WARNING or CAUTION), a statement of the hazard, minimum precautions, and possible result if disregarded.

Refer to the [Safety Summary](#) for an overview of all the existing warnings and cautions used throughout this manual.



A WARNING highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury, death, or long-term health hazards to personnel.



A CAUTION highlights an essential operating or maintenance procedure, practice, statement, etc., which, if not strictly observed, could result in damage or destruction of equipment or loss of mission effectiveness.



A NOTE highlights an operating or maintenance condition or statement which is essential but not of known hazardous nature as indicated by a warning or a caution.

1-2. GENERAL.

Expeditionary ground equipment contains steel, aluminum, composites, and other materials that will corrode or degrade. To ensure that corrosion does not affect the integrity and performance of Expeditionary assets, the following Corrosion Prevention and Control (CPAC) procedures should be followed:

1. Clean

2. Inspect

3. Protect and Preserve

These CPAC procedures must be included in your preventive maintenance (PM) and corrective maintenance (CM) programs. If not, equipment and components will degrade resulting in loss of equipment availability, decreased readiness, and high replacement costs. The remaining chapters of this manual provide specific procedures, relating to each step in the CPAC process, which should be undertaken at the organizational level.

1-3. PURPOSE.

This manual provides guidance for corrosion prevention and control measures for Expeditionary ground equipment to be undertaken at the organizational level. Its purpose is to provide background information on types of corrosion the user is likely to encounter, products (other than coatings) used to mitigate corrosion, and work practices used to identify, control and prevent corrosion.

Included are basic procedures to be used in corrosion control such as corrosion condition assessments, cleaning procedures and the application of various types of corrosion prevention compounds and preservatives. This manual also contains a listing of equipment and materials to be used when applying CPAC procedures. Organizational maintenance personnel shall review this manual and add specific corrosion assessments, cleaning steps, protection, and/or preservation measures to their equipment planned maintenance system (PMS) checklists.

Review of this manual should be used as a training aid for new personnel and refresher instruction to established personnel in basic corrosion, corrosion control theory, and procedures. Additional training materials, such as the Organizational Level Operator and Maintainer CPAC Training CD, are available through the Marine Corps CPAC Program website at www.marcorssyscom.usmc.mil/cpac.

1-4. SCOPE.

This guide provides organizational level CPAC procedures for your PM/CM program to mitigate and prevent corrosion. The application of the procedures will extend your equipments service life and maintain your capability. Corrosion control training and maintenance must be scheduled with the unit S-3/S-4 for operators and maintainers to ensure equipment is properly maintained.

The appendices included in this manual provide detailed CPAC procedures recommended prior to a deployment, during a deployment, and post-deployment. Unit commanders should use this manual in establishing local programs to prevent corrosion during deployments, which is frequently the most severe environment for Expeditionary ground equipment.

1-5. APPLICABILITY.

This manual is applicable to all users/holders of Expeditionary ground equipment.

1-6. CONFLICTS.

This manual shall be used along with the appropriate equipment Technical Manuals (TMs). Where a conflict or difference is found the specific equipment TM will supersede the materials and procedures provided in this manual.

Some types of Expeditionary ground equipment may have their own dedicated corrosion control TMs, Technical Instructions (TIs), or other documentation. In these cases, those manuals also take precedence over this

manual. However, compare the revision dates of those documents to this manual. In some cases, materials which were specified in older manuals may not be able to be used now, due to changing environmental protection regulations. Contact the NEPO for clarification.

1-7. REFERENCE MATERIAL.

This manual is for use at the organizational level in controlling corrosion on all types of Expeditionary equipment, and shall be used in conjunction with the current version of the CPAC related information listed below.

Table 1-1 Reference Material

Short Title	Title
TM 4700-15/1_	Ground Combat Equipment Record Procedures.
	Description: Provides detailed instructions for preparation, use, and disposition of forms and records required for Marine Corps ground combat equipment. It includes instructions for forms such as Product Quality Deficiency Reports (PQDRs) and Equipment Repair Orders (EROs).
MCO 4790.18_	Marine Corps Order for the Corrosion Prevention and Control (CPAC) Program.
	Description: Establishes the CPAC program to extend the useful life of all Marine Corps tactical ground and ground support equipment. Its purpose is to reduce maintenance requirements and replacement costs through identification of corrosion and implementation of corrosion control processes.
TM 4795-34	Corrosion Prevention and Control: Rust-proofing and Underbody Coating Procedures for Tactical Vehicles, Trailers, and Engineer Equipment.
	Description: CPAC Program measures established in this manual give both specific and general procedures for rust-proofing and underbody coating application for tactical vehicles, trailers and selected engineer equipment.
TM 3080-50	Corrosion Control Procedures: Depot Maintenance Activities for Marine Corps Equipment.
	Description: This manual is for DMA use in controlling corrosion on motor transport, amphibious, ordnance, tracked, and engineering support vehicles; communication-electronic equipment; and general supply items that are subjected to deteriorative effects of corrosion and wear.
TM 4750-OD/1_	Painting and Registration Marking for Marine Corps Ground Combat and Tactical Equipment.
	Description: Manual discusses methods for cleaning and preparing surfaces prior to painting, paint application procedures, and procedures for identifying, marking and camouflaging equipment. This is the most detailed manual for painting procedures.
TM 4750-OD/2	Camouflage Paint Patterns.
	Description: This manual contains camouflage paint patterns for U.S. Marine Corps peculiar tactical equipment. This manual shall be used in conjunction with TM 4750-OD/1_, Painting and Registration Marking for Marine Corps Combat and Tactical Equipment.
NAVFAC P-300	Management of Civil Engineering Support Equipment.
	Description: Provides instructions for the management of transportation equipment. Procedures for administration, operation, and maintenance are detailed. These include procurement, technical record control, disposition and procedures for the operation of automotive construction, and railroad equipment. Maintenance functions such as scheduling, shop control, material support, equipment modification, painting, protective coatings, markings, and guidelines for fuels and lubricants are included.
TM-4795-OR/1	Corrosion Prevention and Control Procedures for USMC Ground Combat Equipment.
	Description: Provides instructions for operators and organizational level maintenance personnel in controlling and preventing corrosion on Marine Corps equipment.

Table 1-1 Reference Material - Continued

Short Title	Title
NAVSEA S9086-VD-STM-010	NSTM Chapter 631, Preservation of Ships in Service Description: This chapter provides instructions, requirements and information for prevention of corrosion and deterioration of ships, submarines, boats and small craft in the naval service by means of surface preparation, painting and application of other preventive measures.
NAVSEA Standard Item 009-32	Cleaning and Painting Requirements; Accomplish Description: Provides cleaning and painting requirements for naval vessels.

CHAPTER 2

GENERAL DISCUSSION OF CORROSION

2-1. DEFINITION.

A dictionary definition of the word “corrosion” may say “to dissolve or eat away gradually.” For most equipment and structures, it refers to the deterioration of a metal due to a reaction with its environment. Corrosion reduces the useful life of a metal, decreasing equipment readiness and increasing maintenance and repair costs.

2-2. CAUSES AND PREVENTION OF CORROSION.

Corrosion is the process of a metal deteriorating or returning to its natural state. Corrosion can occur on all metals, but at different rates and under different circumstances. Use of Expeditionary ground equipment on or near the world’s oceans is the major factor that causes corrosion. This is mainly due to the salt in the air and seawater. This is called a “marine environment”. Salt in humid air can cause corrosion (called atmospheric corrosion), as can occasional seawater splash, spray, or immersion.

This manual provides procedures to prevent and control corrosion and is to be used by operators and maintainers of Expeditionary ground equipment. Most often, these procedures are based on keeping salt and water from contacting bare metal. This is done using paints, coatings, sealants, lubricants, and other types of weather-proofing materials. Since dirt and sand help promote corrosion and deterioration of coatings, cleaning is also an important CPAC procedure.

NOTE

Surface Preparation and Touch-Up Paint Procedures are contained in TM 4750-OD/1_.

The procedures described in this manual are not the only way corrosion is being fought in the Expeditionary Community; however, they are the first line of defense. More sophisticated corrosion control measures are being used when procuring and designing new equipment, or when making engineering changes to solve problems. This may include using parts made from corrosion-resistant materials, the use of advanced coatings, or changing a design.

2-3. METALS AFFECTED BY CORROSION.

The most commonly recognizable form of corrosion is red rust which forms on steel and other iron. Not all corrosion products look the same. Corrosion products will look different depending on the material corroding. [Table 2-1](#) contains a list of metals often found in the Expeditionary Community’s ground equipment, some ways these metals are utilized, and the most common appearances of corrosion on these metals. They are described below in detail.

2-3.1 Mild, Plain Carbon, and Low Alloy Steels. Corrosion of steel is easily recognized, because the corrosion product is red rust. On painted or plated surfaces, corrosion will appear where the coating is broken, worn, or chipped. When painting steel, be sure to remove all rust prior to painting, as rust retains moisture and will continue to corrode if left under the new paint. This can result in blistering and failure of the coating system.

2-3.2 Stainless Steels. Stainless steels are alloys containing chromium in excess of 11%. In these alloys a passive oxide film is formed which causes the alloys to be resistant to the type of rusting commonly associated with carbon and alloy steels having a lesser chromium content.

2-3.3 Galvanized (Zinc-Plated) Steel. Galvanized steel is steel that has been coated with zinc. The zinc coating will corrode before the steel structure will, turning gray, or producing white powdery corrosion products. When the zinc is almost used up, red rusting of the steel may begin. Galvanized steels are often top coated with paint for additional corrosion protection. Galvanized steel is being used more often for new vehicles.

2-3.4 Aluminum. The corrosion product of aluminum in the early stages is a white-to-gray powdery material that can be removed by mechanical polishing or brushing with abrasives. More severe corrosion appears as extensive white-gray powdering, pitting, and exfoliation (See [paragraph 2-5.5](#)). Since aluminum is on the anodic end of the galvanic series, it would appear that bare aluminum should corrode more rapidly than steel in a marine environment. This is not always true, since the first layer of corrosion that forms on the aluminum is an aluminum oxide film which retards further corrosion of the aluminum. More severe corrosion occurs under conditions where the surface film is constantly broken and reformed.

2-3.4.1 Anodized Aluminum. Aluminum oxide film on aluminum is a natural protector, and anodizing increases the thickness of the oxide film. Anodized coatings can be dyed different colors, and are often used for wear resistance or as an adhesion promoter for paint.

2-3.5 Copper, Brass, and Bronze. Copper is mainly used in cooling systems and electrical components of equipment. Corrosion of aluminum alloys is greatly accelerated when they are in contact with copper alloys (e.g., brasses and bronzes). Corrosion products are usually a green-blue powder or residue.

2-3.6 Magnesium Alloys. All magnesium alloys are highly susceptible to corrosion and always require protective coatings to prevent corrosion. Because they are very light, they are often used in aircraft and helicopters.

2-3.7 Cadmium Plating. Cadmium is a metal used as thin protective plating on small steel or aluminum parts and fasteners. While its use is decreasing due to environmental concerns, it can still be widely found on fasteners and electrical components. New cadmium-plated parts usually have a yellow-gold sheen from an additional chemical treatment, and corrosion products are usually white and powdery. Once the plating has corroded away on steel, red rust will begin to form.

2-3.8 Chromium Plating and Nickel Plating. Chromium plating and nickel plating are used on steel to provide both corrosion and wear resistance, and a very smooth surface. When worn away, scratched or pitted, the steel underneath will rust. These are the two main metals added when producing stainless steels.

Table 2-1 Corrosion Products of Metals Commonly Used on Expeditionary Equipment

Metal or Alloy (Common Names)	Typical Uses	Typical Appearance of Corrosion
Mild, Plain Carbon , and Low Alloy Steels	Structures, sheet metal, vehicle body parts, machinery, fasteners, many others.	Red-brown oxide (rust); heavy scale can be black.

Table 2-1 Corrosion Products of Metals Commonly Used on Expeditionary
Equipment - Continued

Metal or Alloy (Common Names)	Typical Uses	Typical Appearance of Corrosion
Stainless Steel	Fuel and brake tubing, fasteners, vehicle trim, small hardware, special uses. Magnetic grades sometimes used for exhaust systems.	Nonmagnetic: sometimes light red-brown stain; may be small pits. Magnetic: can have uniform red-brown rust like steel, but not as heavy. Can pit.
Galvanized (Zinc-Plated) Steel	Protective coating for structures, sheet metal, fasteners, and small hardware.	White or gray powder while the zinc is corroding, turning to red rust.
Aluminum & Anodized Aluminum	Structures, sheet metal, vehicle body parts, electrical connectors and boxes, many others.	White or gray powder - openly exposed surfaces may feel gritty to touch. Pasty white products when wet.
Copper , Brass, and Bronze	Wiring, electrical components and boxes, radiators.	Blue or blue-green films or deposits.
Magnesium Alloys	Components for aviation equipment.	White powdery snow-like mounds and white spots on surface.
Cadmium Plating	Protective coating for fasteners, electrical connectors, and small hardware.	White powdery corrosion products while cadmium is corroding, turning to red rust for steel or white aluminum corrosion products.
Chromium Plating and Nickel Plating	Corrosion and wear resistant coatings for hydraulic cylinder and other shafts, surfaces of sliding or wear parts, small hardware.	Chromium and nickel plating usually wears or scratches, resulting in rusting of underlying steel at bare spots or pits in the plating.

2-4. CORROSIVE ENVIRONMENTS.

Expeditionary equipment is operated in a number of environments that can accelerate metal corrosion. The “marine environment” was already described as having to do with the oceans or seacoasts. Since the salts in seawater make it more electrically conductive, seawater is much more corrosive to metals than fresh water. There are a number of factors that contribute to a corrosive environment as described below.

2-4.1 Moisture. Moisture is the greatest contributor to deterioration of metals. Water vapor is present in air and often contains corrosive contaminants. These contaminants can turn rain into “acid rain” in some areas of the world, which is more corrosive. Water and moisture are often referred to as “electrolytes” in the corrosion process.

2-4.2 Temperature. Corrosion rates increase as the temperature rises. High temperatures often make corrosion of steel exhaust components on Expeditionary vehicles very severe.

2-4.3 Salt. Salts used to de-ice roads are a major cause of corrosion on military equipment.

2-4.4 Sand, Coral, and Mud. Sand, coral, and mud can cause abrasion and wear of moving parts and coatings. Additionally, these contaminants can trap moisture and enhance corrosion.

2-4.5 Road Debris and Stones. Debris, stones, and pebbles on roads are kicked up as a vehicle is driven over them, and can “peck” holes in coatings on vehicle underbodies.

2-4.6 Sunlight. Sunlight causes corrosion by breaking down coatings and leaving metallic surfaces unprotected. Sunlight also heats the areas that it shines on and accelerates corrosion, because the higher the temperature, the greater the rate of corrosion.

2-4.7 Coating Protection. Corrosion will occur in a short time if a protective coating such as paint or a preservative does not cover the metal. Once applied, the protective coating must be maintained. If protection of metal surfaces is not done as a part of preventive/corrective maintenance, loss of equipment from service and high replacement rates will result. This can be avoided if organizational personnel institute CPAC procedures along with required PM/CM on the equipment.

2-5. SPECIFIC TYPES OF CORROSION.

2-5.1 Uniform or General Corrosion. Direct surface attack occurs when metal surfaces are exposed to water, corrosive gas, salt spray, or other contaminants. A common example of this is uniform loss of metal in the presence of salt spray, as shown in [Figure 2-1](#).

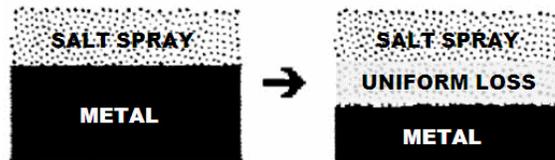


Figure 2-1 Uniform or General Corrosion

2-5.2 Galvanic or Dissimilar Metal Corrosion. Galvanic corrosion, also called dissimilar metal corrosion, occurs when two different types of metal are in contact in the presence of moisture, as shown in [Figure 2-2](#). Depending on the types of metals involved and their relative sizes, the galvanic corrosion rate may be fast or slow. Usually, corrosion only affects one of these metals, and it corrodes faster than it would have were it not in contact with the other metal.

Example:

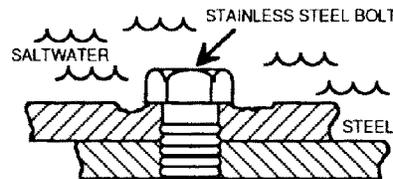


Figure 2-2 Galvanic or Dissimilar Corrosion

A listing of metals by their tendency to corrode is called the galvanic series. A simple galvanic series is shown below.

SIMPLE GALVANIC SERIES

More Corrosion Prone (Anodic)

Zinc

Cadmium

Aluminum Alloys

Carbon Steel and Low Alloy Steels

Copper Alloys

Stainless Steel

Titanium Alloys

Gold

More Corrosion Resistant (Cathodic)

2-5.3 Intergranular Corrosion. This type of corrosion occurs along the grain boundaries of some alloys.

2-5.4 Pitting. Pitting is localized corrosion that takes the form of cavities at the surface. (See [Figure 2-3](#)).

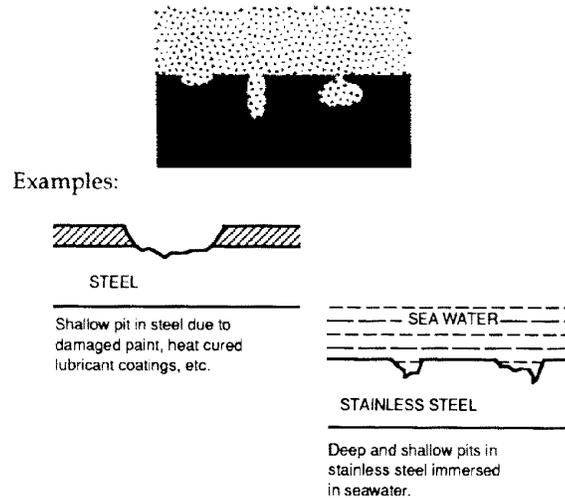


Figure 2-3 Pitting Corrosion

2-5.5 Exfoliation. Exfoliation is a form of inter-granular corrosion localized to the surface of the metal and is normally detected by bulging, followed by the falling away or peeling off of metallic layers in flakes, layers, or scales. Certain types of aluminum are prone to exfoliation corrosion. (See [Figure 2-4](#)).

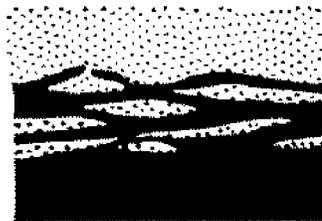


Figure 2-4 Exfoliation Corrosion

2-5.6 Crevice Corrosion. Anything forming a crevice, or an area where salt can concentrate or air cannot get to, can cause crevice corrosion. It occurs in joints, seams, threads, or even under label plates and sand or dirt deposits. Aluminum, steel, and stainless steel can all be subject to crevice corrosion to some degree. Crevice corrosion often looks like pitting. Crevice corrosion, pitting, and galvanic corrosion can all be acting on a piece of metal at the same time. (See [Figure 2-5](#)).

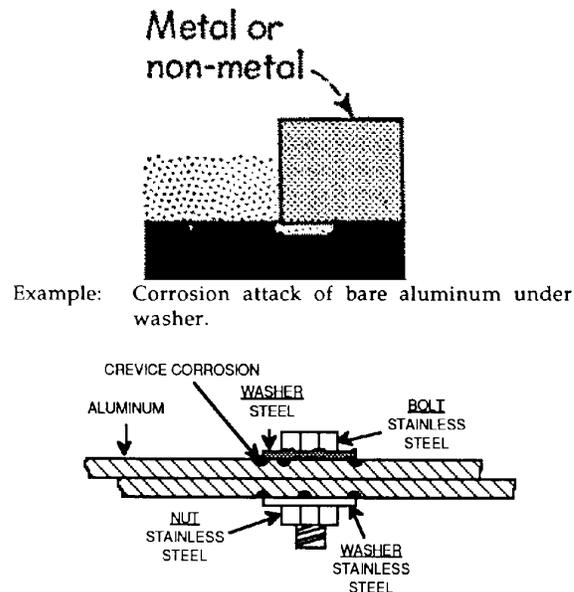


Figure 2-5 Crevice Corrosion

2-5.7 Fretting Corrosion. Fretting corrosion occurs when metal surfaces rub or vibrate against each other under high loads. It can destroy bearing surfaces and may become severe enough to initiate cracks and subsequent failure of the part.

2-5.8 Stress Corrosion Cracking. Stress corrosion cracking (SCC) happens under the combined action of corrosion and a sustained tensile (pulling) stress, as shown in [Figure 2-6](#).

Stainless steel, high strength aluminum, and high strength steel alloys are particularly prone to SCC.

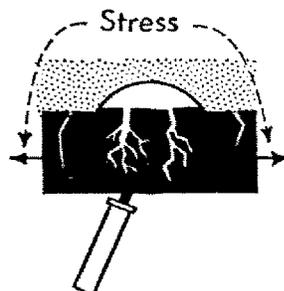


Figure 2-6 Stress Corrosion Cracking. (Magnified)

2-5.9 Corrosion Fatigue. Similar to stress corrosion, but is a result of cyclic stresses on metal in corrosive surroundings rather than the sustained static loads required to cause stress corrosion cracking.

2-5.10 Microbiological Induced Corrosion. When moisture is present, microorganisms or fungi can grow on a surface. These organisms can produce small amounts of corrosive acids. This is often a concern in integral fuel tanks.

2-6. CORROSION CONTROL.

A good corrosion control program should start in the design of a piece of equipment and continue throughout its life cycle. Corrosion control design practices include:

- Proper materials and coatings selection.
- Avoidance of crevices and other types of designed-in corrosion trouble spots.
- Provisions for sealing components from liquid entry or providing drain holes for entrapped liquids.

Corrosion control, while the equipment is in-service, consists of keeping the equipment clean, maintaining protective coatings, inspecting for and reporting corrosion problems, taking corrective actions, and training equipment users and maintainers in corrosion control steps.

2-6.1 Material Selections. One of the most significant factors that affect the amount of corrosion that may be present is the selection of materials. Steel and aluminum are the most common metals used in construction. The metal to be used is usually picked as the best one to meet varied requirements such as cost, strength, weight, weldability, and others. As a result, the most corrosion resistant metals may not always be selected. For example, stainless steel, or other corrosion resistant materials, might be chosen instead of cheaper carbon steel if:

- Abrasion will remove protective coatings from the steel.
- The environment is too severe for coatings.
- The cost of the carbon steel plus protective coatings is more than the cost of corrosion resistant materials.

2-6.2 Coatings and Finishes. The use of coatings and finishes is the most common method of corrosion control. The actual coating selected should depend on a number of factors, which include:

- The base metal that is being protected.
- The operating conditions expected for the part, such as rubbing, temperature, type of fluid used, etc.
- The length of service expected from the coating.
- The ability of the part to be coated, when such factors as close tolerances, presence of threads or holes, etc. are considered.

Coatings that prevent corrosion by keeping moisture from contacting the metal's surface are known as barrier coatings. Coatings or finishes that prevent corrosion using a pigment that preferentially corrodes instead of the steel substrate are known as sacrificial coatings. Common types of sacrificial coatings contain zinc and aluminum.

Since sacrificial coatings corrode instead of the base metal, they might need to be reapplied periodically. Some types of applied finishes are actually films on a part's surface created by a controlled chemical reaction of the metal. Anodizing or conversion coatings on aluminum or phosphate coatings on steel are examples of these finishes. They can also serve as good pre-treatments for painting.

2-6.3 Sealing and Draining. Sealing a piece of equipment to keep moisture out can be a simple and effective corrosion control measure on items such as communications equipment, engine and transmission housings, and other types of closed components. When it is impractical to seal an item, or when the chance of obtaining an effective seal is low, the design should have a provision for draining entrapped water at the lowest point. Mating surfaces, switches, covers, and holes for fasteners are places where sealant should be applied. The choice of a sealant depends on the fluid that it may come in contact with, the temperature expected for the part, and the amount of routine maintenance normally performed inside the component.

2-6.4 Fresh Water Rinse. Operation in a marine environment is the number one cause of corrosion for Expeditionary equipment. Seawater is the only electrolyte commonly occurring in nature that contains a high concentration of salts. Since seawater accelerates corrosion, it would be best if it were washed away with fresh water as soon as possible. This should be done each time the equipment returns to base or is stored after seawater or salt spray exposure. When using a pressurized hose to clean the gear, take care not to spray electrical and communications gear at full pressure. Instead, use a fine spray on these components, or clean them by hand. Additives are available for use with fresh water to help remove salt better. Only use additives that are listed in CPAC manuals.

Understandably, when embarked on ships or when in the field, fresh water may not be available in the amounts necessary. This makes the use of other corrosion control measures increasingly important.

2-6.5 Protection from Weather. The most corrosive environments that Expeditionary equipment is likely to see may be an operation on a beach, being carried on a Navy LCAC hovercraft (See [Figure 2-7](#)), or being carried in the weather deck of an amphibious ship. This is part of the Expeditionary Community's mission and you can't do much about it. However, when the equipment is stored on base ("in garrison"), there may be several ways to reduce the rate of corrosion of the equipment. Protection of the equipment from the weather is one way to prolong its service life and cut back on the amount of maintenance required. Keeping equipment stored under simple open-sided covered structures can reduce exposure to rain and direct sunlight.



Figure 2-7 Equipment on Navy Lighterage

Completely enclosed structures are even better, and the best is a building or structure with a dehumidification system. While these facilities are not currently widely available, they are gaining wider attention throughout the military. Over the past several years, the Marine Corps has developed a robust Dehumidification Program to prolong equipment life.

2-6.5.1 Storage of Equipment. As already discussed, moisture contributes greatly to the corrosion of metals; the higher the amount of moisture in the air (humidity), the higher the rate of corrosion. This is especially significant for Expeditionary equipment, because much of it is located in moisture-laden environments. Further, a large percentage of this equipment is stored outdoors without the benefit of protective enclosed shelters, and is therefore directly subjected to the humid environment.

Corrosion of Expeditionary equipment can be reduced through the use of protected storage. This can be achieved at a basic level by storing the equipment in covered areas similar to carports, or warehousing in garages. Tarps can also provide some protection, but they should be made of a breathable material, or be fitted to allow for ventilation. Otherwise, a tight-fitting, non-breathable tarp may actually cause corrosion, by trapping moisture inside that will condense on surfaces each time it gets cool at night. A higher level of protection (although at a higher cost) can be achieved through the use of Dehumidified (DH) Shelters. Dehumidification removes moisture from the air, thereby reducing corrosion of the equipment.

2-6.6 Dehumidification Processes. There are two ways in which dehumidification may be done, either passively or dynamically.

2-6.6.1 Passive Dehumidification. Passive dehumidification uses materials such as silica gel and activated alumina, called desiccants. Desiccant materials can absorb and hold many times their dry weight in water vapor. This method requires putting the desiccant in an enclosure; however, for best effects, the enclosure should be "sealed tight," with very little airflow. Also, the desiccant must be replaced regularly, since over time it will become saturated and will no longer work. A water-soaked desiccant pack sitting on a metal surface can cause corrosion.

2-6.6.2 Dynamic Dehumidification. Dynamic dehumidification can be achieved by heating, or refrigerating a confined space. Heating involves raising the inside temperature of a space to a level where the relative humidity is reduced. Refrigeration involves reducing the air temperature to a point where moisture condenses out of the air - that is, the dew point is reached. When desiccant materials are used in dynamic DH, they are used in a system of equipment that regenerates them. Drying the desiccant materials by heating allows them to collect moisture once again. Dynamic DH systems can be used in permanent buildings or temporary shelters as mentioned above. However, they can also be used for operational vehicles at a company or battalion. This may involve use of small, portable units that can be hooked up each night to single vehicles, or larger, stationary units that can serve many vehicles at once using a system of hoses or ducting. While these "operational" DH systems cannot protect the outside of the vehicles from corrosion, they have been found to protect equipment inside the vehicles very well. The use of Operational DH Systems are beneficial, since the electronics and communications equipment inside vehicles are among the most expensive, and most critical, to maintain. An example of dehumidified storage is shown in [Figure 2-8](#).



Figure 2-8 Example of Combat Vehicles in a Controlled Humidity Shelter

CHAPTER 3

CPAC PROCEDURES FOR EXPEDITIONARY EQUIPMENT

3-1. GENERAL.

[Figure 3-1](#) shows the series of steps that should become part of a general CPAC plan, along with the remaining chapters of this manual.

3-2. CLEANING.

Removing rust, oxidation, dirt, salt and other contaminants from the surface of metal is the first step in the CPAC process. Cleaning procedures depend on the type of material to be cleaned (plain steel, stainless steel, aluminum alloy, composite, rubber, etc.); severity of corrosion; and available cleaning equipment and materials.

3-3. INSPECTION.

Thorough inspection of equipment is the second step in the CPAC process. You must assess the overall material condition of your equipment. When inspecting look for: corrosion, coating damage, trapped water, and contaminated surfaces. Frequency of corrosion assessments should increase with the operational tempo, severity of environmental conditions, and importance of the component/vehicle. [Chapter 5](#) of this manual provides additional information for completion of a corrosion assessment.

3-4. PROTECTION AND PRESERVATION.

Preservation of the clean, corrosion-free surfaces is the third and final step of the CPAC process. Preservation helps to protect equipment and parts by providing coatings, anti-seizes, sealants, and water displacing and corrosion preventive compounds (CPCs). Preservatives should be used after equipment cleaning, before and after deployment, and when an extended period of equipment storage is anticipated. Chemical Agent Resistant Coating (CARC), and their approved primers are certainly part of a preservation plan. However, since they require special surface preparation and application methods, they are covered in Navy Publication S6360-AW-MMO-010. These coatings provide long-term protection and should be used when possible instead of CPCs, which only provide short-term protection.

3-5. PRE-DEPLOYMENT PROCEDURES.

The application of sound pre-deployment CPAC procedures can provide great benefits in preventing corrosion-related equipment failures and their associated costs. [Appendix B](#) provides generic checklists that can assist in these procedures.

3-6. RECORD PROCEDURES.

- a. CPAC assessments should be performed in conjunction with scheduled maintenance, i.e. monthly, quarterly, or semi-annual PM, and results recorded on the Equipment Repair Order (ERO) and equipment record jacket/folder.
- b. Submit PQDRs (SF 368) on recurring CPAC problems in accordance with current directives.

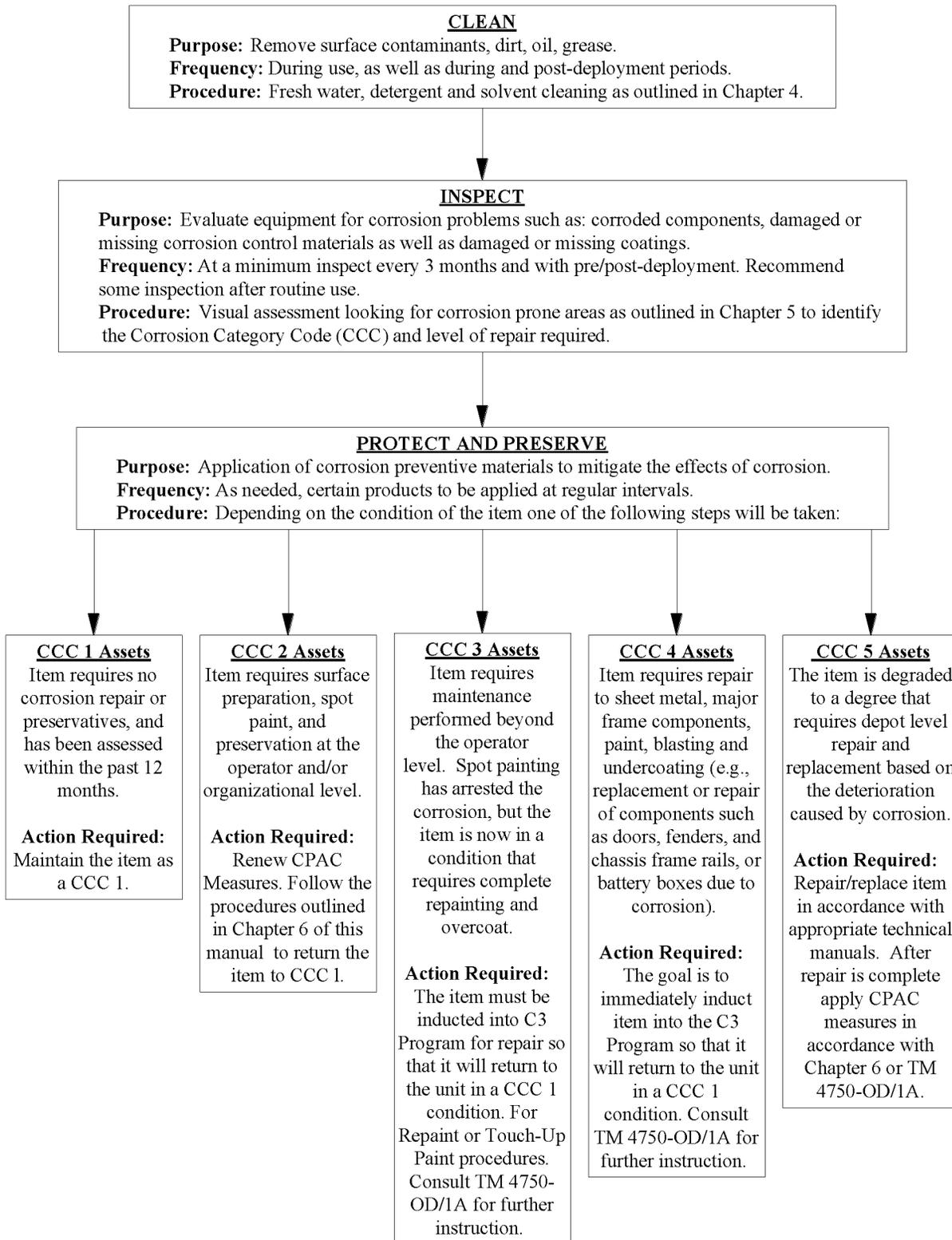


Figure 3-1 General CPAC Planning Guide

3-7. LEVELS OF REPAIR FOR CORROSION DAMAGE.

Repair of metal components and sheet metal is often needed prior to applying any paint or CPAC procedures. The following descriptions and photographs are intended as guides to help maintenance personnel determine the level of corrective actions that may be necessary prior to CPAC work. They are summarized in [Table 3-1](#). Some of the repair actions described in this table may be beyond organizational capabilities - in this case, complete the maximum level of repair that is possible at your level.

Table 3-1 Stages of Corrosion and Repairs Necessary Prior to Taking CPAC Action

Stage	Description	Repair Level	Figures
1	<p>Surface Corrosion-No Scale</p> <ul style="list-style-type: none"> • Painted area is raised or bubbled by corrosion underneath. Surface is lightly corroded, with loose, powdery, or granular deposits, but no scale is present. Base metal is sound. • For steel, metal under raised paint, or any bare metal, displays rusty red, reddish-brown, or black corrosion deposits. • For galvanized steel, white corrosion products may be present, mixed with rust stains. • For aluminum, gray or white corrosion products may be present. 	<ul style="list-style-type: none"> • No metal repair needed, but coating touch-up is required. • Degrease surfaces using steam cleaning prior to surface preparation. • Preferred method of surface preparation is spot abrasive blasting to near-white metal. All rust, corrosion products and loose paint should be removed. If able to measure surface anchor tooth profile, it should be 1-2 mils. • Alternate surface preparation is power tool cleaning or hand sanding, depending on size of area to be treated. • Feather the edges of any surrounding intact coating to make a smooth transition to bare metal area. • Prime and paint cleaned area with approved paint system per TM 4750-OD/1A. 	3-2, 3-3
2	<p>Surface Corrosion with Scaling</p> <ul style="list-style-type: none"> • Has more adherent corrosion products than Stage 1, and steel surfaces may have some scaling. • Base metal may show etching or light pitting, but the metal beneath the corroded area is still sound. 	<ul style="list-style-type: none"> • Same as Stage 1. Additional effort may be needed to clean corrosion out of pitted areas. 	3-4, 3-5
3	<p>Localized Attack, Pits, Some Holes</p> <ul style="list-style-type: none"> • Metal in a certain area has uniformly corroded or pitted until that area is unsound or completely gone. (Unsound means that the mechanical strength is lost.) • Heavy corrosion products or rust scaling. 	<ul style="list-style-type: none"> • Metal repair is required prior to re-coating. • This level of corrosion coming from inside an enclosed area (such as a door panel, frame rail, stiffening channel, etc.) may indicate heavy corrosion throughout the inside of the part. Inspect the part by most appropriate means available: knock on metal lightly with ball-peen hammer or punch; use ultrasonic thickness (UT) gage or calipers to determine remaining thickness; etc. to determine soundness and extent of repair needed. 	3-6, 3-7

Table 3-1 Stages of Corrosion and Repairs Necessary Prior to Taking CPAC

Action - Continued

Stage	Description	Repair Level	Figures
		<ul style="list-style-type: none"> • Cut or grind out affected area, and replace with new metal by welding, riveting, or other means appropriate for part. • Clean and paint per Stage 1 above. 	
4	<p>Severe Corrosion-Thinning & Holes</p> <ul style="list-style-type: none"> • Corrosion has thinned or pitted the entire part to the point where it is cheaper to replace it than repair it. The metal part has holes throughout, or most of its supporting edges have corroded completely away. 	<ul style="list-style-type: none"> • Replace entire part per equipment Technical Manual. • If new part is not already coated, clean and paint it per Stage 1 above, or TM 4750-OD/1A. In most cases, it will be easier to perform a good paint job before the new part is installed. 	3-8, 3-9

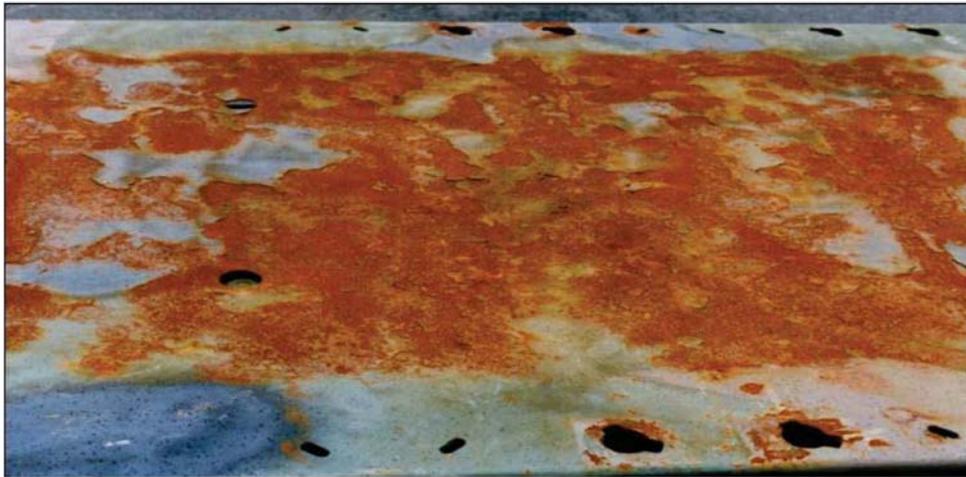


Figure 3-2 Example 1 of Stage 1 Corrosion



Figure 3-3 Example 2 of Stage 1 Corrosion



Figure 3-4 Example 1 of Stage 2 Corrosion



Figure 3-5 Example 2 of Stage 2 Corrosion



Figure 3-6 Example 1 of Stage 3 Corrosion



Figure 3-7 Example 2 of Stage 3 Corrosion



Figure 3-8 Example 1 of Stage 4 Corrosion



Figure 3-9 Example 2 of Stage 4 Corrosion

CHAPTER 4

CLEANING PROCEDURES

4-1. PURPOSE.

Cleaning is intended to help prevent corrosion by removing excess dirt, salts, as well as other foreign debris from equipment surfaces. Cleaning also prepares equipment surfaces for application of Corrosion Preventive Compounds (CPCs), sealants, or for touch up painting. Freshwater washdown and detergent cleaning is the preferred method for routine removal of soil and saltwater contamination from equipment.

4-2. INTRODUCTION.

Removing rust, oxidation, dirt, salt, and other contaminants from the surface of metal is the first step in protecting your equipment against corrosion. Cleaning procedures may vary depending on the type of material to be cleaned (carbon steel, stainless steel, aluminum alloy, composites, rubber, etc.); type and severity of contamination or corrosion; and availability of cleaning equipment and materials.

Mud, sand, dirt, and salt deposits left on a bare metal or painted surface can accelerate corrosion and can cause paint degradation. While clean, fresh water alone can remove some of these deposits, it can be slow, and may be ineffective on certain debris such as oil. When cleaning compounds, detergents, or other additives are used, they can speed cleaning and make it more effective. Detergents and other additives work by dissolving salt deposits, emulsifying oils and greases, and lifting other soils. Different types of cleaners and additives work better for different types of soils.

4-3. RECOMMENDED CLEANING FREQUENCY.

The recommended frequency of the cleaning methods described below depends partly on where and how the equipment has been used and how it is stored. See [Table 4-1](#) for guidelines. For routine usage in garrison, a minimum of monthly fresh water and detergent cleaning is recommended. When equipment has been exposed to direct salt spray or splash, such as on a Navy LCAC hovercraft, amphibious ship cargo deck, or beach exposure, perform a freshwater washdown as soon as possible to remove contaminants.

All cleaning efforts afford the greatest benefit to corrosion mitigation if they are performed soon after exposure to contaminants and repeated as often as needed. This is especially true for flushing salt out of the crevice areas, seams, and lap joints that are often found in the design of Expeditionary equipment. Review [Chapters 5](#) and [6](#) for corrosion prone areas and servicing procedures after cleaning.

4-4. MATERIALS AND EQUIPMENT.

CAUTION

Operating units may occasionally consider use of alternative cleaners and fresh water washdown additives on their equipment. Some cleaning products are corrosive to some types of metals, or may damage non-metal components. When in doubt, test the product first on a very small area or on a scrap component. Contact the NAVFAC Expeditionary Programs Office prior to any unauthorized product use. Accelerated corrosion may result if disregarded.

Table 4-1 lists the materials and equipment that should be used for cleaning. Pressure washers for routine fresh water and detergent washdowns should be locally procured. Pressure washers should not operate at pressures greater than 1200 psi. Operating units at pressures greater than 1200 psi can result in coating and CPC failure.

Information for detergents, cleaners, and washdown additives that are approved for use, can be found in **Appendix A**. In addition, the Defense Logistics Agency (DLA) maintains a catalog of "environmentally friendly" solvents, cleaning compounds, and related products. "The Environmental Products" catalog is updated annually, and is available on CD-ROM. The catalog identifies manufacturers, specifications, NSN's, costs, and intended applications of the products. The catalog as well as related information can be downloaded from DLA's Internet Website: <http://www.dscr.dla.mil>.

NOTE

Defense Logistics Agency item managers have selected the products in the above catalog based primarily on manufacturers' claims. The products may or may not have been tested by government activities to determine their effectiveness. The Environmental Protection Agency or the Federal Environmental Executive has not officially endorsed the catalog. Unless a product has been specifically tested, the NAVFAC Expeditionary Programs Office does not endorse any of the products found in the catalog over any competing product or process.

4-5. FRESH WATER WASHDOWNS.

CAUTION

Do not spray water on electronics or communications equipment or electrical connectors, since this may force water into these items. Clean these items by hand. Equipment damage may result if disregarded.

Fresh water washdown is the simplest cleaning method and is intended to remove contaminants so they do not accelerate corrosion. It is most effective when performed as soon as possible after equipment has been exposed to contaminants such as: seawater or sea-spray, road de-icing salts, mud, sand, beaches and large amounts of dust. If this is not possible, then weekly washdowns are recommended.

4-5.1 Washdown Inhibitors and Additives.

▲ WARNING

Washdown additive concentrate can cause eye irritation. Wear chemical splash proof goggles, and a face shield if needed, when mixing or using at full strength. If material contacts eyes, flush with plenty of fresh water. Follow instructions on MSDS. Loss of vision/eyesight is possible if disregarded.



Washdown additives should not be used at undiluted full strength on aluminum components, since they could cause increased pitting in crevices if disregarded.



The USMC CPAC Program Office has conducted corrosion testing of a number of commercially available washdown additives. Some products were found to have very little benefit above and beyond fresh water alone, while others caused increased pitting corrosion of aluminum alloys in crevices. Only use the additives listed below in the manner described. Contact the NAVFAC Expeditionary Programs Office for information on other additives.

Fresh water washdowns can be enhanced through the use of inhibitors and additives. The use of washdown inhibitors or additives is recommended when equipment has been exposed to seawater. These additives, which are mixed with fresh water, are made to help remove salt from surfaces. They can be used from a bucket, garden sprayer bottles, pressure washers, or other washing equipment. Two approved additives are listed below:

- "Saltbuster": Mix 8 ounces of additive per 1 gallon of fresh water. Can be used for all general washdown activities. This product contains a detergent, so that additional detergent cleaning may not be needed when it is used.
- "Corrostop": Although the label says to use 2 ounces per gallon of water, 8 ounces per gallon is recommended. Can be used for all general washdown activities, with no restrictions for aluminum.



Both of these products can help reduce corrosion when used undiluted at full strength if fresh water is not available, which may occur during deployment. However, observe the CAUTION for use with aluminum alloys.

4-5.2 Steam/Pressure Cleaning.



High pressure water can cause debris to become airborne. Wear chemical splash proof goggles and/or a face shield for eye protection. High temperature water/steam can cause burns. Wear water proof, heat resistant gloves.

Steam/Pressure is often used as a cleaning mechanism for Expeditionary equipment's exterior surfaces and undercarriages. It uses high pressure, high temperature freshwater to remove surface contaminants. It is a highly effective means of removing greases, oils and other salts from the surface of equipment.

Steam cleaning operations should only be carried out in areas with functioning oil/water separators.

4-6. ROUTINE DETERGENT CLEANING.



Keep cleaners out of eyes. Use splash proof goggles to prevent material from being splashed into eyes when being mixed and/or applied. In addition to goggles, a plastic face shield may also be used. The face shield is not to be used in lieu of goggles. If material contacts eyes, flush with plenty of water and follow instructions on MSDS. Loss of vision/eyesight possible if disregarded.



Do not spray water on electronics or communications equipment or electrical connectors, since this may force water into these items. Clean these items by hand. Equipment damage may result if disregarded.



Oil/water separators may be installed at the maintenance ramps at many units in garrison, in order to help control water pollution. Use only approved detergents. Unapproved soaps and detergents can prevent proper operation of the oil/water separators. If there is a question about detergent use, please contact the base environmental officer or the CPAC Program Office.

Detergent cleaning is often necessary to remove materials such as soils, oils and salts, which cannot be removed through fresh water washdown alone. They work by dissolving salt deposits, emulsifying oils and greases, and lifting other soils.

This cleaning method uses Detergent, Non-Ionic, MIL-D-16791, Type I, mixed with fresh water. Do NOT mix with seawater as indicated on the label. This detergent will dissolve salts and remove light oils, but is not effective for grease. It is a good cleaner for interior areas, plastics, and glass. Mix 1 ounce of detergent per 1 gallon of clean, fresh water. Warm or hot water will provide quicker cleaning, but cold water can be used.

Use of a pressure washer can speed overall equipment washdown, but must be used with care around electronic equipment. A pressure washer should not be used on interior areas. Manual cleaning with scrubbing brushes or a clean cloth can also be used. Rinsing with fresh water is recommended and should always be done if this cleaning method is being used in order to prepare a surface for touchup painting.

PPE Summary

- Chemical/splash proof goggles
- Face shield (as needed)
- Chemical protective gloves

4-7. CLEANING OF HEAVY SOILS.



Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded.

Cleaning stubborn soils, heavy oils and/or greases that cannot be removed with detergent and water may require a liquid cleaner such as MIL-PRF-85570 Type II. As indicated on the container label, this cleaner should be mixed 1 part cleaner to 4 parts fresh water for moderate soils, or 1 part cleaner to 1 part fresh water for heavier soils. Clean using a brush, sponge, or clean cloth, and then rinse the area with fresh water.

PPE Summary

- Chemical/splash proof goggles
- Face shield (as needed)
- Chemical protective gloves
- Organic vapor respirator (as needed)

4-7.1 Spot Cleaning. For spot cleaning of heavy oils or greases, pre-clean with one of the following solvents:

- Degreasing Solvent MIL-PRF-680, Type III
- Mineral spirits, ASTM D235
- Ultra Solv 221
- "Skysol". MIL-PRF-680 Type IV
- "Breakthrough". MIL-PRF-680 Type II

4-8. BATTERY COMPARTMENT CLEANING AND PRESERVATION.

Battery acid spills can be very corrosive. In some cases, the batteries may need to be disconnected and removed to have enough access to the compartment.



Do not permit sodium bicarbonate solution to enter battery cells.

Never use a wire brush to clean battery or battery posts. Use appropriate post and terminal cleaning tool, when cleaning is required. Spark hazard possible if disregarded.

Battery mats should only be installed in vehicles with steel battery boxes. The combination of water and a battery mat in an aluminum battery box may possibly cause accelerated corrosion of the aluminum.

If water gets into a battery box with a Battery Mat installed, the mat can wick up and retain the water for a long time. This could result in accelerated corrosion under the mat. If the battery box design on a vehicle is such that water (rain or surf) frequently gets into the box, do not use the Battery Mat, or plan to remove it and dry it out periodically.

4-8.1 Procedure. The following general steps are provided for cleaning battery compartments. Some modifications may be needed for different types of equipment.

- a. Disconnect, tag-out, and remove batteries as needed.
- b. Remove or loosen salt residue with bristle brush.
- c. Sponge clean with solution of one part sodium bicarbonate and sixteen parts fresh water.
- d. After solution stops bubbling, allow to set for five minutes.
- e. Sponge on solution again and rinse.
- f. Dry with a clean cloth.
- g. If battery compartment coating is damaged or failed, compartment should be re-coated. If applicable, follow procedures in equipment Technical Manual.

Once the compartments are cleaned, and any applied coating is cured, the batteries can be re-installed. The use of acid neutralizing "Battery Mat" under the batteries is recommended to help control corrosion in the compartments. They can be cut to fit a given battery box. If the battery posts and cable terminals need to be cleaned, use a post and terminal-cleaning tool as needed. After cables are connected to battery, apply GAA Grease or petrolatum to the terminal posts. Refer to [Chapter 6](#) for procedures on servicing battery cables and terminals.

Table 4-1 Cleaning Methods

When Used/Type Soil	Cleaning Compound	Mixing Directions	Procedures
Fresh Water Washdown			
General Cleaning - Washdown as soon as possible after exposure to contaminants, or weekly if possible.	None	N/A	(Paragraph 4-5) Use hose or bucket and sponge as needed.
Salt Removal - Washdown using additives as soon as possible after exposure to salts.	Washdown additives: "Saltbuster" -or- "Corrostop"	8 ounces additive per 1 gallon of fresh water. Can be used at full strength if no fresh water available - observe precautions for use on aluminum.	(Paragraph 4-5.1) Mix additives with water and washdown using pressure washers, bottle sprayers, hoses, or bucket as appropriate.
Soil, Oil and Debris - Steam Clean as soon as possible after exposure to contaminants.	Steam	N/A	(Paragraph 4-5.2) Use steam cleaning equipment.
Routine Fresh Water Cleaning with Detergent			
Soils, Oils and Salts not removed with fresh water - Routine monthly washdown or cleaning to remove dirt and salt deposits.	Detergent, Non-Ionic, MIL-D-16791, Type I	1 oz. detergent in 1 gal. fresh water. Warm or hot water is preferred, but cold water can be used.	(Paragraph 4-6) Use with a pressure washer for general washdowns, or buckets and clean cloth, or spray bottles for smaller areas. Rinse with fresh water after cleaning.
Heavy Soil Cleaning			
Heavy Soils - Washdowns to remove heavy soil as needed.	Cleaning Compound, Aircraft Surface MIL-PRF-85570, Type II	1 part cleaner to 4 parts fresh water for moderate soils. Use up to 1 part cleaner to 1 part water for heavy soils.	(Paragraph 4-7) Mix in bucket and use brush, sponge, or clean cloth. Rinse with fresh water after cleaning.
Spot cleaning of heavy soils and stains as needed.	Choice of various cleaning solvents: "Skysol" "Breakthrough" "Ultra Solv 221"	N/A	(Paragraph 4-7.1) Use solvent of choice on clean cloth.
Battery Compartment Cleaning			
Battery Compartment - As needed, or in conjunction with PMCS, to remove from battery compartment.	Sodium bicarbonate, A-A-374 ASTM D928	1 part sodium bicarbonate to 16 parts fresh water.	(Paragraph 4-8) Mix and apply with a sponge. Dry with a clean cloth.

CHAPTER 5

CORROSION ASSESSMENT METHODS

5-1. CORROSION ASSESSMENT.

Inspection of equipment by means of a corrosion assessment is the second step in the CPAC process. A corrosion assessment is performed through the use of the Corrosion Assessment Checklist. Deciding how often to conduct corrosion assessments is based on such factors as environment, operational conditions, historical knowledge of how prone the component is to corrosion and wear, and existing PMCS corrosion assessments. The more severe the environment or critical the component, the more frequent corrosion assessments should be performed.

The following sections provide an overview of how to assess and categorize corrosion conditions for Expeditionary equipment. The sections also present particular equipment areas and components known to be corrosion prone and that are to be included in your corrosion assessments. Depending on the findings of the corrosion assessments, use the appropriate procedures throughout this manual for possible courses of action.

5-2. CORROSION CATEGORIZATION.

In an effort to streamline corrosion condition reporting, the USMC CPAC Program Office has designated corrosion category codes for various corrosion maintenance conditions. Corrosion category codes are assigned based on findings from the Corrosion Assessment Checklist. A copy of the Corrosion Assessment Checklist can be obtained at www.marcorsyscom.usmc.mil/cpac.

The Corrosion Assessment Checklist is a series of questions about particular corrosion prone areas. Based on the answers to the questions an overall corrosion category code will be assigned. Corrosion category codes are based on a scale of 1 to 5 with 5 being the worst corrosion state. Corrosion category codes are summarized in [Table 5-1](#). Photographic examples of each corrosion category code are provided in ([Figures 5-1 through 5-13](#)) as references.

Corrosion assessments help personnel determine the level of corrective actions necessary. Some of the repair actions described in this table may be beyond organizational level capabilities - in this case, perform the maximum level of repair that is possible at your level.

Table 5-1 Corrosion Category Codes (CCC)

CCC/Maintainer	Description	Corrective Actions Necessary	Figures
1 Operator Level	Item requires no corrosion repair or preservatives, and has been assessed per MCO 4790.18_.	None	5-1 5-2
2 Operator or Organizational Level	Item requires surface preparation, spot painting and preservation at the operator/organizational level to return to CCC 1 condition. Repairable items will have degradation to include: small areas of coating loss; lack of sealants, preservatives or other visible CPCs; slight surface corrosion, running rust or small areas of loosely adhered rust product.	CCC 2 repair consists of: spot surface preparation, spot touch-up painting, application of CPCs and preservatives.	5-3

Table 5-1 Corrosion Category Codes (CCC) - Continued

CCC/Maintainer	Description	Corrective Actions Necessary	Figures
	Some items are required to be replaced when corroded or seized. These items will display surface corrosion, often to the point of pitting.		
3 Field Level Corrosion Repair Facility	Item requires maintenance beyond the operator level. Item requires a complete repainting and overcoat. Repairable items will have degradation to include: large areas of coating loss, moderate to heavy surface corrosion, adherent corrosion products and possible scaling, but the metal surfaces are sound.	CCC 3 repair consists of: up-to full vehicle surface preparation, painting and over coating, bedliner application, removal and application of CPCs and preservatives. Items will be required to be inducted into a corrosion facility.	5-4 5-5 5-6
4 Field Level or Depot Level	Item requires repair to sheet metal, major frame components, paint, blasting and undercoating. Repairable items will have degradation to include: large areas of coating loss, heavy surface corrosion, corrosion products and scaling, localized metal attack and pitting resulting in holes. Metal may or may not be sound.	CCC 4 repair consists of: small metal fabrication work, full vehicle surface preparation, painting and over coating, bedliner application, removal and application of CPCs and preservatives. Items will be required to be inducted into a corrosion facility.	5-7 5-8 5-9
5 Depot Level or Replacement	Item is degraded to a degree that requires depot level repair and/or replacement due to corrosion. Corrosion will have thinned or pitted the entire part to the point where it is cheaper to replace than to repair. The metal part has holes throughout, or most of its supporting edges have corroded completely away.	CCC 5 often requires the replacement of a piece of equipment. CCC 5 assets can present a safety hazard and should be removed from operational use.	5-10 5-11



Figure 5-1 Example 1 of Corrosion Category 1



Figure 5-2 Example 2 of Corrosion Category 1



Figure 5-3 Example of Corrosion Category 2



Figure 5-4 Example 1 of Corrosion Category 3



Figure 5-5 Example 2 of Corrosion Category 3



Figure 5-6 Example 3 of Corrosion Category 3



Figure 5-7 Example 1 of Corrosion Category 4



Figure 5-8 Example 2 of Corrosion Category 4



Figure 5-9 Example 3 of Corrosion Category 4



Figure 5-10 Example 1 of Corrosion Category 5



Figure 5-11 Example 2 of Corrosion Category 5

5-3. CORROSION PRONE AREAS.

Any area of Expeditionary equipment can become "corrosion prone" if it is neglected. There are various types of corrosion control measures available that are categorized in the following sections. By conducting a corrosion assessment, it ensures that paints and sealants are still in good shape and not blistering or peeling; electrical connector weatherproofing measures are still intact; and that CPC's, antiseizes, and other treatments are still present and effective.

5-3.1 Painted Surfaces. Routine equipment use can create scratches and chips through the paint to the underlying metal. Paint failure can also begin on corners and seams where the paint tends to be thinner. When protective coatings are damaged corrosion can start in these areas and spread, causing further paint failure. Areas of damaged paint, such as blistered (Figure 5-12) or peeling (Figure 5-13) areas can also trap water, increasing the occurrence of corrosion in these areas.



Figure 5-12 Blistering Paint



Figure 5-13 Peeling Paint

5-3.2 Moving Metal Surfaces. Corrosion and wear of a metal surface may result when protective and lubricating grease and oil films have been removed from sliding, rotating, or other moving bare metal surfaces. (See [Figure 5-14](#)).



Figure 5-14 Rusting of Vehicle Underbody Suspension Components

5-3.3 Batteries. Leaking fluids from batteries can damage both the coatings and bare metal. (See [Figure 5-15.](#))



Figure 5-15 Corrosion in a Battery Box

5-3.4 Plating. Plating includes anodizing on aluminum and metal plating on steel. Cadmium or zinc plating may be used on fasteners or other small parts. Anodized aluminum parts may be dyed different colors for easy identification. When these coatings begin to corrode, they usually give off a white corrosion product. For anodized aluminum parts with threads, a very small amount of corrosion may lead to seizing of the part. (See [Figure 5-16.](#))



Figure 5-16 Plated Fasteners

5-3.5 Fasteners. The most common problem is rusting of steel fasteners (Figure 5-17) once any protective coating has worn away. If rusting continues, it can result in seizing of the fastener when you try to remove it, or corroding away of the driving surfaces of screws and bolts. For steel or stainless steel fasteners in aluminum, dissimilar metal corrosion of the aluminum can result.



Figure 5-17 Fastener Corrosion

5-3.6 Hydraulic Cylinders. Hydraulic cylinder shafts are usually plated in order to provide corrosion resistance, and a hard, smooth surface. Look for pitting, bubbling, and dirt on the sliding shaft. Any of these conditions may damage the cylinder seals, causing the fluid to leak and require cylinder replacement. (See Figure 5-18.)



Figure 5-18 Hydraulic Cylinder Corrosion

5-3.7 Hydraulic, Brake, and Fuel Line Fittings. Fittings and couplings are needed to join sections of the tubing for these systems. They are also used in places where the tubing passes through sheet metal or connects to other equipment. (See [Figure 5-19](#).)

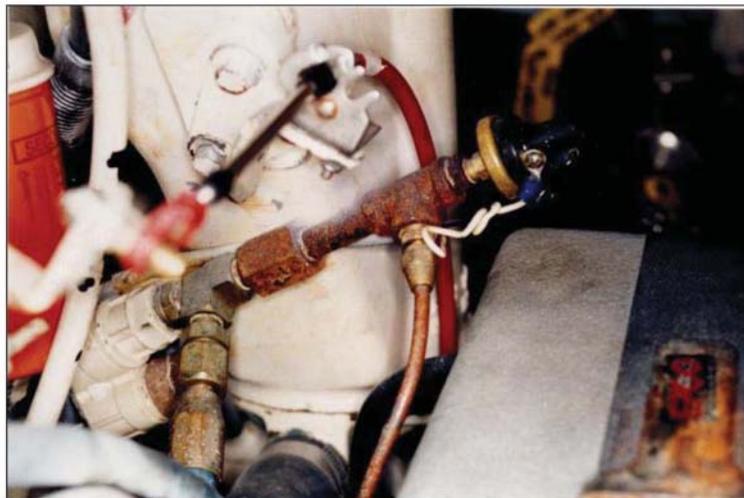


Figure 5-19 Rusted Fittings on Tubing

5-3.8 Crevices, Joints, and Seams. Riveted or intermittently welded lap joints, the edges of cover plates, label plates, and gaskets are all common crevice areas. These areas can hold moisture and stay wet even when the rest of the surrounding area appears to be dry. Pitting corrosion is common in crevices, especially in aluminum or between dissimilar metals. One sign that corrosion may be occurring in a crevice is bulging or buckling of the metal between rivets, welds or fasteners, with rust or white corrosion products seeping out of the crevice. (See [Figure 5-20](#).)



Figure 5-20 Rusting in Crevices Formed by Intermittent Welding

5-3.9 Dissimilar Metal Junctions. Steel-aluminum, stainless steel-aluminum, copper-aluminum, and stainless steel-steel are all common dissimilar metal combinations. Dissimilar metals in contact with each other, in the presence of moisture, can lead to corrosion (Review [paragraph 2-5.2](#)). The degree of this problem is not the same for all of these metal combinations, but by far the worst corrosion happens on aluminum when it is in contact with copper, brass, or bronze. Ensure that each of the metals is painted or that sealants or CPC sprays have been applied to the area to reduce the occurrence of corrosion in these areas. (See [Figure 5-21](#).)



Figure 5-21 Dissimilar Metal Corrosion of Aluminum Fitting on a Stainless Steel Wire Rope

5-3.10 Electrical Connectors. A common corrosion problem for electrical connectors is the corrosion of the connector shells due to wearing away the protective plating. This wear causes rapid shell corrosion and eventual seizing of the connector threads. Corrosion of the connector pins can also occur if moisture penetrates the inside of the connector. Two different weatherproofing methods are described in [Chapter 6](#), which include use of CPC sprays and coating the connector with two different types of sealants. (See [Figure 5-22](#).)



Figure 5-22 Corroded Aluminum Electrical Connector

5-3.11 Water Traps, Corners, Pockets. Look for any type of "built in" water trap or areas of standing water. (See [Figure 5-23](#).)



Figure 5-23 Rusted Out Truck Cab Bottom from Internal Water Trap

5-3.12 Floor Mats and Insulation. Water is often held in or under floor mats, causing corrosion. Thermal insulation around engine compartments can also wick and retain water. If floor mats are removable, pull them up during corrosion assessments. (See [Figure 5-24](#).)



Figure 5-24 Corrosion under Floor Mat

CHAPTER 6

GENERAL CPAC MATERIALS AND PROCEDURES

6-1. MATERIALS FOR CORROSION CONTROL.

This section discusses the various methods and products that are commonly used to help prevent corrosion. [Table 6-2](#) provides a list of general CPAC procedures for common generic problem areas on equipment. Descriptions of the materials referred to in the table are provided in [paragraphs 6-2](#) through [6-11](#).

6-2. RTV SILICONE RUBBER SEALANT.



Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded.

Avoid breathing vapors from sealants. Do not use sealants in poorly ventilated areas. Respiratory problems are possible if disregarded.



Many products that are called "RTV silicone rubber" sealants can produce acetic acid as they cure. This acid, which smells like vinegar, can be corrosive to bare metals. Use only RTV sealants that are labeled as MIL-A-46146, or those that are marked non-corrosive. Corrosion of metals may result if disregarded.



When an electrical connector coated with a sealant requires disconnection, you will need a fair amount of access in order to peel away the sealant. Therefore, these sealants should only be used on electrical connectors with good accessibility not frequently disassembled.

This product is a clear sealant addressed within specification MIL-A-46146. The sealant cures to a tough rubbery condition and can be used to weatherproof electrical connectors, terminal strips, ground point connectors, etc. after the connections have been made. The sealant can also be used to seal crevices from moisture penetration, and to encapsulate items such as fittings on hydraulic tubing lines. The use of a transparent sealant allows you to see if there is any corrosion under the sealant.

The sealant is designated as "flowable", since it is easy to spread and brush. While this makes it easier to apply, care must be used to prevent it from dripping. The sealant will remain flexible and intact over a temperature range of -60 to 350 °F. (Note that the 3145 RTV sealant shown in [Figure 6-1](#) below may also be used, but is considerably less fluid, making it harder to apply by brush. However, it may be better for seam sealing.)



Figure 6-1 RTV Silicone Rubber Sealants

The general application procedure is given below:

- a. The surfaces to be sealed must be clean and dry. Peel off any old sealant and degrease as required and described in [Chapter 4](#).
- b. When applying sealants to cover electrical connections, make sure the connections are properly seated prior to coating. Otherwise, the sealant could interfere with electrical continuity.
- c. Apply sealant from the tube and use either a finger or acid brush to work it into the joint or to smooth it.
- d. If used on an electrical connector, ensure that the connector is uniformly coated all-around. Coat the connector up to where it mates with the electrical receptacle.
- e. Uncured sealants can be cleaned up with mineral spirits.
- f. The sealants cure to a tack-free condition in about 1 hour for the thicker sealant and about 2 hours for the flowable sealant. Coated parts should not be handled for 24 hours.

PPE Summary

- Chemical protective gloves

6-3. ANTI-SEIZE COMPOUNDS AND THREAD TREATMENTS.



These thread treatments and anti-seize compounds should not be confused with thread locking compounds. Thread locking compounds are intended to prevent fasteners from loosening due to vibration. If an equipment TM calls for the use of a thread-locking compound, or if self-locking fasteners are used, then the anti-seize treatments described here should not be used. Fastener loss may result if disregarded.

Thread treatments and anti-seize compounds are used on fasteners to help prevent dissimilar metal corrosion and crevice corrosion in threaded joints. They can be used on many fasteners whenever they are installed.

6-3.1 Zinc Dust/Petrolatum Anti-Seize Compound (ZASC). ZASC is recommended when aluminum threads are present with either steel or stainless steel fasteners or inserts. The zinc helps provide corrosion protection for the aluminum or steel, and the petrolatum helps keep moisture out of the threads. ZASC can also be used on stainless steel fasteners to help prevent corrosion. ZASC can be reapplied as often as necessary. Instructions for its use are provided as follows. (See [Figure 6-2.](#)) DO NOT substitute a copper-containing or a graphite-containing anti-seize for the ZASC; the copper or graphite bearing materials can accelerate corrosion of aluminum, steel, or stainless steel materials.



Figure 6-2 Fastener Treatments (Zinc Dust Anti-Seize Top, Teflon Thread Compound, Bottom)

⚠ WARNING

Wire brushing can create flying debris. Wear appropriate eye and hand protection when wire brushing. Follow instructions on MSDS. Loss of vision/eyesight is possible if disregarded.

NOTE

Minimal cleaning is needed to use ZASC on fasteners. Remove old, caked anti-seize with a rag. If necessary, remove rust or corrosion products from steel or aluminum threads using a stainless steel wire brush.

At temperatures below freezing, the anti-seize can cake and be difficult to apply. At high temperatures (over 100 °F) the petrolatum becomes runny.

- a. Apply a liberal coating of ZASC to the threads of fasteners using either an acid swabbing brush or a finger. For fine threads on adjusting knobs or dials, only use a very small amount.
- b. Reinstall components as required.

PPE Summary

- Disposable or Chemical Protective Gloves

- Work Gloves (for wire brushing)
- Impact resistant goggles/glasses. (for wire brushing)

6-3.2 Teflon® Thread Compound. This material, like the anti-seize compound, is useful on fasteners for preventing corrosion between dissimilar metals and seizing. It also prevents corrosion in stainless steel fasteners and helps keep moisture out of the crevices in fastener threads. The advantages over ZASC are that the Teflon thread compound has a wider application and service temperature range and it will last longer. However, it is more expensive than ZASC. Application procedures are the same as for ZASC, [paragraph 6-3.1](#).

NOTE

This is NOT the same type of material that plumbers use which is commonly called "pipe dope".

6-4. CORROSION PREVENTIVE COMPOUNDS (CPCs).

WARNING

Wire brushing can create flying debris. Wear appropriate eye and hand protection when wire brushing. Follow instructions on MSDS. Loss of vision/eyesight is possible if disregarded.

Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded.

CPCs can be flammable. Keep containers away from steam lines, electronic equipment, or other heat sources. Do not disperse spray in the presence of flames, hot surfaces, or other sources of ignition. Do not incinerate or puncture can. Serious injury or possible death by fire may be possible if disregarded.

CPCs are sprays that should only be considered as a short-term corrosion preventive method. All of the CPCs are formulated to displace water from a surface. CPCs form a thin film on the component to be protected and are typically applied by either brushing or spraying. Descriptions of each type of CPC are given below.

6-4.1 Amlguard (MIL-DTL-85054, Type I). Amlguard forms a clear, dry, hard film that is about 1 mil thick. Amlguard is recommended for use **ONLY** on non-moving parts where bare metal is exposed, such as installed fastener heads or areas with scratched or damaged coating. For areas where the coating is damaged, it should only be considered as a temporary protective coating until the coating can be repaired per TM 4750-OD/1A. Amlguard takes about 1/2 hour to dry.

If Amlguard is used repeatedly on an area without cleaning and removing previous applications, it can build up a film that will tend to stay soft and tacky. This can result in dirt sticking and collecting on the surface. Therefore, always try to clean off any old films of Amlguard before applying more, or use this CPC sparingly. (See Figure 6-3.)



Figure 6-3 Amlguard (MIL-DTL-85054, Type I)

CAUTION

Amlguard is not to be used inside electrical connectors, since it dries to a hard film that would interfere with electrical contacts. Connection could seize together if caution is disregarded.

NOTE

Old films of Amlguard must be removed prior to performing any touch-up painting.

The general application procedure is given below:

- a. Wipe off dirt and moisture from the surface to be protected.
- b. If there is an old layer of Amlguard present, remove it using rags and a cleaning solvent. Mineral spirits, isopropyl alcohol, or dry cleaning solvent can be used to remove Amlguard.
- c. If there are corrosion products on the area to be treated, use either a metal wire brush or a fiber bristle brush to remove them.
- d. Spray a uniform coat of Amlguard directly on the area to be protected.

PPE Summary

- Chemical/splash proof goggles
- Chemical protective gloves
- Organic vapor respirator (as needed)
- Work gloves (for hand cleaning)
- Impact resistant goggles/glasses (for hand cleaning)

6-4.2 PMS-3. This material is used in the same applications as Amlguard. It comes in bulk and can be applied by brush, roller, or Prevail sprayer. (Note: PMS-3 is not to be used on the top or exposed sides of vehicles due to observability issues)

6-4.3 Thin-Film CPC (MIL-PRF-81309, Type II). This type of CPC is a soft film that displaces water and provides short-term corrosion protection of metal surfaces during shipment, storage, and in-service use. It also provides protection for some moving parts where some lubrication is required (such as hinge areas and sliding parts). It is useful for protecting areas that contain recesses or are hard to reach. The film is about 0.5 mil thick, is translucent, and is amber in color. Unlike Amlguard, it does not form a hard film. The application procedure is the same as for Amlguard, outlined in [paragraph 6-4.1](#). (See [Figure 6-4](#).)



Figure 6-4 Thin Film CPC (MIL-PRF-81309, Type II)

CAUTION

Do not use MIL-PRF-81309, Type II, PMS-3 or Amlguard CPCs where the use of ultra-thin film CPC Type III is intended. Electrical hazard could result if caution is disregarded.

6-4.4 Ultra-Thin Film CPC (MIL-PRF-81309, Type III). This type of CPC forms an extremely soft and thin film that displaces water and provides short-term corrosion protection of metal surfaces. It is often called "avi-ionic" CPC because it is widely used on aircraft electrical equipment. Although the coating is non-conductive, it is so soft and thin that it can be used in an electrical connector before assembly, which is the main use of this material, as described in [paragraph 6-6](#). (See [Figure 6-5](#).)

NOTE

The application procedure is similar to that of the other CPCs.



Figure 6-5 Ultra-Thin Film CPC (MIL-PRF-81309, Type III)

6-5. VAPOR CORROSION INHIBITORS (VCIs).

VCI tape and cartridge emitters are intended for use in enclosures that are infrequently opened and have little or no airflow. Typical uses are in electronics and communications cabinets and boxes, circuit breaker boxes, and the like. They should not be installed in enclosures having forced air ventilation. (See [Figure 6-6](#).)

These devices work by emitting an invisible vapor of a corrosion-inhibiting compound. This vapor spreads through the air and will be used up quickly if there is ventilation. They are available in the form of self-adhesive cartridges and foam adhesive tapes. Depending on the volume, or size, of the enclosure, and how often it is opened, the VCI will require periodic replacement. If the components inside the enclosure are already corroded, the benefit of the VCIs may not be evident, since they cannot remove existing corrosion.

A VCI device can provide corrosion protection between 18 and 24 months. In order to provide continuous protection, they must be replaced after this time. The service life of VCI devices will be affected by how many times the enclosure has been opened. Opening the enclosure will shorten the service life of the VCI. Unfortunately, there is no easy way to tell if the chemical compound in the device is depleted, so it is recommended that they be replaced every 18 months, or as part of vehicle pre-deployment preparations. (See [Figure 6-6](#).)



Figure 6-6 VCI Emitter Installed in Electrical Enclosure

6-5.1 General Application Procedures.

- a. Open the cover/lid/door of the area/enclosure to be treated.
- b. If a VCI device has previously been installed, the enclosure should be allowed to vent for 3 minutes prior to working inside.
- c. Locate a spot within the enclosure to be treated where the VCI device can be installed without interfering with moving parts or becoming an obstruction. Recommended locations include inner walls/sides of the enclosure such that the VCI device does not hinder access to other components inside the enclosure. Be sure not to place VCI devices on any moving parts, circuit boards, or contacts. A location for the VCI device should be chosen so that in the unlikely event that it falls off, it will not land on any area or component where it could cause damage or cause moving parts to be obstructed.
- d. Determine the volume of the enclosure to be protected and select the appropriate number and type of VCI device(s) required. VCI devices will protect the following volumes of air.
 - Vapor Phase Corrosion Inhibitors (VCI) foam tape emitter for 1 cubic foot.
 - Vapor Phase Corrosion Inhibitors (VCI) cartridge emitter for 5 cubic feet.
 - Vapor Phase Corrosion Inhibitors (VCI) cartridge emitter for 11 cubic feet.
- e. If an expired VCI device is present, remove and dispose of it in accordance with local regulations.
- f. If there is any moisture or dirt in the enclosure, wipe the area with a clean, dry cloth.
- g. Remove the VCI device from wrapper.
- h. Peel off the adhesive backing. Do not peel, puncture, or otherwise damage the breathable paper covers on the cartridge device.
- i. Stick the adhesive side of the VCI device on a clean, dry surface.

PPE Summary

- Organic vapor respirator (if needed)

6-6. ELECTRICAL CONNECTOR WEATHERPROOFING.

Expeditionary equipment contains an array of electrical hardware. Wiring harnesses and electrical connectors are key links that enable the system to work together. Therefore, relatively small corrosion problems in electrical connectors can lead to larger problems that can impact mission readiness. Weatherproofing is intended to prevent these problems:

- Corrosion of the contacts inside of the connectors can cause faulty signals.
- Corrosion of the outer shells can cause moisture intrusion and seizing of threads, leading to increased maintenance time.
- Moisture intrusion into the connectors and receptacles can also cause shorting.

Three types of connector weatherproofing are described: the clear RTV silicone rubber sealant from [paragraph 6-2](#); a brushable or a sprayable preservative; and wrapping with a special grade of electrical tape. The ultra-thin film Type III CPC is recommended for use inside the connectors for each of these methods. Choosing between the methods for individual connectors is up to the discretion of the using units, since there are trade-offs to be made for each method. [Table 6-1](#) summarizes the pros and cons of the methods to help you choose between them. These methods can be used for in-line connectors or for places where a connector is mated to a receptacle on the surface of an electronics box or cabinet. (See [Figure 6-7](#).)



Figure 6-7 Electrical Connector and Receptacle

6-6.1 Preliminary Connector Cleaning. For the best results for each of these methods, the connector and receptacle to be treated should be clean and dry. Cleaning procedures are provided below, but they can be adapted to meet the needs of the user.



Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded.

CAUTION

Do not use abrasive material or wire brush on new aluminum connectors to prevent damage to protective plating. Use only enough force to clean away corrosion on existing connectors. Premature metal failure may result if disregarded.

- a. Use a clean cloth and cleaning solvent to clean the connector, back-shell, the mating receptacle (if applicable), and the cable sheathing/wiring harness at least 2 inches beyond the connector. Use solvents described in [Chapter 4](#) or other approved solvents currently used by the unit's electrical personnel that do not damage the cable sheathing. Aluminum electrical connectors already have a thin, corrosion protection plating on them, but white corrosion products will form as this plating wears off. Remove any corrosion products with a non-metallic bristle brush to prevent damage to the connector shell.
- b. Disconnect the cable connector from the receptacle. If the connector threads are seized, perform the following steps.
 - (1) Liberally apply MIL-PRF-32033 penetrating oil to connector at receptacle interface.
 - (2) Wrap rag soaked with penetrating oil around the area. Allow soaking for 30 minutes.

CAUTION

Care should be taken not to damage tool-gripping surfaces while attempting to loosen connector. Destruction of connector is possible if disregarded.

- (3) Try to rotate the connector by hand first, and then use connector pliers to loosen the connector from the receptacle.
 - (4) If unsuccessful, reapply penetrating oil as in step b (1) and b (2), but allow soaking for 4 hours before repeating step b (3).
- c. Use isopropyl alcohol and a clean rag for the final rinse of the connector and cleaning of threaded areas.
 - d. Spray CPC Type III inside and on the connection before mating the connector.

Table 6-1 Electrical Connector Weatherproofing Method Selection Guide

Method	Pros	Cons
RTV Silicone Rubber Sealant MIL-A-46146 (paragraph 6-6.2)	<ul style="list-style-type: none"> • Transparent - can see through it. • Simple to apply from tube. • Good protection for medium term. • Good for connectors that are infrequently removed. • Low-moderate cost. 	<ul style="list-style-type: none"> • Longer cleanup • Dripping possible with flowable type. • Need adequate access to peel off old sealant when disconnecting.
Brushable or Sprayable Preservative Treatments	<ul style="list-style-type: none"> • Lowest cost. • Easy to apply by brush or spray. • Good for frequently removed connectors. 	<ul style="list-style-type: none"> • Relatively short term protection only. • Cures by solvent evaporation - needs adequate ventilation.

Table 6-1 Electrical Connector Weatherproofing Method Selection Guide -

Continued

Method	Pros	Cons
Brushable MIL-PRF-16173 Grade IV (paragraph 6-6.3.1)		<ul style="list-style-type: none"> • May need to solvent clean periodically to remove old treatments prior to applying new.
Sprayable MIL-PRF-81309 CPC, Type II (paragraph 6-6.3.2)		
Self-fusing Silicone Rubber Electrical Tape Wrap A-A-59163, (paragraph 6-6.4)	<ul style="list-style-type: none"> • Low cost. • Easy to apply if connector is not obstructed. • Easy to remove if needed. • Good for frequently removed connectors. 	<ul style="list-style-type: none"> • If moisture gets under tape due to poor application, corrosion may be undetected under tape.

PPE Summary

- Chemical/splash proof goggles
- Chemical protective gloves
- Organic vapor respirator (as needed)

Connector is now ready for one of the following treatments.

6-6.2 Room Temperature Vulcanizing (RTV) Silicone Sealant. Refer to [paragraph 6-2](#) for background and application instructions. This material is applied after the connector has been installed onto the receptacle. Apply with brush to cover the entire connector, receptacle, and a short distance (approx. 1/4 inch) down the cable to provide a waterproof seal. (See [Table 6-1](#).)

6-6.3 Brushable or Sprayable Preservative. These are simple and easy to apply materials that are good for quick pre-deployment treatments. Two types are described below.

6-6.3.1 Brushable Preservative. This material is MIL-PRF-16173 Class 2, Grade 4. It provides good corrosion protection for electrical connectors and solenoids that are hard to reach. It also works well in areas where large amounts of water collect on or run off of structures. It forms a thin, relatively dry, semi-transparent film through which identification can be read, and is light brown in color. It may be used at temperatures down to -40 °F. Application instructions are given below. (See [Table 6-2](#).)



Solvents are flammable and toxic. Use only in well ventilated spaces. If ventilation cannot be provided and work would result in breathing solvent vapors, wear air-purifying respirator equipped with organic vapor cartridge. Do not use near open flames or sources of sparks. Do not smoke in the area where solvents are

Warning - precedes

being used. Do not allow prolonged contact of solvent with bare skin. Respiratory problems or skin rashes are possible if disregarded.

NOTE

MIL-PRF-16173 Grade 4 is a non-water displacing substance and must be applied to dry surfaces. Trapped moisture/water will cause the corrosion.

6-6.3.2 General Application Procedures.

- a. Wipe off dirt and excess moisture. If there is old preservative present, it may be removed by using a non-synthetic wiping cloth that is wetted with dry cleaning solvent, mineral spirits, or paint thinner.
- b. Apply a coat of MIL-PRF-16173, Class 2, and Grade 4 brushable sealant.

PPE Summary

- Chemical/splash proof goggles
- Chemical protective gloves
- Organic vapor respirator (as needed)

6-6.3.3 Sprayable Preservative. This is the MIL-PRF-81309 thin film Type II CPC described in [paragraph 6-4.3](#). It should only be used on the outer shell of an electrical connector after the connection has been made. (See [Table 6-1](#).)

6-6.4 Silicone Rubber Electrical Tape Wrap. This tape can be used in service temperatures between -90 °C and 260 °C (-130 °F to 500 °F). When wrapped tightly around itself, it will adhere to itself and prevent moisture entry. The tape has a slightly triangular cross-section to facilitate overlapping, and a color guideline in the middle to indicate the amount of overlap. (See [Table 6-1](#).)

6-7. CREVICE COATINGS, CORROSION INHIBITING PENETRANTS.

Crevice on equipment are a result of the assembly or configuration of individual components. Examples include bolted, tack welded, and intermittently welded components. Crevices are a potential site of heavy corrosion since they are often difficult or impossible to access. However, crevices can be treated with special coatings to help prevent corrosion from occurring within them. These products work by being applied directly to the crevice area; the coating penetrates the crevice, and acts to inhibit corrosion.

Crevice coatings approved for use on Expeditionary equipment have been selected based on comparative tests sponsored by the USMC CPAC Program Office. Application of these products is very simple, since you are not expected to be able to gain access to the crevice to clean it. They are just sprayed onto the crevice area and allowed to penetrate.

NOTE

Since these products produce non-drying films, they may tend to collect dust and dirt. Therefore, their use is not recommended for sliding bare metal surfaces, except for hydraulic cylinder pistons.

6-7.1 Corrosion Preventive Lubricant and Penetrant. This is a wool-wax based product that offers good corrosion protection, penetration, lubrication, and water displacement. The appearance of this compound is a light milky liquid that turns a clear amber color upon exposure to air. It will bubble for a short time after application as the propellant evaporates. The film is soft and does not dry out. It can be applied from a spray can.

NOTE

In addition to crevices, potential applications for this preservative include moving parts such as rollers, gears, and hinges; joints formed by fasteners; and wire ropes. It can be removed using mineral spirits or dry cleaning solvent.

6-7.2 Rust Inhibiting Compound. This product is a petroleum based compound that looks similar to automotive transmission fluid. It is Carwell T-32 and can be used in the same applications as the penetrant described above.

CAUTION

Rust Inhibiting Compounds should not be applied directly to rubber seals, gaskets or other rubber materials. Damage may occur if caution disregarded.

6-7.3 Axxanol 46 Bio. Axxanol 46-Bio is a bio-based, sprayable corrosion inhibitor preservative-lubricant used to stop rust on iron and steel, and other corrosion on aluminum and its alloys. Axxanol is made with renewable agricultural vegetable oils, and provides environmental benefits for responsible use and disposal. It contains no petroleum, making it less flammable than mineral oil-based corrosion preventive compounds (CPC).

6-8. BATTERY MATS.**NOTE**

Battery mats should only be installed in vehicles with steel battery boxes. The combination of water and a battery mat in an aluminum battery box may possibly cause accelerated corrosion of the aluminum.

Corrosion problems often occur in equipment battery compartments as a result of battery acid leakage. To help prevent this from occurring, you can install protective mats within the battery compartment. These mats work by neutralizing the battery acid that comes into contact with it. Installation typically involves opening the compartment, removing the battery, installing the mat, and then reinstalling the battery. Cleaning the battery compartments and use of the mats was described in more detail in [paragraph 4-8](#).

6-9. CLEANER, LUBRICANT, PRESERVATIVE (CLP).



Do not use CLP on rubber or other elastomeric parts such as O-rings. CLP contains solvents, which may degrade these parts if caution disregarded.

CLP is a thin corrosion preventive lubricant per specification MIL-PRF-63460. It is commonly used for corrosion prevention of weapons where only thin film products can be used in order to prevent sticking and seizing.

6-10. DESICCANTS.

Desiccants are chemical compounds that absorb moisture from the air. They are commonly used in closed spaces to keep the humidity down, and therefore prevent corrosion. They are sometimes used together with the VCI's, described in [paragraph 6-5](#).

6-10.1 Silica Gel. A chemical called "silica gel" is one commonly used desiccant, and is often packaged in small packets. These packets are then put inside communications and electronics boxes, storage containers, and shipping crates.

A desiccant pack or pouch can only adsorb so much moisture before it becomes saturated. At that point, it needs to be replaced, since a wet desiccant bag lying on a metal surface can cause corrosion. Many desiccants contain an indicating chemical that changes color from blue to pink to indicate that they have reached the saturation point. Some types of desiccants can be baked in an oven or heated to remove the moisture in them so that they can be used again.

For available NSNs and sizes, refer to [Table A-2](#), Item 21. The term "unit" indicates the size of the desiccant pack, which is actually a measurement of how much moisture the pack will adsorb. For example, the desiccant pack shown in [Figure 6-8](#) below is approximately a 1/6th-unit pack.

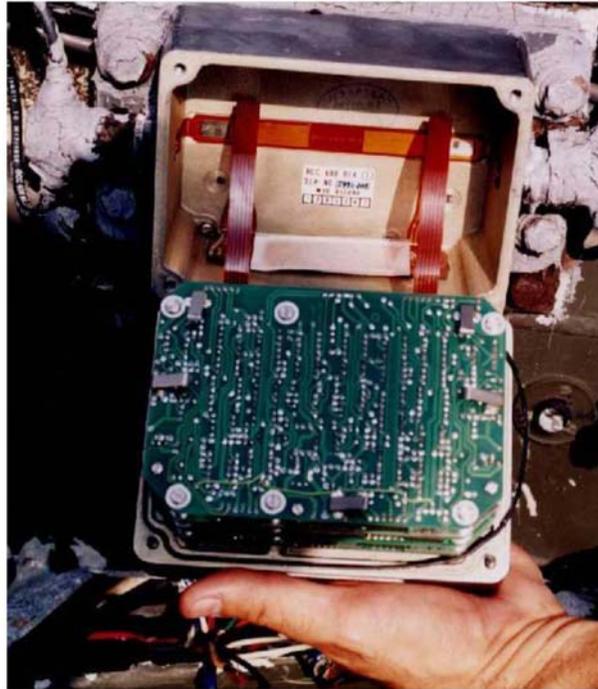


Figure 6-8 Desiccant Pack Installed in Intercom Box

6-11. SOLID DRY FILM LUBRICANTS.

Solid dry film lubricants are thin film coatings that are intended to reduce wear and prevent seizing and corrosion. The coating contains very fine lubricating particles and a corrosion inhibitor. The one described here (MIL-L-23398), can be applied with a spray can and will dry in air after about six hours. However, if the coated part is heated to about 250 °F, it will dry cure in about one hour. The useful life of this product may range between six months and two years, depending on how much wear there is on the coated surface.

6-11.1 Dry Film Lubricants vs. Other CPCs. This CPAC method is different from the short-life expectancy of the CPCs listed in [paragraph 6-4](#) and the crevice coating and lubricants in [paragraph 6-7](#), in that it cures to form a dry film. The advantage to this is that the dry film will not collect dust or dirt like the other products, which stay wet or tacky. Since the dry film lubricant is very thin (between 0.0002 and 0.0005 inches, or 0.2 to 0.5 mils thick), it can be used in places where normal paints cannot be used if there is very little clearance between moving parts.

Solid dry film lubricants may be used on steel and aluminum surfaces, and are generally useful for sliding motion applications, such as hinges and cam surfaces. This lubricant is not recommended for roller bearing elements. It is also not recommended for use in conjunction with other oils and greases. It may often be called for use in TMs for gun and weapon systems.

The solid dry film lubricant should be applied to clean, dry surfaces. Any old dry film lubricant should be removed prior to reapplication. Solvent cleaning methods described in Chapter 4 should be used for cleaning.

Table 6-2 Generic CPAC Applications

Area to Treat	CPC	Reference Paragraph
<p>Painted Surfaces - temporary preservation of chipped or damaged paint until coating can be repaired.</p> 	<ul style="list-style-type: none"> • Amlguard Hard Film, Type I CPC or • PMS-3 hard film CPC <div style="text-align: center; border: 1px solid black; background-color: #4a7ebb; color: white; padding: 5px; width: fit-content; margin: 10px auto;"> <p>NOTE</p> </div> <p>The CPCs listed above are temporary in nature and should only be utilized until proper surface preparation and touch painting can be performed per TM 4750-OD/1A.</p>	<ul style="list-style-type: none"> • 6-4.1 • 6-4.2
<p>Bare Metal Surfaces- requiring lubrication, protection, where a wet film is OK.</p> 	<ul style="list-style-type: none"> • Corrosion Preventive Lubricant/Penetrant or • Rust Inhibiting Compound 	<ul style="list-style-type: none"> • 6-7.1 • 6-7.2

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Bare Metal Surfaces- requiring lubrication, protection, where a thin, dry lubricant is needed, especially sliding surfaces.</p> 	<ul style="list-style-type: none"> • Solid Dry Film Lubricant 	<ul style="list-style-type: none"> • 6-11
<p>Small Arms, Weapons</p>	<ul style="list-style-type: none"> • CLP as directed by PCMS for weapon or • Dry Film Lubricant for sliding surfaces, as directed by PCMS for weapon 	<ul style="list-style-type: none"> • 6-9 • 6-11
<p>Electrical Connectors - frequently disconnected.</p> 	<ul style="list-style-type: none"> • Clean connector then • Apply Ultra-Thin Film Type III CPC inside connector 	<ul style="list-style-type: none"> • 6-6.1 • 6-6.4

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Electrical Connectors- seldom disconnected.</p> 	<ul style="list-style-type: none"> • Clean connector then • Apply Ultra-Thin Film Type III CPC inside connector then • Apply RTV Silicone Sealant to outside back of connector once connection is made 	<ul style="list-style-type: none"> • 6-6.1 • 6-4.4 • 6-2
<p>Battery Boxes- steel only.</p> 	<ul style="list-style-type: none"> • Clean and install battery mat 	<ul style="list-style-type: none"> • 6-8

Table 6-2 Generic CPAC Applications - Continued

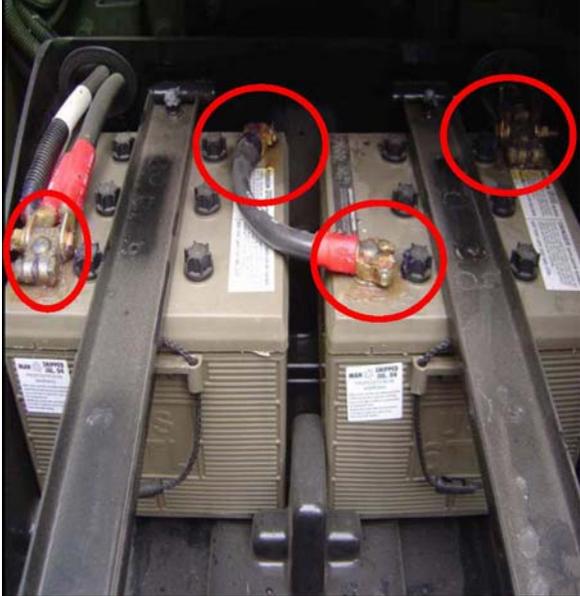
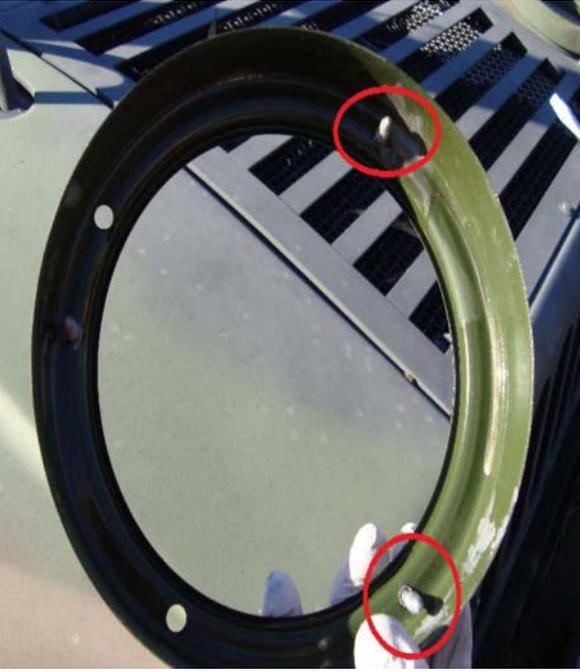
Area to Treat	CPC	Reference Paragraph
<p>Battery Terminals.</p> 	<ul style="list-style-type: none"> Automotive and Artillery Grease (GAA) or Petrolatum on terminals. Do not disconnect when applying. 	<ul style="list-style-type: none"> 4-8, 6-8
<p>Threaded Fasteners- frequently removed.</p> 	<ul style="list-style-type: none"> Zinc Dust Anti-Seize Compound (ZASC) or Teflon Thread Compound (TEFGEL) 	<ul style="list-style-type: none"> 6-3.1 6-3.2

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Threaded Fasteners- infrequently removed.</p> 	<ul style="list-style-type: none"> • RTV Silicone Sealant, applied to exposed heads or nuts 	<ul style="list-style-type: none"> • 6-2
<p>Hydraulic Tubing Line Fittings</p> 	<ul style="list-style-type: none"> • RTV Silicone Sealant 	<ul style="list-style-type: none"> • 6-2

Table 6-2 Generic CPAC Applications - Continued

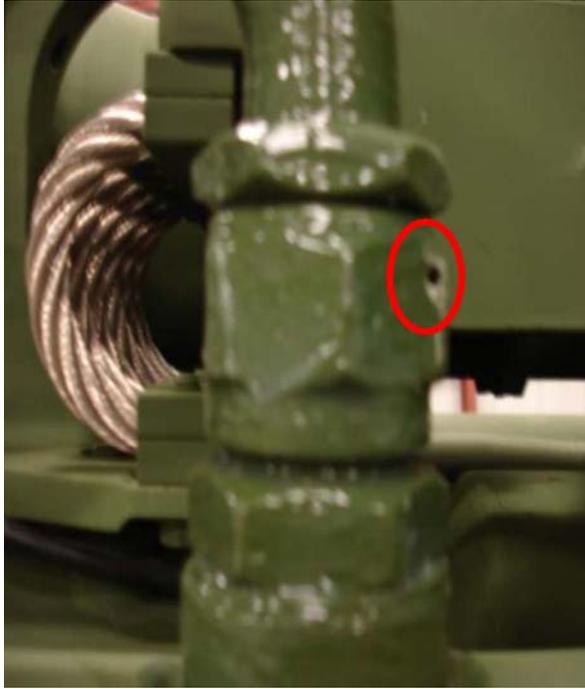
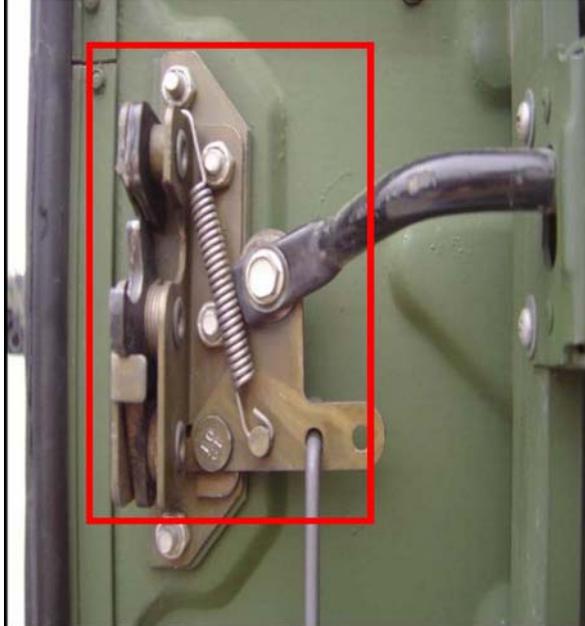
Area to Treat	CPC	Reference Paragraph
<p>Fittings with Oil Passages</p> 	<ul style="list-style-type: none"> • RTV Silicone Sealant <div style="text-align: center; border: 1px solid black; background-color: yellow; padding: 5px; width: fit-content; margin: 10px auto;"> CAUTION </div> <p>Particular attention must be paid to ensure Oil Passages are not covered with RTV Silicone Sealant.</p>	<ul style="list-style-type: none"> • 6-2
<p>Latches, Springs, Cables, Rollers, etc.</p> 	<ul style="list-style-type: none"> • Corrosion Preventive Lubricant/Penetrant or • Aerosol spray Thin Film Type II CPC or • Rust Inhibiting Compound 	<ul style="list-style-type: none"> • 6-7.1 • 6-4.3 • 6-7.2

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Miscellaneous Electronics and Communications Enclosures - non-ventilated, subject to internal component corrosion due to humidity and condensation.</p> 	<ul style="list-style-type: none"> • Vapor Corrosion Inhibitor (VCI) device inside box, sized for volume of enclosure or • Desiccant packet and • Seal seams with RTV Silicone Sealant <div style="text-align: center; border: 2px solid black; background-color: yellow; padding: 5px; width: fit-content; margin: 10px auto;"> <p>CAUTION</p> </div> <p>This line item is for use only by personnel qualified to open and work in electronics and communications equipment.</p>	<ul style="list-style-type: none"> • 6-5 • 6-10 • 6-2
<p>Hinges (Piano Hinges, Door & Hood Hinges, Covers, etc.)</p> 	<ul style="list-style-type: none"> • Corrosion Preventive Lubricant/Penetrant or • Rust Inhibiting Compound 	<ul style="list-style-type: none"> • 6-7.1 • 6-7.2

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p data-bbox="196 338 787 401">Crevices (Lap Joints, Bolted Joints, Intermittent Weld Joints, etc.)</p> 	<ul style="list-style-type: none"> <li data-bbox="820 338 1295 415">• Corrosion Preventive Lubricant/Penetrant or <li data-bbox="820 436 1133 470">• Rust Inhibiting Compound <li data-bbox="820 541 1328 667">• On newer equipment where crevices were sealed by the OEM, RTV Silicone Sealant may be used to replace missing or damaged sealant 	<ul style="list-style-type: none"> <li data-bbox="1344 338 1425 371">• 6-7.1 <li data-bbox="1344 436 1425 470">• 6-7.2 <li data-bbox="1344 541 1409 575">• 6-2
<p data-bbox="196 1094 386 1127">Push Pull Cables</p> 	<ul style="list-style-type: none"> <li data-bbox="820 1094 1263 1171">• Aerosol spray Thin Film Type II CPC or <li data-bbox="820 1192 1133 1226">• Rust Inhibiting Compound 	<ul style="list-style-type: none"> <li data-bbox="1344 1094 1425 1127">• 6-4.3 <li data-bbox="1344 1192 1425 1226">• 6-7.2

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Diagnostic Ports and Electrical Cannon Plugs</p> 	<ul style="list-style-type: none"> • Ultra-Thin Film Type III CPC inside diagnostic ports and electrical cannon plugs 	<ul style="list-style-type: none"> • 6-4.4
<p>Radiators</p> 	<ul style="list-style-type: none"> • Corrosion Preventative Lubricant/Penetrant or • Rust Inhibiting Compound along bottom forward edge, sides along welds and all bolted brackets. 	<ul style="list-style-type: none"> • 6-7.1 • 6-7.2

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Headlights</p> 	<ul style="list-style-type: none"> • Clean connectors then • Apply Ultra-Thin Film Type III CPC inside connectors then • Apply Thin Film Type II CPC inside headlight housing and headlight ring then • Apply Amlguard Hard Film, Type I CPC to outside back of headlight housing then • Apply Zinc Dust Anti- Seize Compound (ZASC) to headlight ring fasteners 	<ul style="list-style-type: none"> • 6-4.4 • 6-4.3 • 6-4.1 • 6-3.1
<p>Taillights</p> 	<ul style="list-style-type: none"> • Apply Ultra-Thin Film Type II CPC inside Taillight housing then • Apply Zinc Dust Anti- Seize or Tef-Gel (if required) to taillight cover fasteners 	<ul style="list-style-type: none"> • 6-4.4 • 6-3.1

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Lifting Shackles (Lap Joints, Bolted Joints, Intermittent Weld Joints, etc.)</p> 	<ul style="list-style-type: none"> • Thin Film Type II CPC or • Rust Inhibiting Compound 	<ul style="list-style-type: none"> • 6-4.3 • 6-7.2
<p>Inside Storage Boxes</p> 	<ul style="list-style-type: none"> • Thin Film Type II CPC or • Rust Inhibiting Compound <div style="text-align: center; margin: 10px 0;"> <div style="background-color: #0056b3; color: white; padding: 5px; display: inline-block;">NOTE</div> </div> <p>Due to the amount of condensation that can occur inside of a closed storage box, the CPC will be applied to the entire inside surface of the box.</p>	<ul style="list-style-type: none"> • 6-4.3 • 6-7.2

Table 6-2 Generic CPAC Applications - Continued

Area to Treat	CPC	Reference Paragraph
<p>Latch, Pin</p> 	<ul style="list-style-type: none"> • Remove pin from housing, apply Automotive and Artillery Grease (GAA) to side surface and reinstall then • Corrosion Preventative Lubricant/Penetrant or • Rust Inhibiting Compound applied to outside of pin 	<ul style="list-style-type: none"> • 6-7.1 • 6-7.2

APPENDIX A

CORROSION CONTROL CHEMICALS, LUBRICANTS, MATERIALS, AND SUPPLIES

Table A-1 Cleaners, Detergents and Solvents

Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
1	Cleaning Compound, Solvent	MIL-PRF-680, Type III P/N AA59601-3C P/N AA59601-3D P/N AA59601-3E P/N AA59603-3F	6850-01-377-1811 6850-01-377-1808 6850-01-377-1809 6850-01-331-3349	PT QT GL 5 GL CN
2	Thinner, Paint Products Regular Regular Regular High Flash Point (60 °C) High Flash Point (60 °C)	Type I P/N ASTM D235-1C-001Q P/N ASTM D235-1C-001G P/N ASTM D235-1C-055G Type II ASTM D235-2C-001Q ASTM D235-2C-001G	8010-00-290-4079 8010-00-242-2089 8010-00-246-6116 8010-01-122-2136 8010-00-246-6112	1 QT CN 1 GL CN 55 GL DR 1 QT CN 1 GL CN
3	Cleaning Compound, Aircraft Surface	MIL-PRF-85570, TYPE II	6850-01-239-0571 6850-01-235-0872 6850-01-248-9828	1 GL CN 5 GL CN 15 GL DR
4	Detergent, Non-Ionic, Water Solvent	MIL-D-16791 TYPE I	7930-00-282-9699 7930-00-985-6911	BX 5 GL CN
5	Isopropyl Alcohol, Technical Grade A Grade B	P/N TT-I-735AGRADE A P/N TT-I-735GRADEB	6810-00-286-5435 6810-00-855-6160	1 GL CN 5 GL CN
6	Cleaning Compound, Solvent	P/N SKYSOL/CN/5GL P/N SKYSOL/DR/55GL	6850-01-381-4420 6850-01-472-2719	5 GL CN 55 GL DR
7	Cleaning Compound, Solvent	P/N BT05 P/N BREAKTHROUGH BT/55	6850-01-474-2317 6850-01-474-2316	5 GL CO 55 GL DR
8	Cleaning Solvent, "Ultra Solv 221"	Type III, MIL-PRF-680	6850-01-474-2318	GL
9	Cleaning Compound, Solvent SC1000 Protective Soil Remover Concentrate	P/N VPW-SC-1000-1 P/N VPW-SC-1000-55 P/N VPW-SC-1000-55S	6850-01-505-7202 6850-01-474-1273 6850-01-474-1311	BX 5 GL CO 55 GL DR

Table A-2 Corrosion Preventive Compounds and other Misc CPAC Products

Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
1	Corrosion Preventive Compound, Solvent Cutback, Cold Application	MIL-PRF-16173 Class 1, Grade 4 P/N NOX-RUST 366 P/N C/0846IF80 P/N ROYCO 194R	8030-00-903-0931 8030-00-062-5866 8030-00-526-1605	1 PT CN 1 GL CN 5 GL CN
2	Corrosion Preventive Compound, Water Displacing, Thin Film			

Table A-2 Corrosion Preventive Compounds and other Misc CPAC Products -

Continued

Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
	(Class 1 = Non-pressurized)	Type II , MIL-PRF-81309 Class 1, P/N M81309-A10	8030-00-213-3279	1 GL CN
	(Class 2 = Pressurized)	Type II , MIL-PRF-81309 Class 2, P/N M81309-A2C02	8030-00-938-1947	16 OZ CN
3	Corrosion Preventive Compound, Water Displacing, Ultra-Thin Film	MIL-PRF-81309 Type III, Class 2, P/N M813092	8030-00-546-8637	16 OZ CN
4	Corrosion Preventive Compound, Lubricant and Penetrate	P/N FLUID FILM AS	8030-01-387-1131	12 OZ CN BX OF 12
5	Corrosion Preventive Compound, Water Displacing (Formerly AMLGUARD)	Type I & II , MIL-DTL-85054	8030-01-347-0979 8030-01-347-0980 8030-01-347-0981 8030-01-347-0982 8030-01-347-0983	14 OZ CN 14 OZ CN 1 QT CN 1 GL CN BT
6	CLP (Cleaner, Lubricant, Preservative)	Type II, MIL-PRF-63460 P/N BF-CLP-4CE P/N 3058220120 P/N CLP-7	9150-01-079-6124 9150-01-054-6453 9150-01-053-6688	4 OZ BT 1 PT BT 1 GL BT
7	Zinc Dust Anti-Seize Compound (ZASC)	A-A-59313	8030-00-292-1102	8 OZ TU
8	Corrosion Preventive Compound, 12 16 oz. bottles 5 Gallon	CARWELL T-32 P/N 732CP90 P/N 732P5	8030-01-414-7423 8030-01-414-8947	1 BX 5 GL CN
9	Sodium Bicarbonate, Technical	P/N ASTM D 928	6810-00-297-0092	50 LB BG
10	Petrolatum, Technical	VVP236	9150-00-250-0931	8 OZ TU
11	Lubricating Oil, General Purpose (Water Displacing, Low Temperature)	MIL-PRF-32033 P/N 9150-027 P/N ASC1385550	9150-01-374-2021 9150-00-231-6689 9150-00-273-2389	PT 1 QT CN 4 OZ CN
12	RTV Silicone Rubber Sealant, Clear, Non-Corrosive Thick (Seam Sealing) Flowable (Recommended)	MIL-A-46146 P/N 3145 RTV P/N 3140 RTV	8040-00-117-8510 5970-01-081-1733	3 OZ TU 3 OZ TU
13	Lubricant, Solid Film, Air Cure, Corrosion Inhibiting	Type I, MIL-L-23398	9150-01-360-1906	16 OZ CN
14	Thread Compound, Teflon®, "Tef-Gel"	P/N TG-01	8030-01-450-4009	1 OZ TU
15	Liner, Battery Box-Battery Tray 1 ft. x 100 ft. roll, 1/8" thk. 1 ft. x 100 ft. roll, 5/16" thk. Battery Mat 8 in. x 12 in. mat, 1/8" thk. 8 in. x 20 in. mat, 1/8" thk.	P/N 74-216549-2404 P/N 74-2165-253883 P/N 802049 P/N 802050	6160-01-389-1966 6160-01-395-5943 7930-01-393-6763 7930-01-398-0939	RO RO BX BX
16	Corrosion Removing Compound Innovative Chemicals, Inc. (CAGE 0YD16)	P/N SB-1 (SALTBUSTER) P/N SB-5 (SALTBUSTER) P/N SB-55 (SALTBUSTER)	6850-01-470-3319 6850-01-470-3304 6850-01-470-3312	BX 5 GL CO 55 GL DR
17	Washdown additive, "Corrostop"	J275G-1	Pending	1 GL

Table A-2 Corrosion Preventive Compounds and other Misc CPAC Products -

Continued

Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
	Ocean Management Systems, Inc. 23 Factory Street P.O. BX 146 Montgomery, NY 12549	J275G-5 J275G-55		5 GL 55 GL DR
18	Vapor Phase Corrosion Inhibitor (VCI) 1 cu. ft. foam tape emitter	VCI-101	6850-01-338-1392	BX
19	Vapor Phase Corrosion Inhibitor (VCI) 5 cu. ft. cartridge emitter	VCI-105	6850-01-406-2060	BX
20	Vapor Phase Corrosion Inhibitor (VCI) 11 cu. ft. cartridge emitter	VCI-111	6850-01-408-9025	BX
21	Desiccant Packs, Activated 1200-1/6 Unit Bags in 5 GL Can 250-1 Unit Bags in 5 GL Can 130-2 Unit Bags in 5 GL Can 400-4 Unit Bags in 22 GL DR Desiccant Packs, Activated <u>Sources of Other Sizes</u> Multisorb Technologies, Inc. 325 Harlem Road Buffalo, NY 14224-1893 (888) 767-2368 Desiccare, Inc. 211 Industrial Drive Richland, MS 39218 (888) 932-0405	Type II, MIL-D-3464 P/N 8790670-8 P/N 8790670-5 P/N 87906-4	6850-00-264-6564 6850-00-264-6562 6850-00-264-6573 6850-00-935-9795	5 GL CN 5 GL CN 5 GL CN 22 GL DR
22	Grease, Molybdenum Disulfide (GMD) For Low and High Temperatures	Type II, MIL-G-21164 P/N DTD5527	9150-00-754-2595 9150-00-053-0101	1.7 LB CN 3 LB CN
23	Grease, Automotive and Artillery (GAA)	Type II, MIL-G-10924F	9150-01-197-7689	6.5 LB CN
24	Tape, Insulation, Electrical Silicone Rubber, Self-Fusing, 1" wide, 36 ft. roll	Type II, MIL-I-46852 P/N MS70T09-S	5970-00-955-9976	RO
25	Corrosion Preventive Compound	P/N PMS-3	8030-01-588-5283	BX
26	Axxanol 46 Bio (ZERUST) Northern Technologies Intl Corp. 4201 Woodland Road P.O. BX 69 Circle Pines, MN 55014 USA (763) 404-8701	Axxanol 46 Bio		1 GL

Table A-3 Tools for Corrosion Control

Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
1	Brush, Wire, Scratch	P/N H-B-178 TY3CL3	7920-00-269-1259	EA
2	Pipe Cleaner, 12"	P/N PIPSET	9920-01-192-7611	BX
3	Brush, Battery Terminal	P/N 1052SP	5120-00-926-5175	EA
4	Rag, Wiping, UNDYED Cotton	P/N A-A-2552 GRA/WHITE	7920-00-205-3570	BE
5	Cloth, Cleaning	P/N CCC-C-46, CL4TY1	7920-01-130-7738	HD
6	Abrasive Mat, Non-Metallic (Aluminum oxide impregnated nylon webbing)	MIL-A-9962 Very Fine Fine Coarse	5350-00-967-5089 5350-00-967-5093 5350-00-967-5092	PG PG PG
7	Abrasive Cloth, Aluminum Oxide, waterproof, 9" x 11" sheets	240 grit/GGG-C-520 300 grit/A-A-1048	5350-00-865-5948 5350-00-597-5798	PG PG
8	Brush, Acid Swabbing 5-3/4" long 8-1/4" long	H-B-643 P/N CFA105 P/N H-B-643 TY1CL1	7920-00-223-8005 7920-00-543-7728	GR GR
9	Tooth Brush (Bristle brush)	H-T-560 P/N A-A-123	8530-01-293-1387 8530-00-258-1507	DZ EA
10	Cloth, Abrasive	ANSI B74.18, Type I	5350-00-187-6285	RO
11	Wet Film Thickness (WFT) Gauge, Aluminum (Open Purchase) S.G. Pinney & Assoc. 800-955-0574 Paul Gardner Co. 800-762-2478	P/N WFTALUM P/N WF-CCD	5120-01-467-1908	EA EA
12	Pad, Scouring 12" x 6"	MIL-C-83957	7920-00-171-1534	PG
13	Brush, Cleaning, Round, Nylon bristles	MIL-B-23958	7920-00-054-7768	EA

Table A-4 Environmentally Friendly Surface Preparation Power Tools & Accessories

Tools listed in Tables A-4 and A-5 are from two vendors. Parts from different vendors are not compatible. Be sure to match replacement parts for the specific manufacturer and unit size.				
Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
1	Tool Kit, Corrosion Prevention and Control Reference: TM 10510-OD/1H, pg. 1-103	TAMCN-C7910 P/N 00981	4130-01-461-5696	EA
2	Pneumatic Grinder with Starter Kit, 3" DCM/DOTCO Model 12L1280-36 (Starter kit includes shrouds and disks.)	P/N 151083	4130-01-458-8662	EA
3	Electric Grinder with Starter Kit, 3" DCM/Milwaukee #6140 (Starter kit includes shrouds and disks.)	P/N 151123	4130-01-459-1793	EA
4	Pneumatic Needle Gun Kit with Shroud	DCM P/N 60100	4130-01-459-1441	EA.
5	Vacuum System, HEPA, Portable, 5 Gallon, Electric, 100 cfm (with 15 ft. hose)	DCM P/N 50030	4130-01-458-8679	EA

Table A-4 Environmentally Friendly Surface Preparation Power Tools &
Accessories - Continued

Tools listed in Tables A-4 and A-5 are from two vendors. Parts from different vendors are not compatible. Be sure to match replacement parts for the specific manufacturer and unit size.				
Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
6	Storage Container for Kit ("Vacu-Tote")	DCM P/N 00480	4130-01-460-6615	EA
7	HEPA Filter Cover, for 5 Gallon, Electric HAPS Vacuum System (2/pkg)	DCM P/N 00529	4130-01-459-1249	EA
8	Bag, Disposal, HAZWASTE Containment, for 5 Gallon, Electric Vacuum System (5/pkg)	DCM P/N 00540	4130-01-459-1257	PG
The following items list the basic tools (without starter kits), and consumables for the kit in item 1 above.				
9	Pneumatic Grinder, 3", w/o Shroud	DCM/DOTCO P/N 170083	4130-01-458-8673	EA
10	Electric Grinder, 3", w/o Shroud	DCM/Milwaukee P/N 6140	5130-01-397-9512	EA
11	Shroud, for 3" DCM/DOTCO Pneumatic Grinder	DCM P/N 155083	4130-01-459-8274	EA
12	Shroud, for 3" DCM/Milwaukee Electric Grinder	DCM P/N 155123	4130-01-460-4069	EA
13	Shroud, for DCM Needle Gun	DCM P/N 60110	4130-01-460-5299	EA
14	Back-Up Pads/Disc Holder	DCM P/N 175083	4130-01-458-8343	EA
15	Discs, cleaning and abrasive, for DCM/DOTCO, 3" 36A grit 60A grit 80A grit 120A grit	DCM P/N 18541 DCM P/N 18544 DCM P/N 18545 DCM P/N 18547	4130-01-459-2336 4130-01-459-2345 4130-01-459-2363 4130-01-459-2374	BX BX PG BX
16	Needle Holder, for DCM Needle Gun 2 mm 3 mm	DCM P/N 60113 DCM P/N 60152H	4130-01-459-3583 4130-01-459-3594	EA EA
17	Needles, for DCM Needle Gun 2 mm 3 mm	DCM P/N 60111S DCM P/N 60173	4130-01-459-3581 4130-01-459-3591	EA EA
18	Vacuum Bags, Replacement, for DCM 5 Gallon, Electric Vacuum Impact Filter Bags Containment Bags HEPA Filter Cover	DCM P/N 00501 DCM P/N 00540A DCM P/N 00529	4130-01-459-1263 4130-01-459-1257 4130-01-459-1249	EA PG EA
19	Oil/Water Separator/Dryer (for compressed air source)	MILS12928 CLASS 1	4940-00-242-4100	EA

Table A-5 Alternate Environmentally Friendly Surface Preparation Power
Tools & Accessories

Tools listed in Tables A-4 and A-5 are from two vendors. Parts from different vendors are not compatible. Be sure to match replacement parts for the specific manufacturer and unit size.				
Following items are available from: DESCO Mfg. Co. 30081 Comercio Rancho Santa Margarita, CA 92688 (714) 858-7400				
Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
1	Pneumatic Grinder, 3", with starter kit	DESCO P/N 2003RASRC3		EA
2	Pneumatic Grinder, 3", (Grinder only - no kit or shroud)	DESCO P/N 2003R		EA
3	Pneumatic Grinder, 3", with shroud only	DESCO P/N 2003RDC3		EA
4	Electric Grinder, 3", with starter kit	DESCO P/N 9140.2162		EA
5	Electric Grinder, 3" (Grinder only - no kit or shroud)	DESCO P/N 150.120		EA
6	Pneumatic Micro Needle Gun System, with starter kit	DESCO P/N 130.2166		EA
7	Pneumatic Micro Needle Gun, with shroud only	DESCO P/N 130.2166		EA
8	NILFISK GS82, Vacuum System, 160 cfm, with containment bags and hoses. This vacuum system is needed when using DESCO tools. Available from: NILFISK of America 300 Technology Dr. Malvern, PA 19355 (610) 647-6420 GSA Contract GS-07F-8356C	Sp. Item #375-102 P/N 01791139		EA
9	NILFISK GS-82, Vacuum Bags, Replacement Micro Filter HEPA Exhaust Filter	P/N 616821 P/N 01710420	7910-01-124-5840	EA
10	Back-up Pads/Disc Holder	DESCO P/N GP-13		
11	Discs, Cleaning & Abrasive (DESCO) 3" Roloc Clean/Strip 3" Roloc Coarse Disc 3" Roloc Medium Disc 3" 24 Grit Resin Sanding Disc 3" 36 Grit Resin Sanding Disc 3" 50 Grit Resin Sanding Disc 3" 80 Grit Resin Sanding Disc	No P/N P/N RL3S-C P/N RL3C-M P/N CA411108 P/N CA422393 P/N CA422394 P/N CA422404		
12	Needles, Replacement (DESCO) 2 mm	P/N 130.023		

Table A-6 Personal Protective Equipment (PPE)

NOTE				
The table provides only a sample of the PPE available. Operating bases may use alternate equipment based on their local sources of supply.				
Item No.	Nomenclature	Specification or Part Number	NSN	Unit Issue
1	Protective Goggles, Chemical and Impact Resistant	9400 CHEMICAL-CLEAR-4C	4240-01-364-2994	EA
2	Gloves, Chemical and Oil Protective	MIL-G-87066 Size 7 Size 8 Size 9 Size 10 Size 11	8415-01-147-6263 8415-01-147-9540 8415-01-012-9294 8415-01-013-7382 8415-01-013-7384	PR PR PR PR PR
3	Gloves, Work	A-A-50021	8415-00-634-4658	PR
4	Coveralls, Clothing Outfit, Liquid Contaminant	MIL-S-44384 Class 2, Tan Class 1, Green	8415-01-333-0987 8415-01-364-3320	EA EA
5	Respirator, Organic Vapor, Reusable, Half-Face Piece 3M 7200S 3M 7300S	P/N 7200S Small/Medium P/N 7503 Medium/Large	4240-01-246-5401 4240-01-495-1291	BX BX
6	Cartridge, Organic Vapor, Replacement for Respirator 3M 7253	P/N 70-0703-1675-8	4240-01-342-2859	BX
7	Shield, Face, Tilting, Clear	P/N A-A-1770	4240-00-542-2048	EA
8	Mask, Air Filtering, Adjustable Straps, Disposable	P/N 55795T1	4240-01-246-0314	BX
9	Plugs, Ear, Plastic, Universal Size, Disposable	P/N NFES 1027	6515-00-137-6345	BX
10	Plugs, Ear, with Adjustable Headband	P/N 10	6515-00-392-0726	EA
11	R95 Dust/Mist Air Filter Respirator	P/N 8247 R95	4240-01-452-8323	BX
12	P100 Particulate Respirator	P/N 8293	4240-01-475-8293	BX

APPENDIX B

EXAMPLE CPAC PROCEDURES FOR DEPLOYMENTS

The following sections describe CPAC procedures for general areas of USMC NAVFAC Expeditionary Programs Office (NEPO) Ground Combat Equipment. These areas are known to be corrosion prone and should be addressed as stated within this appendix prior to deployment, during deployment (if possible) and post-deployment.

B-1. PRE-DEPLOYMENT.

- a. Remove and/or disassemble major components as needed or practical, in order to gain access to items that need to be treated. (Examples: engine components, exhaust system, transmission, wheels, communications and electronics boxes, turrets, weapons, etc.). See [Table B-1](#).
- b. Consider the expected length of deployment when planning the level of disassembly. Longer deployments would indicate a greater degree of required disassembly so that more parts can be treated. Treating the equipment with CPCs will provide the protection required to prolong the equipment in an operational state.
- c. Clean all removed equipment and areas made accessible by removal of components.
- d. Remove dirt, sand deposits, oil, grease, hydraulic fluid and any other debris.
- e. Inspect equipment for condition of items to be treated or for other corrosion prone areas (Equipment TMs/locally developed checklists). Components or parts to which CPAC treatments have been previously applied and which are still intact do not need to be treated again.
- f. Perform surface preparation and touch-up painting on exterior and interior surfaces where the paint is damaged and corrosion has begun. A protective coating is the best barrier against corrosion.
- g. Use the CPAC materials listed in [Chapter 6](#) to treat components (Equipment TMs/locally developed checklist). Typical components and their treatments include:
 - Fasteners: Teflon thread compound or zinc dust anti-seize ([paragraph 6-3](#)).
 - Electrical Connectors: Weatherproof with clear, flowable RTV silicone sealant, a brush or spray-on preservative, or wrap with silicone-rubber electrical tape ([paragraph 6-6](#)).
 - Crevices, Lap Joints, Intermittent Weld Seams: Crevice coating and lubricant, or rust inhibiting compound ([paragraph 6-7.2](#)).
 - Hydraulic, Fuel, and Brake Tubing Fittings: Clear, flowable RTV silicone sealant ([paragraph 6-2](#)).
 - Exhaust System: High temperature paint (Equipment TM).
 - Communications and Electronics Enclosures: Desiccant ([paragraph 6-10](#)) and/or VCI device ([paragraph 6-5](#)) inside of enclosures and RTV silicone sealant ([paragraph 6-2](#)) on outside seams.
 - Sliding/Wear Surfaces Requiring Lubrication: Dry film lubricant ([paragraph 6-11](#)) or wet lubricant ([paragraph 6-7.1](#)). Check equipment Lubrication Order (LO) or Lubrication Instruction (LI).
 - Instrument Panels and Gauges (back side): Treat with thin film CPC's as appropriate ([paragraph 6-7.2](#)).
- h. Additional items are listed in [Table 6-2](#) of this manual.
- i. Re-install all components removed from equipment.
- j. Clean up and dispose of any hazardous waste in accordance with local policies.
- k. Reapply CPCs as needed during deployment to prevent corrosion.

B-2. WHILE ON DEPLOYMENT.

- a. If applicable use equipment or turret covers where appropriate to prevent direct seawater splash and spray.
- b. Perform fresh water washdowns of vehicle exteriors as soon as possible after exposure to sea water. Use approved additives, if available, to help remove salt and reduce corrosion.
- c. Perform touch-up painting on areas where paint is damaged, as situation permits. Amlguard Clear, Dry, Hard Film CPC (Table A-2) may be used as a quick, temporary preservative if touch-up painting cannot be performed.
- d. Lubricate equipment as needed, especially areas that have been immersed in water where lubricants and greases may have washed out.
- e. Check to make sure weatherproofing on electrical connectors remains intact. Ultra-Thin Film CPC (paragraph 6-4.4) can be used as a quick, temporary preservative.

B-3. POST-DEPLOYMENT.

- a. Perform thorough fresh water washdown, with corrosion preventive additive, as soon as possible.
- b. Clean entire vehicle/equipment to remove dirt, sand, and other debris.
- c. Perform any touch-up painting that was deferred during deployment.
- d. Check condition of sealants that were previously applied, and renew as needed.
- e. Lubricate equipment as needed as per equipment LO or LI.
- f. Post-deployment disassembly and removal of components for the purposes of CPAC is up to the discretion of the unit commander.

B-4. SUGGESTED COMPONENTS TO BE REMOVED PRIOR TO CPC SERVICING (As Applicable to Equipment Type).

(See Table B-1.)

Table B-1 Components

Components	
Engine Compartment	Turret
Power Pack/Engine	Turret
Exhaust Piping	Barrel Support & Barrel Lock
Coolant Lines	Coax MG Mount
Air Cleaner housing	Periscopes (if needed)
Starter	Sight Assemblies
Alternator	Ammo Ready Boxes
Radiator/Cooling Tower	Power Distribution Assembly (PDA)
Grill Cover	Control Display Assembly (CDA)
Fan Hydraulic motor	

Table B-1 Components - Continued

Components	
Interior	Exterior
Driver's Seat and Frame	Tires
Periscopes (if needed)	Hubs
Deck Plates	
Troop seats/backrests	
Batteries	

B-5. SPECIAL PROCEDURES.

- a. Turret or Vehicle Covers. If turret or equipment covers are available, they can be beneficial on deployment to help reduce corrosion. If the applicable Navy LCAC Assault Craft Unit (ACU) has approved them for use, this is where they will provide the greatest benefit, due to the large amount of wind-driven salt spray and sand produced by an LCAC. However, they may also be useful in minimizing exposure for equipment kept in amphibious ship well decks or cargo decks.
- b. Electrical Connectors. Because the proper operation of electrical connectors is critical to mission accomplishment, CPAC treatments for connectors are emphasized below. Three CPAC methods are recommended:
- (1) Infrequently Disconnected: Use Type III CPC inside a connector and RTV Silicone Rubber Sealant around the outside of a connector that is infrequently disconnected or only disconnected if there is a problem. Encapsulating the connector will prevent corrosion and downtime due to corrosion alone.
 - (2) Frequently Disconnected with Preservative: Use Type III CPC inside a connector and a Type II CPC or MIL-C-16173 Grade 4 preservative on the outside of a connector that may be expected to be disconnected frequently.
 - (3) Frequently Disconnected with Tape: Use Type III CPC inside a connector and wrap the outside tightly with a self-fusing silicone rubber electrical tape as an alternative method for connectors that may be expected to be disconnected frequently.

Methods listed above were selected based on equipment surveys and interviews of crewmen and maintenance personnel. Units may use other methods for connectors listed in appropriate equipment TMs.

B-6. CPAC CHECKLISTS FOR USE IN APPLYING CPAC MEASURES ALONG WITH DEPLOYMENT.

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

General Components			
Area	CPAC Procedure	Reference	OK?
Damaged, Scratched Paint Down to Bare Metal	<ul style="list-style-type: none"> • Touch-up paint with CARC or Water Reducible CARC (exterior surfaces) or epoxy (interior surfaces). • If on deployment and little time or materials are available, use temporary preservative Amlguard until touch-up painting can be performed. 	TM 4750-OD/1_ Paragraph 6-4.1	
General Lubrication Points	<ul style="list-style-type: none"> • Perform lubrication on all points specified in TMs, LOs, or LIs. 		

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

General Components			
Area	CPAC Procedure	Reference	OK?
General Vehicle Exterior	<ul style="list-style-type: none"> Perform fresh water washdown with additive as soon as possible after exposure to seawater. 	Paragraph 4-4	
Threaded Fasteners, except self-locking styles.	<ul style="list-style-type: none"> If fastener has been removed, coat threads lightly with Zinc Dust Anti-Seize or Tef-Gel (if required) upon re-installation. Heads of steel bolts that have not been removed can be coated with Amlguard. 	Paragraph 6-3 Paragraph 6-4.1	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

Exterior			
Area	CPAC Procedure	Reference	OK?
A-Frame	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to fasteners and clevis pin. 	Paragraph 6-7.2	
Air Couplings	<ul style="list-style-type: none"> Apply Type III CPC. 	Paragraph 6-4.4	
Antenna Mount	<ul style="list-style-type: none"> Apply RTV Silicone Sealant to fasteners. Apply Fluid Film or Carwell T-32 to any crevices created between mount and vehicle hull. 	Paragraph 6-2 Paragraph 6-7.2	
Battery Boxes and Batteries	<ul style="list-style-type: none"> Clean compartment and batteries. Apply GAA Grease, Petrolatum or other suitable protective compound to battery posts. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize to threads of battery clamping studs. Re-install box cover, using Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads. Hinge: Apply Fluid Film or Carwell T-32 to hinge and hinge rod. Frame: Apply Fluid Film or Carwell T-32 to all crevices of support frame. 	Paragraph 4-8.1 Paragraph 6-3.1 Paragraph 6-3.1 Paragraph 6-7.2 Paragraph 6-7.2	
Brake Tubing (exposed)	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Cargo Shells	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Clasps	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Composite Lights	<ul style="list-style-type: none"> If light housing is opened, spray Type III CPC on internal electrical connections. Apply Fluid Film or Carwell T-32 to crevices of support members. 	Paragraph 6-4.4 Paragraph 6-7.2	
Crane Hydraulic Fittings	<ul style="list-style-type: none"> Seal with flowable 3140 RTV Silicone Sealant. Apply Fluid Film or Carwell T-32 if unable to seal appropriately. 	Paragraph 6-2 Paragraph 6-4.4	
Crane Power Cable	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
Crane	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to fasteners and pins. 	Paragraph 6-7.2	
Crevices and Skip Welds	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Exterior			
Area	CPAC Procedure	Reference	OK?
Doors	<ul style="list-style-type: none"> • Apply Fluid Film, Dry Film or Carwell T-32 to: <ul style="list-style-type: none"> - Latch Assembly - Hinges - Window Slides - Locks 	Paragraph 6-7.2 Paragraph 6-11	
Drain Plugs	<ul style="list-style-type: none"> • Apply Tef-Gel (if required) or Zinc Dust Anti-Seize, or GMD grease on threads. 	Paragraph 6-3	
Driver's Hatch	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> - Hinges - Hinge Fasteners - Latch - Mount 	Paragraph 6-7.2	
Engine Cover, Radiator Cover and Engine Access Panels	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> - Hinges - Crevices - Lower channel where engine compartment screen hinges are located • If paint is damaged or corrosion has begun on any deck area of the platforms, including access covers, touch-up the coating in accordance with TM as soon as possible. 	Paragraph 6-7.2 TM 4750-OD/1_	
Exhaust Piping	<ul style="list-style-type: none"> • Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Fire Suppression System	<ul style="list-style-type: none"> • Apply Fluid Film or Type II CPC on spring, moving parts. 	Paragraph 6-7.2 Paragraph 6-4.3	
Grounding Straps	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Gunner's Platform	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Headlights, Taillights, Turn Signals, Black-Out Drive Light	<ul style="list-style-type: none"> • Apply Type III CPC on internal electrical connections. • Apply Tef-Gel or Zinc Dust Anti-Seize on fastener threads upon installation. • Seal edges where water could enter light housing with RTV Silicone Sealant. • Apply Fluid Film or Carwell T-32 to crevices of support members. 	Paragraph 6-4.4 Paragraph 6-3 Paragraph 6-2 Paragraph 6-7.2	
Hood	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> - Hinges - Grid Attachment Points - Frame - Latches 	Paragraph 6-7.2	
Hydraulic Assembly	<ul style="list-style-type: none"> • Apply Type III CPC to pin connectors. 	Paragraph 6-4.4	
Hydraulic Line Fittings	<ul style="list-style-type: none"> • Encapsulate with 3140 RTV Silicone Sealant. • Apply Fluid Film or Carwell T-32 if unable to seal appropriately. 	Paragraph 6-2 Paragraph 6-7.2	
ISO Locks	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32 to hinges and moving parts. 	Paragraph 6-7.2	
Latches	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Exterior			
Area	CPAC Procedure	Reference	OK?
Machine Gun Pintle Mount	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to Ring Rollers. Apply CLP or Carwell T-32 on sliding surfaces such as the flex mount and the locking clasp. 	Paragraph 6-7.2 Paragraph 6-7.1	
Mirror	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> Springs and Swivels Cab Attachment Points 	Paragraph 6-7.2	
Mounting and Support Brackets	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to attachment points. 	Paragraph 6-7.2	
Power Cables	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
Power Receptacle (Electrical Connector)	<ul style="list-style-type: none"> Apply Type III CPC inside receptacle. Apply Fluid Film or Carwell T-32 to the exterior of the receptacle. 	Paragraph 6-4.4 Paragraph 6-7.2	
Shackles	<ul style="list-style-type: none"> Apply Tef-Gel (if required) or Zinc Dust Anti-Seize to threads. Apply Fluid Film or Carwell T-32 to pin, moving parts. 	Paragraph 6-3 Paragraph 6-7.2	
Smoke Grenade Launcher	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. Apply Fluid Film or Carwell T-32 to the exterior surfaces of launcher. 	Paragraph 6-2 Paragraph 6-7.2	
Springs	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Tie Rods	<ul style="list-style-type: none"> Exterior touch-up painting as necessary. 	TM 4750-OD/1_	
Tie-Downs	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to attachment points. 	Paragraph 6-7.2	
Towing Pintle	<ul style="list-style-type: none"> Lubricate grease fittings. Apply Fluid Film or Carwell T-32 on pin, moving parts. 	Paragraph 6-7.2	
Trim Vane	<ul style="list-style-type: none"> Clean old, caked grease and dirt, and re-grease or apply Fluid Film to side rails. 	Paragraph 6-7.2	
	<ul style="list-style-type: none"> Clean hydraulic cylinder pistons and treat with Carwell T-32. 		
Underbody	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to all crevices formed by intermittent welds on the underbody, if not already protected by undercoat material. 	Paragraph 6-7.2	
Vision Blocks	<ul style="list-style-type: none"> Seal edges at hull opening with 3145 RTV Silicone Sealant. 	Paragraph 6-2	
Weapon Station	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> Hatch Tray Weapon Station Support Assembly Turret Support Ring 	Paragraph 6-7.2	
Window Shield	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> Cab Reducing Hinges and Pins Rain Gutter Window Locks 	Paragraph 6-7.2	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

Engine Compartment and Engine			
Area	CPAC Procedure	Reference	OK?
Alternator and Voltage Regulator	<ul style="list-style-type: none"> Apply Type III CPC inside electrical connections. 	Paragraph 6-4.4	
Brake Reservoir Clamps	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Camshaft Pulleys	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Coolant Line Band Clamps Adjusting Screws	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Coolant Line Band Clamps	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to adjusting screws. 	Paragraph 6-7.2	
Cooling Fan Housing	<ul style="list-style-type: none"> Inspect for paint failure and corrosion. Touch-Up Paint as needed. 	TM 4750-OD/1_	
Crankshaft Pulley	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Engine Access Cover	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to hinges and hinge fasteners 	Paragraph 6-7.2	
Engine Fittings and Connections	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Engine Oil Pan	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Engine Relay Panel	<ul style="list-style-type: none"> Apply Type III CPC inside electrical connections. 	Paragraph 6-4.4	
Exhaust clamps	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Exhaust Manifolds	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Firewall	<ul style="list-style-type: none"> Inspect to make sure all insulation glued to firewall is intact and not peeling at any edges. If insulation is damaged or peeling and firewall is rusted, remove insulation and touch-up paint, as time and materials permit. Install new insulation per Equipment TM. 	Equipment TM	
Fittings on Oil Line to Pressure/Temp. Sender Units (Located right-front side of engine)	<ul style="list-style-type: none"> Wire brush to remove any rust. Coat with RTV Silicone Sealant. 	Paragraph 6-2	
Fuel Supply Shut-Off Valve	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to valve and handle. 	Paragraph 6-7.2	
Glow Plug Module Connector	<ul style="list-style-type: none"> Apply Type III CPC to electrical connections. 	Paragraph 6-4.4	
Headlamps Housing (rear)	<ul style="list-style-type: none"> Apply Type I CPC 	Paragraph 6-4.1	
Hood Wiring Harness	<ul style="list-style-type: none"> Apply Type III CPC to electrical connections. Seal Exterior with RTV Silicone Sealant 	Paragraph 6-4.4 Paragraph 6-2	
Hood	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> Hinges Grid Attachment Points Frame Latches 	Paragraph 6-7.2	
Hydraulic Chassis Pump	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	
Hydraulic Line Fittings	<ul style="list-style-type: none"> Encapsulate with 3140 RTV Silicone Sealant. Apply Fluid Film or Carwell T-32 if unable to seal appropriately. 	Paragraph 6-2 Paragraph 6-7.2	
Hydraulic Oil Cooler Housing	<ul style="list-style-type: none"> Apply High Temperature Touch-Up Paint as needed. 	TM 4750-OD/1_	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Engine Compartment and Engine			
Area	CPAC Procedure	Reference	OK?
Oil Cooler	• Apply High Temperature Touch-Up Paint as needed.	TM 4750-OD/1_	
PCB Connector	• Apply Type III CPC to electrical connections. • Seal top exterior of connector with RTV Silicone Sealant	Paragraph 6-4.4 Paragraph 6-2	
Radiator Assembly Fasteners	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	
Radiator Core Housing	• Apply Touch-Up Paint as needed to the steel housing. • Apply Fluid Film or Carwell T-32 to crevices and skip welds particularly at outlet tube connection.	TM 4750-OD/1_ Paragraph 6-7.2	
Radiator	• Apply Fluid Film or Carwell T-32 to: - Side Rails - Headers - Supports - U-Bends	Paragraph 6-7.2	
Shift & Throttle Linkage (Located top of engine)	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	
Starter	• Apply High Temperature Touch-Up Paint as needed. • Apply Type III CPC on electrical connections. • Apply RTV Silicone Sealant to terminal lugs.	TM 4750-OD/1_ Paragraph 6-4.4 Paragraph 6-2	
Thermostat	• Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on threads.	Paragraph 6-3	
Throttle and Governor Linkage	• Apply High Temperature Touch-Up Paint as needed. • Apply Fluid Film or Carwell T-32.	TM 4750-OD/1_ Paragraph 6-7.2	
Transmission Housing	• Apply High Temperature Touch-Up paint as needed.	TM 4750-OD/1_	
Transmission Oil Pan	• Apply High Temperature Touch-Up paint as needed.	TM 4750-OD/1_	
Turbocharger Clamps	• Apply High Temperature Touch-Up paint as needed.	TM 4750-OD/1_	
Turbocharger Housing	• Apply High Temperature Touch-Up paint as needed.	TM 4750-OD/1_	
Valve Covers	• Apply High Temperature Touch-Up paint as needed.	TM 4750-OD/1_	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

Undercarriage, Suspension, Wheels and Brakes			
Area	CPAC Procedure	Reference	OK?
Air Brake Tank Drain Cock Valve	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	
Air Fittings	• Apply Fluid Film or Carwell T-32. • Apply Type III CPC to pin connectors.	Paragraph 6-7.2 Paragraph 6-4.4	
Brake Cylinders	• Apply Fluid Film or Carwell T-32 to crevice between attaching clamp and cylinder. • Apply RTV Silicone Sealant to fittings.	Paragraph 6-7.2 Paragraph 6-2	
Brake Drum	• Apply High Temperature Touch-Up paint as needed.	TM 4750-OD/1_	
Engine Mounting Bracket	• Apply Fluid Film or Carwell T-32 to fasteners and crevice at the frame rail.	Paragraph 6-7.2	
Exhaust Shock Springs	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	
Front Driveshaft Bearing Mount	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Undercarriage, Suspension, Wheels and Brakes			
Area	CPAC Procedure	Reference	OK?
Hydraulic Oil Tank	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to: <ul style="list-style-type: none"> - Hinges - Hinge Pins - Vertical "C" channels - Skip Welds - Crevices 	Paragraph 6-7.2	
Radius Rod	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Shift Cylinders (4WD/8WD actuating arms & cylinders at differential cases and marine drive case).	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to actuating arm pivot points and cylinder piston. 	Paragraph 6-7.2	
Steering Damper Hydraulic Cylinders	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to clean pistons. 	Paragraph 6-7.2	
Wheel Lugs	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to all nuts without disassembly. Apply Molybdenum Disulfide Paste or Zinc Dust Anti-Seize during installation. 	Paragraph 6-7.2 Paragraph 6-3.1	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

Interior - Driver's Compartment/Cab			
Area	CPAC Procedure	Reference	OK?
Cab Windows	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to crevice areas around window seals. If paint is damaged or corrosion has begun around the window, touch-up the coating. 	Paragraph 6-7.2 TM 4750-OD/1_	
Center Periscope Cavity for Night Sight	<ul style="list-style-type: none"> Remove periscope. Inspect opening for failed coating and rust. If needed, Touch-Up Paint opening, and apply Dry Film Lubricant after paint is dry. Re-install periscope upon coating(s) cure, using Tef-Gel on wing nut stud threads. 	TM 4750-OD/1_ Paragraph 6-11 Paragraph 6-3.2	
Driver's Seat	<ul style="list-style-type: none"> Remove Seat, apply Touch-Up Paint on seat supports as needed. Treat mating areas of moving/rotating parts with Dry Film Lubricant, Fluid Film or Carwell T-32. 	TM 4750-OD/1_ Paragraph 6-11 Paragraph 6-7.2	
Engine Access Cover	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Instrument/Indicator Panels	<ul style="list-style-type: none"> Apply Type III CPC if panels are opened for maintenance. 	Paragraph 6-4.4	
Light Bar	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to exposed fasteners. 	Paragraph 6-7.2	
Light Support Bracket	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Machine Gun Mount	<ul style="list-style-type: none"> Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on threads during assembly/installation. 	Paragraph 6-3	
Passenger Bar	<ul style="list-style-type: none"> Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on threads during assembly/installation. 	Paragraph 6-3	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Interior - Driver's Compartment/Cab			
Area	CPAC Procedure	Reference	OK?
	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to attachment points. 	Paragraph 6-7.2	
Periscope Mounts (except center)	<ul style="list-style-type: none"> Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on mounting studs. 	Paragraph 6-3	
Slave Cable Receptacle	<ul style="list-style-type: none"> Apply Type III CPC inside and install cap. 	Paragraph 6-4.4	
Stowage Bracket for Tarp Bows	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to attachment points. 	Paragraph 6-7.2	
Stowage Brackets	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Threaded aluminum fittings on all tubing, air actuator lines, etc.	<ul style="list-style-type: none"> Apply Fluid Film, Carwell T-32 or Type II CPC as needed. 	Paragraph 6-7.2 Paragraph 6-4.3	
Window/Windshield Wiper Hardware	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to linkage and moving parts. 	Paragraph 6-7.2	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

Interior - Troop/Cargo/Work Area			
Area	CPAC Procedure	Reference	OK?
Attachable Radio Sets	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
Battery Boxes and Batteries	<ul style="list-style-type: none"> Clean compartment and batteries. Apply GAA, Petrolatum or other suitable protective compound to battery posts. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize to threads of battery clamping studs. Re-install box cover, using Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads. Hinge: Apply Fluid Film or Carwell T-32 to hinge and hinge rod. Frame: Apply Fluid Film or Carwell T-32 to all crevices/seams of support frame. 	Paragraph 4-8.1 Paragraph 4-8.1 Paragraph 6-3.1 Paragraph 6-3.1 Paragraph 6-7.2 Paragraph 6-7.2	
B-Pillar	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Communications Equipment	<ul style="list-style-type: none"> Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections. 	Paragraph 6-6.1	
C-Pillar	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Deck Plates	<ul style="list-style-type: none"> Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads. 	Paragraph 6-3	
Fire Suppression Tubing and Fittings	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to steel fittings. (Do not apply to brass) 	Paragraph 6-2	
Fuel Filler Neck	<ul style="list-style-type: none"> Apply Touch-Up Paint as needed. 	TM 4750-OD/1_	
Heater Duct Regulating Valve	<ul style="list-style-type: none"> Apply Dry Film Lubricant on rusted areas with failed paint. Apply Fluid Film or Carwell T-32 on spring and moving parts. 	Paragraph 6-11 Paragraph 6-7.2	
Heater Fresh Air Intake Duct	<ul style="list-style-type: none"> Apply High Temperature Touch-Up paint as needed. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads during reinstallation. 	TM 4750-OD/1_ Paragraph 6-3	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Interior - Troop/Cargo/Work Area			
Area	CPAC Procedure	Reference	OK?
Hose Clamps	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	
Panel Distribution Box	• Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection.	Paragraph 6-2	
Parking Brake Lever	• Apply Fluid Film or Carwell T-32 to moving parts and joints.	Paragraph 6-7.2	
Receiver/Transmitter	• Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections.	Paragraph 6-6.1	
Selector Switch Box	• Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection.	Paragraph 6-2	
Service Brake	• Apply Fluid Film or Carwell T-32 to moving parts and joints.	Paragraph 6-7.2	
Shore Power Cable	• Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections.	Paragraph 6-6.1	
STE/ICE Connector	• Apply Type III CPC on electrical connections. • Apply RTV Silicone Sealant to threads and cap.	Paragraph 6-4.4 Paragraph 6-2	
Throttle Spring and Cable	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	
Transmission/Transfer Shifters	• Apply Fluid Film or Carwell T-32 to moving parts and joints.	Paragraph 6-7.2	
Troop Seat Kit (Interface between kit and body)	• Apply Fluid Film or Carwell T-32.	Paragraph 6-7.2	
Troop Seats	• Remove Seat, apply Touch-Up Paint to seat supports as needed. • Treat mating areas of moving/rotating parts with Dry Film Lubricant, Fluid Film or Carwell T-32.	TM 4750-OD/1_ Paragraph 6-11 Paragraph 6-7.2	
Wiper Motor Power Cable	• Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections.	Paragraph 6-6.1	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

Turret - Exterior			
Area	CPAC Procedure	Reference	OK?
Antenna-Mount Spring	• Apply Fluid Film or Carwell T-32 or Brushable Preservative.	Paragraph 6-7.2 Paragraph 6-6.3.1	
Ballistic Shield for Vehicle Cmdr. & Gunners Sights	• Apply Fluid Film or Carwell T-32 to hand crank, linkage and shaft. • Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads.	Paragraph 6-7.2 Paragraph 6-3	
Emergency Turret Hand Crank Access Cap	• Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads.	Paragraph 6-3	
FLIR/TV Sight Ballistic Shield Operating Linkage	• Apply Dry Film Lubricant to clean, bare metal.	Paragraph 6-11	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Turret - Exterior			
Area	CPAC Procedure	Reference	OK?
Gatling Gun Connectors W18 Harness (opposite ends, under cover on rear of gunner's cupola.)	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
Gatling Gun Main Power Connector	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
Gun Barrel	<ul style="list-style-type: none"> Check for pitting and corrosion both inside and outside of the barrel. Apply light coat of MIL-PRF-32033 Oil. 	Equipment TM	
Gun Barrel Support Assembly	<ul style="list-style-type: none"> Apply Dry Film Lubricant to clean, bare metal. Use GMD Grease on mating surfaces as needed. 	Paragraph 6-11	
Machine Gun Pintle Mount	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 to Ring Rollers. Apply CLP or Carwell T-32 on sliding surfaces such as the flex mount and the locking clasp. 	Paragraph 6-7.2 Paragraph 6-7.1	
Missile Tube Shim Packs	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads. 	Paragraph 6-7.2 Paragraph 6-3	
Night Sight Brightness and Contrast Motors	<ul style="list-style-type: none"> Apply Type II CPC to motor housings and connectors. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on cover fastener threads. 	Paragraph 6-4.3 Paragraph 6-3	
Night-Sight Focus Motor	<ul style="list-style-type: none"> Apply Type II CPC to motor and electrical connections. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on cover fastener threads. Apply 3145 RTV Silicone Sealant on cover edges to seal. 	Paragraph 6-4.3 Paragraph 6-3 Paragraph 6-2	
Night-Sight Range Focus Linkage	<ul style="list-style-type: none"> Apply Fluid Film or Carwell T-32 on moving parts and rods. <p>DO NOT TREAT FRICTION PADS.</p>	Paragraph 6-7.2 Paragraph 6-3	
Precision Lightweight GPS Receiver	<ul style="list-style-type: none"> Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections. 	Paragraph 6-6.1	
Remote Arming Device (RAD) Enclosure/ RAD Umbilical Connector	<ul style="list-style-type: none"> Install Desiccant Pack inside enclosure. Apply Type III CPC on terminal boards and contacts. Apply Type III CPC on electrical connectors. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on cover fasteners upon re-installation. Apply 3145 RTV Silicone Sealant to seal cover edges upon reinstallation. 	Paragraph 6-10 Paragraph 6-4.4 Paragraph 6-2	
Rotor Extension	<ul style="list-style-type: none"> Apply Touch-Up Paint as needed. 	TM 4750-OD/1_	
Rotor Gasket Seals	<ul style="list-style-type: none"> Inspect perimeter seals for cracking and damage. Replace damaged seals as needed, and re-install using fasteners coated with Tef-Gel (if required) or Zinc Dust Anti-Seize on threads. 	Paragraph 6-3	
Vision Blocks	<ul style="list-style-type: none"> Seal edges at hull opening with 3145 RTV Silicone Sealant. 	Paragraph 6-2	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Turret - Exterior			
Area	CPAC Procedure	Reference	OK?
W18P2 Magazine Pickup Connector (Located on Gatling Gun)	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
W18P3 Safing-Solenoid Connector (Located on Gatling Gun)	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
W18P4 Feeder Solenoid Connector (Located on Gatling Gun)	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
W3, W9, W12 Launcher Harness	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
W31P2 Azimuth Drive Connector for Gatling Gun (Located on front of Turret)	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
W45P3 and W45J1 Connections to IFF Antenna (Located on front of Turret)	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	
Wind Mast Connectors (Located on outside of VHF Antenna Mount)	<ul style="list-style-type: none"> Apply RTV Silicone Sealant, Silicone Tape or Brushable Preservative to weatherproof electrical connection. 	Paragraph 6-6.1	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

Turret - Interior			
Area	CPAC Procedure	Reference	OK?
25MM Gun Azimuth & Elevation Servo Cables	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
25MM Gun Barrel Lock/Release	<ul style="list-style-type: none"> Apply Dry Film Lubricant to bare metal areas. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads. 	Paragraph 6-11 Paragraph 6-3	
25MM Gun Rotor	<ul style="list-style-type: none"> Apply Dry Film Lubricant or Light Lubricating Oil, MIL-PRF-32033 or equal, to bare metal areas. 	Paragraph 6-11	
Ammo Forwarder/Feeder Assembly (Located on gun assembly & in ready round box)	<ul style="list-style-type: none"> Apply Dry Film Lubricant on sprocket shafts and feed chutes. 	Paragraph 6-11	
Cant Sensor	<ul style="list-style-type: none"> Clean any corrosion off with bristle brush. Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
CDA Cables	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
CDA Enclosure	<ul style="list-style-type: none"> If open, install VCI Emitter or Desiccant Packet. Ensure seals are in good condition. 	Paragraph 6-5	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Turret - Interior			
Area	CPAC Procedure	Reference	OK?
	<ul style="list-style-type: none"> Reinstall cover screws with Tef-Gel. 	Paragraph 6-3.2	
Co-Axial Machine Gun Mount	<ul style="list-style-type: none"> Apply Dry Film Lubricant to mount and tunnel. Install mount using light coat of Zinc Dust Anti-Seize on outer surface of mounting ring. 	Paragraph 6-11 Paragraph 6-3	
Control/Monitor, C-11291/VRC boxes	<ul style="list-style-type: none"> Clean any corrosion off with bristle brush. Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
DECA and LLA Boxes (Located on rear of turret basket)	<ul style="list-style-type: none"> Clean any corrosion off with bristle brush. Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
Emergency Escape Hatch Interlock Sensor	<ul style="list-style-type: none"> Clean any corrosion off with bristle brush. Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
FLIR/TV Sight Electrical Connectors	<ul style="list-style-type: none"> Clean any corrosion off with bristle brush. Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
Gatling Gun Battery Box	<ul style="list-style-type: none"> Clean compartment and batteries. Apply GAA, Petrolatum or other suitable protective compound to battery posts. Apply Tef-Gel (if required) or Zinc Dust Anti-Seize to threads of battery clamping studs. Re-install box cover, using Tef-Gel (if required) or Zinc Dust Anti-Seize on fastener threads. Hinge: Apply Fluid Film or Carwell T-32 to hinge and hinge rod. Frame: Apply Fluid Film or Carwell T-32 to all crevices of support frame. 	Paragraph 4-8.1 Paragraph 6-3.1 Paragraph 6-3.1 Paragraph 6-7.2 Paragraph 6-7.2	
GCP Harness W1	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
GPS Antenna Splitter	<ul style="list-style-type: none"> Clean any corrosion off with bristle brush. Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
Gun Turret Drive (GTD) Enclosure	<ul style="list-style-type: none"> Install VCI Emitter or Desiccant Packet. Ensure seals are in good condition. Reinstall cover screws with Tef-Gel. 	Paragraph 6-5 Paragraph 6-3.2	
Gunner's Control Panel (GCP) Enclosure	<ul style="list-style-type: none"> Install VCI Emitter or Desiccant Packet. Ensure seals are in good condition. Seal cover with RTV Silicone Sealant. 	Paragraph 6-5 Paragraph 6-2	
Hand Control (joystick) Cable	<ul style="list-style-type: none"> Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections. 	Paragraph 6-6.1	
Hydraulic Line Fittings (Steel)	<ul style="list-style-type: none"> Encapsulate with 3140 RTV Silicone Sealant Apply Fluid Film or Carwell T-32 if unable to seal appropriately. 	Paragraph 6-2 Paragraph 6-7.2	
Hydraulic Pump Motor Cable	<ul style="list-style-type: none"> Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
Image Transfer Assembly (ITA)	<ul style="list-style-type: none"> Apply Tef-Gel (if required) or Zinc Dust Anti-Seize on threads. 	Paragraph 6-3	

CPAC Checklists for Use in Applying CPAC Measures Along with Deployment

- Continued

Turret - Interior			
Area	CPAC Procedure	Reference	OK?
Intercom Boxes at Gunner's and Vehicle Commander's Stations	<ul style="list-style-type: none"> • Clean any corrosion off with bristle brush. • Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
ITA Wiring Harness	<ul style="list-style-type: none"> • Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections. 	Paragraph 6-6.1	
Night Sight Cable	<ul style="list-style-type: none"> • Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
PDA/Gun Control Assy (GCA) Cables	<ul style="list-style-type: none"> • Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
Power Distribution Assembly (PDA) Enclosure	<ul style="list-style-type: none"> • If opened, install VCI Emitter or Desiccant packet. • Ensure seals are in good condition. • Reinstall cover screws with Tef-Gel. 	Paragraph 6-5 Paragraph 6-3.2	
Slip Ring Power Cables	<ul style="list-style-type: none"> • Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
Tachometer Drive Assy. Cable	<ul style="list-style-type: none"> • Apply flowable 3140 RTV Silicone Sealant to weatherproof electrical connection. 	Paragraph 6-2	
Thermal Electronics Unit (TEU), (Located on rear of turret basket)	<ul style="list-style-type: none"> • Clean any corrosion off with bristle brush. • Apply Type II CPC to outside of connector. 	Paragraph 6-4.3	
Thermal Sight Cable	<ul style="list-style-type: none"> • Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections. 	Paragraph 6-6.1	
Thermal Sight Linkages	<ul style="list-style-type: none"> • Apply Fluid Film or Carwell T-32. 	Paragraph 6-7.2	
Threaded Aluminum Fittings on all Tubing, Air Actuator Lines, etc.	<ul style="list-style-type: none"> • Apply Fluid Film, Carwell T-32 or Type II CPC. 	Paragraph 6-7.2 Paragraph 6-4.3	
Turret Support Bearing	<ul style="list-style-type: none"> • Lubricate as per LO, LI or TM. 		
W104 Main Gun Wiring Harness	<ul style="list-style-type: none"> • Apply Silicone Tape or Type II CPC to weatherproof frequently disconnected electrical connections. 	Paragraph 6-6.1	

Glossary

Term	Definition
Anode.	The metal or area of a metal in a corrosion cell that is actively corroding.
Anodize.	A thickened layer of oxide, which is applied electrolytically to a metal surface, such as aluminum. This layer is not only protective, but also a good base for paint adhesion.
Bedliner.	High build Polyurethane/Polyurea coatings to reduce coating damage and subsequent corrosion on steel cargo surfaces on Expeditionary Equipment.
CARC.	Chemical Agent Resistant Coating. Type of camouflage coating system used to provide resistance to chemical agents and decontaminating solutions. This coating requires a good primer to provide corrosion.
Cathode.	The metal or area of a metal in a corrosion cell that is not actively corroding.
CCM.	Corrosion Control Manual.
Chloride.	A form of the element "Chlorine" (chemical symbol "Cl") that is found in most salt, either from the ocean or in road de-icers. Chloride compounds in salts are what promotes or accelerates corrosion of most metals.
CLP.	Cleaner, Lubricant, Preservative. A thin film, light lubricating and preservative oil per MIL-L-63460. It is also sometimes called "Breakfree." It will provide short-term corrosion protection, about 30 days or less, depending on the environment. Useful for sliding surfaces and hinges, it is often called for in maintaining small weapons.
Coating.	Paint, preservative compounds, and inorganic layers formed by anodizing and chemical conversion.
Concentration Cell.	Corrosion that is initiated by the difference in concentration of dissolved oxygen or metal ions in the electrolyte. Concentration cells are associated with crevice areas where water is trapped.
Corrosion.	The electrochemical deterioration of a metal reacting with its environment.
Corrosion Cell.	Electrochemical process that has four parts: an anode, a cathode, an electrolyte, and an electrically conductive pathway between the anode and the cathode.
Corrosion Fatigue.	Effect of corrosion and cyclic stress on metal. This type of corrosion is usually associated with high strength alloys.
Corrosion Rate.	A term used to show how fast a metal corrodes when exposed to a specified environment. Corrosion rate is often expressed in terms of weight lost per year (grams/year) or thickness lost per year (mils per year, mpy).
CPAC.	Corrosion Prevention and Control. This term is used to identify the formal U.S. Marine Corps corrosion control program, as well as a general term to refer to the system of identifying, preventing, and controlling corrosion on USMC ground combat equipment.
CPC.	Corrosion Preventive Compound. This term is used to cover a variety of sprayable or brushable products intended for relatively short-term corrosion protection. The compounds are typically very thin films that may remain soft or harden, depending on the type. The compounds may have a corrosion-inhibiting chemical in them and usually have the ability to displace moisture from a surface. They are usually used for corrosion control on electrical components and connectors, or for hinges and sliding surfaces. MIL-C-81309 and MIL-C-85054 are two common specifications for CPC products.
Direct Surface Attack.	A type of corrosion that results from direct reaction between a metal surface and the atmosphere. Rust on iron is a common example. It may also be called uniform corrosion or general corrosion.
Electrode.	An electrical conductor in a corrosion cell that may act as either an anode or a cathode.
Electrolyte.	A material that surrounds the anode and cathode in a corrosion cell that is able to conduct electricity. Water, battery electrolyte, and even wet sand or soil can act as an electrolyte. Salts in seawater make it more conductive, which can result in higher corrosion rates.
Epoxy Primer.	Approved primer for the CARC coating system.

Glossary - Continued

Term	Definition
Emulsion.	A suspension of small globules of one liquid dispersed throughout another liquid with which it will not combine in solution. Some cleaners for oily surfaces work by "emulsifying" the oil.
Exfoliation.	A form of corrosion that looks like blistering and flaking off of metal layers. This term is usually used for aluminum alloy plate and sheet material.
Faying Surfaces.	Metal surfaces in contact such as laps, joints and crevices.
Fretting Corrosion.	Corrosion where two surfaces in contact with each other under heavy pressure is subject to motion vibration sufficient to cause wear and slippage.
Galvanic Cell.	A corrosion cell of two dissimilar metals and an electrolyte.
Galvanic Corrosion.	Accelerated corrosion as a result of contact between dissimilar metals in a corrosive material. The metal that is the anode corrodes faster in a galvanic cell than it would if were not in contact with the other metal.
Galvanic Series.	A listing of metals and alloys in order of their tendency to corrode in a certain environment. The galvanic series in seawater is of most interest to the Expeditionary Community.
Hydroscopic.	The ability to absorb and retain moisture.
Inhibitor.	A substance that slows down a chemical reaction, such as corrosion.
Inorganic Coating.	A protective coating such as electroplating, chemical conversion coating, or anodizing the term "inorganic" means that it is not based on oils or polymers. Most conventional paints are organic coatings.
Intergranular Corrosion.	A form of corrosion that attacks a metal along its "grain boundaries". Metals and alloys are composed of microscopic "grains" or particles; the grain boundaries are simply the edges of the grains.
Ion.	An electrically charged atom or group of atoms.
LO.	Lubrication Order.
LI.	Lubrication Instruction.
Metalizing.	A coating process that applies melted metal droplets onto a surface, usually by spraying. Zinc, aluminum, and some combination of these metals are commonly used for metalizing.
Mil.	One one-thousandth of an inch (0.001 in.). Used to express paint coating thickness, surface profile roughness, and depth of corrosion damage.
NSN.	National Stock Number. Numbers used to identify products available through the Federal Stock System.
Noble Metals.	Metals such as gold, silver and platinum, which do not readily corrode.
Organic Coating.	A coating whose chemistry relies on hydrocarbons, oils, or polymers. Most paints, lacquers, plastic, grease, and preservatives are organic.
Oxidation.	Another term that indicates corrosion.
Passivation.	An electrochemical process, where the surface of a metal becomes inert or neutral to the corrosive environment.
Pitting Corrosion.	Localized corrosion that takes the form of cavities at the surface of metals.
PPE.	Personal Protective Equipment. Refers to safety equipment to be used when performing maintenance. This includes respirators, goggles, gloves, etc. The specific equipment required depends on the task being performed and is specified in the individual maintenance procedures.
RTV.	Room Temperature Vulcanizing. Usually refers to silicone sealants. These sealants may be 1-part or 2-part materials and are used to prevent moisture from getting into such things as electrical connectors, enclosures, and seams or joints.
Scaling.	Formation of partially adherent oxide layers on a metal surface.
SC CARC.	Single Component CARC Coating.

Glossary - Continued

Term	Definition
SCC.	Stress Corrosion Cracking. SCC is the brittle fracture of a metal at a stress level below its normal strength when it has been exposed to a corrosive environment while under a tensile (pulling) stress or load. In general, SCC affects only very high strength metals. SCC usually cannot be detected until it is too late and cracks have already occurred.
TI.	Technical Instruction.
TM.	Technical Manual.
Toxic.	Poisonous by ingestion, inhalation, and absorption through the skin.
VCI.	Vapor Phase Corrosion Inhibitor. A compound used for corrosion protection of bare metal components in closed or low airflow spaces. When VCI material is exposed to air, it gives off a vapor, which spreads through the enclosed space to all exposed metallic surfaces. On contact with the surface, the vapors condense into an extremely thin, invisible film, which provides a degree of corrosion protection.
Water Reducible CARC.	A more environmentally friendly coating system than CARC that has been approved as an alternative camouflage topcoat for U.S. Marine Corps & Navy Expeditionary ground combat equipment.
WFT.	Wet Film Thickness. Term for the thickness of paint upon application, before it dries. It can be used to estimate the dry film thickness (DFT) of the cured coating during application.
ZASC.	Zinc Dust Anti-seize Compound. Substance of zinc dust in petrolatum applied to threaded parts to help prevent seizing. It is especially useful to provide corrosion protection of aluminum threads when in contact with steel or CRES fasteners. It is intended for use whenever maintenance is being performed on equipment and fasteners are reinstalled.
Zinc-Rich Primer (ZRP).	Provides sacrificial cathodic protection to steel surfaces and has been demonstrated as a proven and mature technology for corrosion control.

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