

Oshkosh Corporation
Specification No.: PS100
Change No.: 5
Date: January 4, 2010

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DOCUMENT

Robert M. Hathaway
VP, Materials and Process Engineering

Pretreatment and Paint Specification PS 100

For

Oshkosh Corporation (OSK) & OSK Suppliers

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Scope:

This specification is a general manufacturing document summarizing the finishing processes incorporated on parts, sub-assemblies, and vehicles of Oshkosh Corporation (OSK).

Purpose:

The communicate the specific methods, procedures, and inspection criteria to be used for the finishing of OSK components and vehicles.

Subcontractors and On-Premise Finishers:

Refer to the Vendor Paint Process Check List located in Appendix A and appropriate Vehicle Technical Drawing, when available, for allowable material and process specifics. The Vendor Paint Process Check List summarizes the requirements of this specification. Compliance with the applicable items of this list are required when painting parts, assemblies, and vehicles by and for OSK. Verification through regular audits by OSK or an authorized representative will be performed.

To help control the quality of parts or vehicles being painted for or by OSK, the following conditions must be met and satisfied in writing or in the form of a certification from their suppliers:

1. Training on use and application of cleaning and pretreatment chemicals used based upon contract requirements or Specifications of item being finished.
2. Training on use, mixing, and application of all paints applied based upon contract requirements using the Specifications referenced
3. Written proof of approval from supplier of paint that the correct solvents are being used for production and/or clean-up.

Precedence:

In the event of a conflict between the text of this document and the references cited herein, the order of precedence shall be:

1. The contract or purchase order
2. This Document
3. The Engineering Drawing
4. Referenced documents to the extent specified herein.

Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained. As specifically required by the Mine Resistant Ambush Protected (MRAP) All Terrain Vehicle (M-ATV) program, any revisions to this document must be approved by the appropriate Government authority prior to their incorporation and use on the M-ATV program.

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Applicable Documents:

Military and Federal Standards:

MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-DTL-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-P-14105	Paint, Heat Resistant (for Steel Surfaces)
MIL-DTL-53022	Primer, Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free
A-A-52474	Commercial Item Description, Electrocoating Primer (Water Borne, Cathodic Epoxy)
MIL-PRF-85285	Coating: Polyurethane High Solids
MIL-DTL-53072	Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection
A-A-59745	CID Zinc-Rich Coatings
MIL-DTL-53030	Primer Coating, Epoxy, Water Reducible, Lead and Chromate Free
MIL-DTL-53039	Coating, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant
MIL-DTL-0053084	Primer, Cathodic Electrodeposition, Chemical Agent Resistant
MIL-PRF-85582	Primer Coatings: Epoxy, Waterborne
A-A-1830	Tape, Film, Pressure-Sensitive Adhesive, (Box Closure) Classification
A-A-884	Tape, Pressure-Sensitive Adhesive, Box Closure Salient Characteristics
TT-C-490	Cleaning Methods for Ferrous Surfaces and Pretreatment for Organic Coatings
MIL-PRF-26915	Primer Coating, Zinc Dust Pigmented, For Steel Substrates
MIL-HNBK-46164	Handbook for Rustproofing Military Vehicles and Trailers
A-A-3007	Thinner: for Phenol-Formaldehyde and Medium Oil and Styrenated Alkyd Paints and Varnishes
DS108 per SAE AMS 3166	Solvents, Cleaning, Cleaning Prior to Application of Sealing Compounds

Industry Standards:

ASTM B117	Standard Practice for Operating Salt Spray (Fog) Testing Apparatus
SSPC-SP5/NACE	No. 1 - Steel Structures Painting Manual Vol. 2
SSPC-SP6/NACE	No. 3 - Steel Structures Painting Manual Vol. 2
SSPC-SP10/NACE	No. 2 - Steel Structures Painting Manual Vol. 2
SSPC-SPCOM	Steel Structures Painting Manual Vol. 2
SSPC 74-01	Surface Profile for Anti-Corrosion Paints
SSPC-PA-2	Measurement of Dry Paint Thickness with Magnetic Gages
NACE RP0287	Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape
ASTM D4417	Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D1654	Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

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ASTM D4138 Measurement of Dry Film Thickness of Protective Coating systems by Destructive, Cross Sectioning Means

CC#168 Coral Chemical Company, Checking Cure of Chromium Chromate Coatings on Aluminum

ASTM G53 Standard Practices for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials (QUV)

GM9540P General Motors – Accelerated Corrosion Test

ASTM E376 Calibration of Instruments for Measurement of Dry Film Thickness

OSK Quality Control Procedures:

QCP-24 OSK Chemical Conversion Coating for Aluminum

QCP-31 OSK Zinc Phosphate Procedures

QCP-131 OSK Paint Testing Procedure

NPO-155 North Plant Component Rustproofing Work Instructions

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SECTION I

Tactical Wheeled Vehicle Finish Requirements

- 1. Family of Heavy Tactical Vehicles (FHTV)**
- 2. Medium Tactical Vehicle Replacement (MTVR) – CPC Plan P/N 3052913**
- 3. Logistics Vehicle System Replacement (LVSF) – CPC Plan P/N 3509217**
- 4. Mine Resistant Ambushed Protected - All Terrain Vehicle (M-ATV)**
 - A. General finish requirements MIL-DTL-53072
 - B. Clean steel per TT-C-490, Pretreat Steel per TT-C-490 Type I – Non Chrome Seal. Cleaning Method I of TT-C-490 may be used as a pretreatment provided the subsequent organic barrier coating is applied within 4 hours of cleaning and test panels show conformance to the required performance criteria.
 - C. Clean and treat aluminum per MIL-DTL-5541, Type II, Class 1A or 3 respective of engineering application requirements.
 - D. Prepare fiber reinforced composites for paint by mechanically abrading the surface with 180-220 grit abrasive paper. Before and after abrading the surface use a lint-free cloth dampened with thinner per A-A-3007, or DS-108 cleaning solvent SAE AMS 3166 and wipe the surface clean.
 - E. Prime MIL-DTL-53022, MIL-DTL-53030, A-A-52474 Water Borne Cathodic Epoxy Electrodeposition, or MIL-DTL-0053084 Cathodic Electrodeposition, Chemical Agent Resistant Coating
 - F. Top coat with MIL-DTL-53039

Note: The color and special paint requirements, i.e., Zinc Rich Primer, Heat Resistant Black, Acid Resistant Black, etc., will be specified in the purchase description, engineering drawing, and technical drawing.

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SECTION II Coating Dry Times

Coating	Time in Minutes	Temperature ° F	Wet Film Thickness in Mils.	Dry Film Thickness in Mils.
MIL-DTL-53022/53030	30	180 ~ 260	2 ~ 3	1.0 ~ 1.5
MIL-DTL-53039 min.	30	140	4 min.	1.8 min.
MIL-DTL-53039 max.	45	180	4 min.	1.8 min.
Hentzen Organic Zenthane Zinc Rich, min.	240	140	4.5 ~ 5.0	2.5 ~ 3.5
Hentzen Organic Zenthane Zinc Rich, max.	30 ~ 120	180 ~ 260	4.5 ~ 5.0	2.5 ~ 3.5

Grit Blasting

If cleaning is performed by Method I of TT-C-490, it must be done in accordance to SSPC-SP-5, or SSPC-SP-10, NACE #1 and #2 respectively. These specifications are summarized:

Name	SSPC Designation	NACE Designation	Description
White Metal Blasting	SSPC-SP-5	NACE #1	Complete removal of all visible rust, paint, mill scale, and foreign material by wheel or pressure blistering using (wet or dry) sand, grit, or shot. Suitable for all of the most severe environments, including immersion service.
Near White Blast	SSPC-SP-10	NACE #2	Blast clean until at least 95% of each element of surface is free of all visible residues.

Prior to grit blasting, the component shall be cleaned to remove visible deposits of oil or grease, i.e. SSPC-SP-1. The blast cleaning abrasive shall be dry and free of oil, grease, and other contaminants in accordance with SSPC-SP-5 and SSPC-10. The condition of the surface prior to coating shall be as specified in TT-C-490.

Minimum Surface Preparation Requirements for Steel

Coating Type	Minimum Surface Preparation	Recommended Surface Profile X .001" or Mils	Recommended Dry Film Thickness at the Top of the Surface Peaks X .001" or Mils
Epoxy	Near-White (NACE #2, SSPC-SP-10)	1.0 to 2.0	1.0 to 1.5
Urethane	Near-White (NACE #2, SSPC-SP-10)	1.0 to 2.0	2.0 minimum
Organic Zinc Rich Primer	White or Near-White (NACE #1 or #2, SSPC-SP-5 or SSPC-SP-10)	1.5 to 2.0	2.5 to 3.5

The listed coatings should not be applied unless the minimum surface preparation requirements are met. The maximum typical profile height is that expected under normal good operating conditions. If excessively high air pressure or wheel speed is used, the profile may be significantly higher and a greater amount of organic coating will be needed to coat the peaks of the surface profile. Two shop coats may be required to adequately cover the peaks of the profile to pass the salt fog requirements or TT-C-490, MIL-DTL-5541, and /or MIL-DTL-81706

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Recommended Practices:

Application Zinc Rich Primer (OSK P/N 3191067)

- Organic Urethane Zinc Rich Primer by Hentzen Coatings, Inc., 09443FMU-2, e.g., Zinc Rich Zenthane[®].
- Single-component paint
- Apply to a grit blasted surface
- Dry film thickness should be 0.0025-0.003”
- Allow material to dry for 4-6 hours before recoating with MIL-DTL-53022 barrier coat. Barrier coat should be applied to .0008” - .00125” DFT.
- Otherwise, a force dry of 60 minutes at 180 degrees Fahrenheit is acceptable.
- Allow barrier coat to cure until it’s dry to touch, typically 2 hours at ambient temperature, before handling or recoating.
- Otherwise, a force dry of 20 minutes at 180 degrees Fahrenheit is acceptable.
- Accelerators and/or heat can be used to accelerate this cure time. Consult Hentzen Coatings for detailed instructions.
- The material should be agitated with a paint shaker prior to and during use to maintain homogeneity of the zinc dust within container.
- Brush or air-spray application
- Use xylene or Aromatic 100 to reduce. Consult Tech Data Sheet

CARC Epoxy Primer (OSK P/N’s 1934130 & 1934140)

- MIL-DTL-53022 Epoxy Primer, known by Hentzen Coatings, Inc. as White High Solids Epoxy Primer 4488WEP-4/4489CEH-4 (5510WEP-X/5511CZH-X where allowed).
- Mix 4:1 by volume
- Apply to a 0.0016 ~ 0.0023” approximate wet film thickness
- Dry film thickness is required to be 0.001 ~ 0.0015”
- Allow material to cure until it’s dry to touch, typically 2 hours at ambient temperature, before handling or recoating
- Otherwise, a force dry of 20 minutes at 180 degrees Fahrenheit is acceptable.
- The useable pot life is 16 hours
- Brush or Air-spray
- Use 1:1 MEK and Cellosolve Acetate to clean up.
- CARC topcoat shall be applied within 4 days of outdoor/UV exposure or 3 weeks of indoor exposure
- Epoxy primer which is uncoated after this period will need to be scuff sanded and solvent wiped prior to top coating

CARC topcoat (OSK P/N 1517880, 383 Green)

- MIL-DTL-53039, known by Hentzen Coatings, Inc., as Zenthane[®] Aliphatic Single Component Camouflage Polyurethane Coating
- Single component
- Apply approximate wet film thickness of 0.0036” minimum

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- Dry film thickness is required to be 0.0018” minimum
- It is recommended that the maximum thickness be less than 0.020”
- Allow material 3 ~ 4 hours to cure at ambient conditions before handling
- Full cure is obtained at 168+ hours
- Accelerated cure times may be achieved at elevated temperatures.
- Allow topcoat to flash for 15 minutes prior to force cure
- Heat lamps may be place about 1 foot away from the paint surface. A temperature between 120-160 degrees Fahrenheit on the surface of the part is recommended. A time of 3 hours is required to reach full cure.
- Force drying ovens operating at 120-220 degrees Fahrenheit will also reduce drying time.
- To avoid pigment from settling, material should be agitated prior to and during use. Paint shakers or drum rollers are recommended.
- Brush or air-spray apply
- Use urethane grade solvents for clean up. Clean up should be prompt, as Zenthane has excellent solvent resistance once it is cured.
- If item is to be tested for quality, it should be fully cured prior to testing. This is accomplished through 168 hours of cure at ambient conditions or 4 hours at 180-220 degrees Fahrenheit. If cured at elevated temperatures, the part should be allowed to return to room temperature prior to testing.

Note: Alcohols or Glycol Ethers must not be used, as they will adversely affect the film properties.

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Coating Requirements:

Paint Storage

Consult Tech Data Sheets for specific information. In most cases, storage indoors at room temperature in a clean and dry location should be sufficient.

Order of Operations:

All machining and welding operations should be completed prior to application of protective barrier finishes.

Water Break Test Performance:

Immediately prior to the application of primer, the surface to be painted must be capable of meeting the water break test.

Water Break Test:

A mist of distilled water shall be atomized on the surface to be checked for cleanliness. The surface is considered as having passed the water break test if water droplets tend to coalesce into large lenses lasting for 30 seconds, (ASTM F21 or ASTM B322, Section 8). The surface is considered as having failed the water break test if water gathers into droplets within 30 seconds (if surface shows a "water break" within that time), or if the water forms a continuous film by flashing out suddenly over a large area (due to impurities on the surface such as free alkali or residual detergent), the surface shall be re-cleaned and tested as described in ASTM B322, Section 8.1. Failure to support an unbroken water film shall be sufficient cause for additional cleaning.

Surface Temperature:

During surface preparation and coating operations, the surface temperature of the part being coated shall be at least 60 deg. F and at least 5 deg. F above the ambient dew point.

Guidelines for Cross-hatch Adhesion Checks

For those items that require paint rework on areas greater than 2 square feet, it is recommended that they be checked for paint adhesion on a periodic basis. This shall be done according to PS100.

Guidelines for Solvent Rub Testing

Periodically, areas, which have been reworked, should be checked for proper mixing. Using a clean lint free cloth thoroughly dampened with MEK, rub the surface that was repaired for 10 seconds to remove any overspray. Wet a clean cloth and briskly rub the same surface with 20 strokes approximately 6 inches in length. A slight amount of green on the rag is acceptable and may just be indicative of overspray. However, under this type of test, the coating should not degrade or be removed from the epoxy primer. This result indicates an improperly catalyzed or uncured topcoat.

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Failure of Tests

In either case, failure of the tests could mean that the paint system is not yet cured. Therefore, before the item is rejected it should be subjected to a force cure via heat lamp or oven. A time of 2-3 hours at the temperature ranges listed above should be sufficient to cure the paint. Allow surface to cool down to room temperature prior to retesting. If part should fail a second time, it should be considered a failure. As necessary, topcoat or topcoat/primer should be removed and reapplied to the proper specifications.

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Primer Systems:

1. Electrodeposition Primer

- A-A-52474 has poor resistance to ultraviolet degradation, hence, parts should be top coated as soon as possible following primer application. Exterior parts exposed to direct UV radiation rely on the topcoat for protection. Avoid storing parts outside prior to topcoat application as the E-coated surface will oxidize and produce topcoat adhesion failures. Depending on the amount of time prior to top coating and the environment in which the E-coated surface has been stored, it may be necessary to scuff sand the surface prior to top coat application to achieve acceptable adhesion characteristic.
- It is of the utmost importance that those items epoxy coated with either electrodeposition A-A-52474 or air spray MIL-DTL-53022 or MIL-DTL-53030 not be stored outdoors where ultra-violet radiation can produce oxidation of the epoxy primer and affect top coat adhesion. It is of great concern that if these components are not properly handled that they will require scuff sanding prior to top coating. This could produce a severe bottle neck in the assembly of vehicles. The MIL-DTL-53022 can be stored undercover out of direct sunlight for a maximum period of 4 weeks. After which they can be assembled to the truck and top coated without scuff sanding. Primer aging hardens the coating to where it becomes difficult for the Chemical Agent Resistant Coating top coat to bite into the primer. It is for this reason that, even if UV damage does not occur extended periods of uncoated primer can generate top coat adhesion concerns. It has been shown that within 48 hours in an accelerated weathering chamber, i.e., QUV cabinet, the epoxy has oxidized to the point where sanding is required for the top coat to adhere. Although there is no correlation between time in the QUV cabinet and real-time outdoor exposure, I would conservatively state that parts could be stored outdoors for a maximum of 2 weeks and then brought in-house, washed of any dirt or debris and top coated without scuff sanding. These examples cover both ends of the spectrum of time available prior to the need for scuff sanding. It is for these reasons that the supplier that primes the parts should whenever possible complete the MIL-DTL-53072 finishing requirement by CARC top coating.

2. Organic Epoxy Based Zinc Rich Primer with MIL-DTL-53022 CARC Epoxy Primer

- Hentzen Coatings, in conjunction with Oshkosh Corp. has established that utilizing the 2 component Zinc Rich Primer per A-A-59745 directly underneath the 2 component Epoxy Primer per MIL-DTL-53022 is a fully compatible system.
- Instructions: Part A of the Zinc Rich Primer should be thoroughly agitated for a minimum 10 minutes prior to catalyzing with part B at a ratio of 4:1. A 30 minute induction period is then required. Paint vessels with constant agitation are required. The Zinc Rich primer should be applied between 5-7 mils wet, which will yield 2.5-3.5 mils dry film thickness. After the zinc Rich is applied, a minimum 2 minute flash off is required before application of the subsequent Epoxy Primer.

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- Part A of the Epoxy primer should be thoroughly agitated for a minimum 10 minutes prior to catalyzing with part B at a ratio of 4:1. A 30 minute induction period is then required. Paint vessels with constant agitation are required. The MIL-DTL-53022 Epoxy primer should be applied between 1.6-2.4 mils wet, which will yield 0.8-1.2 mils dry film thickness over the Zinc Rich primer.
- This wet-on-wet process can then be either air-dried or force cured through ovens, however prior to final topcoat with MIL-DTL-53039, this Zinc Rich/Epoxy primed surface must be dry to handle and print free so that blistering of the topcoat does not occur. Compared to air drying, the use of forced heat helps expedite the drying process.

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Supporting Commentary

Cleaning of Ferrous Substrates:

The following information summarizes the cleaning methods detailed in TT-C-490, SSPC-SP5, 6, & 10/NACE No. 1, 3, & 2 respectively and SSPC-SP COM:

- Method I:** Mechanical or abrasive cleaning. Abrasive blasting is generally recommended to remove heavy rust and mill scale. It must be noted that, per TT-C-490, cleaning "Method I (abrasive blasting) is generally recommended to remove heavy rust and mill scale on metals with thicknesses greater than 1/8" and, when specified, can be epoxy primed directly. This is applicable provided the requirements of TT-C-490 and the respective coating specifications are being met, i.e., adhesion, salt fog resistance, permeability, etc.
- Method II:** Solvent (immersion, spray, or vapor) de-greasing, to assure a grease free surface. De-greasing is followed by cleaning techniques such as air or brushing for the removal of dust and metal particles.
- Method III:** Hot alkaline (immersion, spray, or electrolytic), for ferrous surfaces only. Clean parts to remove oils, and other contaminants, by using a hand operated high pressure washer or the first and second stage of multi-stage washer system. The final stage of this cleaning process is to rinse with clean water to remove soaps and soluble salts.
- Method IV:** Emulsion (with or without added water). The emulsion method is a petroleum distillate base that can be hand wiped without water or must be sprayed if water is added. Rinse off with clean water. With this process, oils and greases are removed.
- Method V:** Alkaline de-rusting. This process eliminates rust deposits; parts can be immersed, brushed, or pump sprayed. Rinse off with clean water.
- Method VI:** Phosphoric acid (alcohol, detergent, or solvent type with detergent). This process will remove oils, grease, oxidation, and light mill scale with a hand wipe or brushing method. Rinse off with clean water. Spraying is not recommended. For spot treatment DuPont 5717S Phosphoric Acid will remove oils, grease, and oxidation. Rinse with clear water to remove excess chemicals.

Mill Scale: Reference, Addendum 05. Mill Scale left on the surface of a part prior to painting severely undermines the corrosion prevention and control offered the organic barrier coating. Failure to completely remove the mill scale from the part will result in short times to corrosion, and ultimate loss of coating adhesion. Hence, it is recommended wherever possible that hot rolled pickled and oiled steel be used in those instances that required hot rolled steel.

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This assures that the scale has been removed and provides a reduction in life cycle cost of the component and the vehicle to which the component is being used.

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In general:

- Blast profile height increases as the abrasive size increases.
- Profile height also increases as the degree of cleaning is improved from commercial blast to white metal.
- Profile height increases as the angle of abrasive impingement increases from oblique to perpendicular.
- In general, profile obtained with metallic abrasives tends to be higher and less “disturbed” than that obtained with sand or other non-metallics.
- Steel thickness has a relatively small effect on profile height.

Because each part number has its own unique characteristics, the abrasive selection should not be done in a haphazard manner. Some of the important factors that help to determine abrasives to be used are:

1. Type of metal to be cleaned
2. Shape of the structure
3. Type of material to be removed
4. Coating surface finish desired
5. Profile of the steel to be coated and coating thickness
6. Amount of abrasives that will be lost during blasting
7. Reclamation of the abrasive
8. Breakdown rate of the abrasive
9. Hazards associated with the use of the abrasive
10. Area where the abrasive will be used and its danger to surrounding equipment

Different abrasives impart different surface affects onto the part they impinge upon. Specifically, sand or mineral abrasives tend to scour in addition to cutting the surface. This is effective in exposing the greatest number of reactive sites on the metal surface so that maximum adhesion of the coating can be achieved. The cleaning action of sand however, is less effective on heavy rust or mill scale than metal shot or grit because of its lesser impact energy. Once the heavy scale has been popped off, the cleaning action of sand is superior. Steel shot on the other hand relies on impact alone. The shot essentially hammers the surface, which as stated is advantageous when heavy brittle deposits must be removed. Because the shot hammers the surface it also compresses and stretches the metal surface. This, on thin sheet metal, may not have acceptable results with certain components. Steel grit on the other hand has more cutting action imparted to the metal’s surface. This cutting action forms sharp peaks and valleys. As the steel grit is reclaimed and reused, it loses its cutting effectiveness because the grit edges become round and impart more peening characteristics over time.

Surface Inspection:

Hence, based on the different types of abrasive which can be used, there are primarily three different surface finishes that can result. However, the behavior of high performance coatings is best over a sand or nonmetallic grit-blasted surface. An anchor pattern (the surface roughness formed by the peaks and valleys on the surface), should be between 1 and 2 mils in depth (as measured with a profilometer) and/or NACE RP0287, ASTM D4417, to obtain adequate adhesion on most high performance coatings. It must be noted however that the profile achieved

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must be covered with the base primer as would be evidenced through its salt fog performance and the primer's conformance to its requirements.

The surface profile is the roughness of the surface that results from abrasive blast cleaning. The profile depth (or height) is dependent upon the size, type, and hardness of the abrasive, particle velocity and angle of impact, hardness of the surfaces, amount of grit recycling, and the proper maintenance of working mixtures of grit and/or short. The allowable minimum/maximum height of profile, i.e., distance measured from the bottoms of the lowest valleys to the tops of the highest peaks, is usually dependent upon the thickness of the coating to be applied. To be cost effective in the application of organic finishes it is essential that the surface profile be minimized in achieving the required surface preparation. In other words, to achieve a white or near white metal finish it is recommended that larger abrasives be avoided. It is essential that regardless of what the surface profile is after blasting the primer, whether it be a Akzo-Nobel CIP, MIL-DTL-53022, MIL-PRF-85582, or a zinc rich (see Addendum 05) it must be applied in such a manner that the test panels, which represent the actual component, pass the salt fog requirements referenced in the respective specifications. In order that the salt fog pass/fail requirements are met the peaks of the surface need to be covered with an amount of primer sufficient to prevent oxidation. The proper dry film thickness of the MIL specification epoxy primer is between 1.0 to 1.5 Mils. The proper dry film thickness for Akzo-Nobel's Commercial CIP primer is approximately 2 Mils (See Appendix D), and the proper dry film thickness of the organic zinc rich primer is 2.5 to 3.5 Mils. For the reader's edification, additional information concerning the correlation of surface profile of the grit blasted surface and dry film coating thickness can be found in SSPC 74-01, "Surface Profile for Anti-Corrosion Paints".

Dry Film Thickness:

The dry film thickness is considered that coating thickness that exists at the top of the surface profile peaks. It is essential that ample coating be applied after blast cleaning to adequately cover and protect the peaks of the surface profile. Thus, the depth of the surface profile should be considered in determining the amount of coating to be applied. For higher profiles a larger coating thickness should be specified to assure that coating thicknesses are properly measured for the peaks of the profile, refer to SSPC-PA-2, "Measurement of Dry Paint Thickness with Magnetic Gages". Surface profile should be measured in accordance with NACE Standard RP0287, "Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape", or ASTM D4417, "Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel".

Pretreatment of Ferrous Substrates:

The following summarizes the pretreatment options detailed in TT-C-490. Reference should be made to the applicable vehicle technical drawing for allowable pretreatment type.

- **Type I: Zinc Phosphate:** The properly cleaned articles shall be subjected to a balanced aqueous solution containing phosphoric acid, zinc, and accelerating agents until a uniform, insoluble, phosphate coating is produced. Dated records should be maintained for the chemical analysis and additions made to the solutions. Coating deposits shall be continuous, uniform in texture, evenly deposited, and gray-to-black in color. The coating shall not be mottled in appearance, nor show any smut, powder, corrosion products, or white stains due to dried phosphating solutions. There shall be a minimum number of contact marks from holders or racks. Non-uniformity of color due to heat treatment, composition of the basis

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metal, the degree of cold work performed on the basis metal, or presence of brown or orange stains inherent from the acidified final rinse process, shall not be cause for rejection. Phosphate coating weight information can be found in TT-C-490. There are five tests required by TT-C-490, and suppliers will be required to perform these tests and keep records, see Appendix A.

Cleaning of Aluminum Substrates:

- **Type I:** Non-etch alkaline cleaner (aluminum and aluminum alloys) (immersion, spray, or swab method). Clean parts to remove oils, grease, or other organic soils. A dipping method may be used in the first station of a multi-stage process. A pump spray operation may be used as well as a hand wiping operation. A clean water rinse must follow to remove excess chemicals.
- **Type II:** Deoxidize (aluminum and aluminum alloys) (immersion, spray, or swab method). This process will remove white oxides or any surface smut. Rinse with clean water to remove excess chemicals.
- **Type III:** Chemical etch (aluminum and aluminum alloys) (immersion, spray, or swab method). This process must be exercised when a non-etch alkaline is used (Type I). All inorganic soils such as welding smut and oxides will be removed and rinsed thoroughly with clean water to remove excess chemicals.

Note: If using an etching alkaline cleaner, Type II may be omitted. Then Type I and II only need to be used for preparing the substrate.

- **Type IV:** Hot alkaline (stainless steel) (immersion or spray). Clean parts to remove oils, grease, or other organic soils.
- **Type V:** Solvent (stainless steel) (immersion, spray, or vapor). This method is for de-greasing to assure a grease free surface and should be followed by cleaning techniques such as air or brushing for the removal of dust and metal particles.
- **Type VI:** Mechanical or abrasive cleaning with a galvanically compatible abrasive. Abrasive blasting is generally recommended to remove heavy corrosion. An organic pretreatment must be followed. See Section I, Method I.

Pretreatment of Aluminum Substrates:

- **MIL-DTL-5541, Type II, Class 1A or Class 3:** Non hexavalent chrome conversion coated aluminum and aluminum alloys can be accomplished with the following methods, 1) Immersion, 2) Spray, 3) Brush or 4) Applicator pen. Chemical coatings, referred to as chromate conversion coatings, shall result from the treatment of aluminum and aluminum alloy parts non-electrolytically with an aqueous solution of chemicals conforming to MIL-DTL-81706 to produce a suitable, hexavalent chrome free protective coating on the metal surface. The resultant coating shall be produced with approved products applied by the treatment method or methods for which the product was approved. There are three test

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requirements concerning this method: salt spray, wet adhesion, and visual. These procedures may be found in MIL-DTL-5541.

Note: After application of the conversion coating, the part(s) must be stored indoors and kept free of dust and other contaminants that would interfere with primer performance characteristics. The primer shall be applied in a timely manner and must pass the adhesion requirements as defined in the appropriate Military Standard.

Cleaning of Pre-Primed Assemblies Prior to Final Painting:

The following procedure is necessary in providing a clean surface that is receptive to achieving a quality finish:

1. Clean assembly with an approved method listed in the cleaning methods for the respective substrate.
2. Allow assembly to air dry thoroughly. If faster dry time is desired, use heat or blow dry with approved air tool.
3. Remove all excess sealant using plastic or metal scrapes. Be careful to check for excess R.T.V. Silicone Rubber Scaler; paint does not adhere. (Do not use metal scraper on aluminum surfaces that will not be painted).
4. Scuff sand all pre-primed surfaces that will be re-primed if initial surface is epoxy. Remove all loose or flaking primer to bare metal only if adhesion of primer has been impaired. When top coating gloss urethane over gloss urethane, scuff sand first. These are general guidelines and must be tested upon the beginning of each system or product start up. Each manufacturer's paint system cure rates vary with time, temperature, and humidity.
5. Any bare metal areas must be pretreated with an approved method per the pretreatment called out on the contract.
6. Mask entire assembly that will not be primed or may be adversely affected by the primer or paint. Particular areas of concern are: finned tubing, windows, rubber molding, door jams, etc.

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SECTION III

Inspection Criteria and Defects

This section lists where inspection information may be found and how to eliminate defects by giving a description along with probable causes and possible cures. This section is to be used by OSK and its respective suppliers as an aid in defining problems and identifying potential corrective actions during finishing operations.

Paint film thickness, adhesion, salt spray, permeability, and other written requirements, shall be in accordance with the Vendor Paint Process Check List in Appendix A. If questions exist concerning testing, contact OSK so clarification may be made. Failure to perform and properly document paint tests may result in supplier having to reprocess parts that fail upon use by OSK, its' customers, or other suppliers. Failure to perform and document paint tests may also result in suspension or loss of painting privileges until satisfactorily resolved. In addition to those listed above, the following sets of problems may result in a return or reject:

Finishing Defects:

Runs/Sags: (Heavy applications of sprayed material failing to adhere uniformly to the substrate or primer). Sags are usually the result of an unskilled spraying operator, the presence of too much thinner, or the wrong type of thinner. This trouble can usually be overcome by using quicker-flashing thinner, increased atomization by raising the air pressure, and/or lowering the fluid pressure.

Pinholes: (Pinholing is the presence of tiny holes in the finish which may appear in groups). Causes of pinholing may be the presence of oil and water in the compressed air line, and/or insufficient atomization. Elimination of water, oil, or dirt from the air line can be aided by using a filter attachment in front of the connection for the spraying hose. If the problem is insufficient atomization, a lower pot pressure and a higher pressure on the gun will often help.

Orange Peel: (An uneven formation on the surface resembling that of an orange peel). This condition is caused by the failure of atomized paint droplets to flow into each other when they reach the surface. Orange peel may be caused by one or a combination of factors. Examples are: wrong gun adjustment or technique, poor shop temperature, flash time or time between coats, and wrong thinning. Improved technique, a lower air pressure, and/or a slower evaporating thinner may help. A constant shop temperature with good air circulation avoids leaving evaporated solvents to settle on the topcoat.

Sanding Marks: (Scratches in the primer or substrate resulting from sanding usually in a circular motion). Caused from improper surface cleaning or preparation. Use of coarse grit sandpaper or omitting a sealer in repairs exaggerates the swelling caused by thinner penetration.

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Thin Paint: (Inadequate coverage of topcoat). A slowed down sweep of the gun or a higher fluid delivery should eliminate this.

Over Spray: (Paint coverage of an undesirable color or in an undesirable area). Caused from not properly masking off areas to be protected from paint dust. Air pressure too high at gun causing misting of paint or too wide of a spray pattern. Lower gun pressure and/or a similar spray pattern.

Inspection Schedule:

Reference should be made to the OSK Vendor Paint Process Check List for the frequency and requirements of inspection tests (Appendix A).

Inspection Procedures:

1. Film Thickness:

The upper limits on film thickness are not mandatory for surface areas on which such limits are impractical to maintain; for example, contoured areas. However, film thickness should be controlled in these areas to prevent excessive deposition of paint which often correlates to a diversity of problems such as slow dry, solvent pop, etc. As a result, thickness checks shall be performed on uniform coated surfaces as follows:

- A. Paint thickness tests shall be performed on clean, uncontaminated, finish painted parts that have been adequately cured.
- B. Thickness testing shall be performed using a conventional non-destructive measure device. Each device used must be calibrated and registered through the respective gauge control program either at OSK or the supplier.
- C. All commercial product coated per 101-OCT shall have a minimum 1.0 mil thickness after sanding, 1.0 mil minimum of CIP sealer, and 2.5 mils minimum topcoat for a minimum total film thickness of 4.5 mils. The thickness shall be the manufacturer's minimum for meeting the salt spray requirements in 101-OCT Commercial Paint Specification. The minimum thicknesses are highly dependent, where applicable to grit blast profiles. The thickness of the primer shall be such to cover the blast profile and meet the salt fog requirements of 101-OCT. The dry film thickness is that thickness at the peaks of the surface profile.
- D. All parts that do not comply with the minimum specifications for primer and topcoat shall be recoated and retested according to the original specification.
- E. Using a logbook, document all paint thickness testing with time, date, and measurements.

2. Adhesion Test:

The applied coating thickness shall be the determining factor as to which inspection test method is used for the adhesion test. Hence, it is recommended that prior to performing an adhesion check the total dry film thickness of the organic finish needs to be defined in

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accordance with SSPC PA-2 on steel substrates. Then based on that measurement, the appropriate adhesion test shall be performed.

Per MIL-DTL-53072 and 101-OCT the following total coating thickness can be present

Coating	Dry Film Thickness X .001" or Mils
MIL-DTL-53022 or MIL-DTL-53030 epoxy primer	1.0 to 1.5
A-A-52474A Electrocoating Primer DFT Thickness for 1000 B117	≅1.0 to 1.2
Mil-P-26915 Hentzen Organic Zinc Rich Primer	2.5 to 3.5
MIL-DTL-53039 CARC Top Coat	1.8 min.
Sikkens Monorail Primer	1.5 min.
Sikkens CIP Primer (after sanding)	1.0 min.
Sikkens CIP Sealer	1.0 min.
Sikkens Topcoat per 101-OCT	2.5 min.
Sikkens Urethane Primer for ARFF	2.0 min.

Hence, depending on primer system used, the total film thickness can range from a minimum of 3.1 Mils to a maximum with zinc rich primer of over 7.3 Mils.

- With coating thicknesses between 2.0 and 5.0 Mils, allow the use of four or six blade scribes with the removal of two or three squares respectively constituting failure.
- With coating thicknesses greater than 5.0 Mils, adhesion shall be tested Per ASTM D3359, Test Method A, X-Cut Tape Test. In using the following criteria:

Rating	Description
5A	No peeling or removal.
4A	Trace peeling or removal along incisions or at their intersection.
3A	Jagged removal along incisions up to 1.6 mm on either side.
2A	Jagged removal along most of incisions up to 3.2 mm on either side.
1A	Removal from most of the area of the X under the tape.
0A	Removal beyond the area of the X.

Any rating lower than 4A shall constitute failure.

The MTRV contract requirements state that the CARC coating must be applied in accordance with the requirements set forth in MIL-DTL-53072B. This specification identifies an epoxy primer dry film thickness of between 1.0 and 1.5 Mils, and a minimum CARC top coat dry film thickness of 1.8 Mils. Hence, the minimum combined coating thickness would be 3.1 Mils. Section 3.6.2.4 states; "It is recommended that a total of 20 Mils not be exceeded. With the increased usage of single component urethane zinc rich primer with a dry film thickness of between 2.5 and 3.5 Mils primer+CARC top coat sequence. In Section 4.3.3.6 it states; "Where possible, (adhesion) testing shall be performed daily on a production item in an area of uniform film thickness after a minimum of 168 hours (7 Days) drying time." The number of drying hours prior to adhesion testing can increase based on the temperature and humidity levels as defined in Section 4.3.3.3. Section 4.3.3.6.1 then defines the dry adhesion test that shall be performed in accordance with ASTM D3359, Method B, cross cut tape adhesion with four or six blade scribes. After the test has been performed, removal of two or three squares respectively constitutes failure, but minor flaking from scribe intersections is permitted, as is removal of overspray.

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ASTM D3359-97, "Standard Test Methods for Measuring Adhesion by Tape Test" covers procedures for assessing the adhesion of coating films to metallic substrates by applying and removing pressure-sensitive tape over cuts made in the film. The standard identifies two test methods, A and B. Test Method A is performed by making an X-Cut in the film to the substrate, the tape is applied over the cut and then removed to assess qualitatively on a 0-5 scale, with 5 having no coating removal and 0 removal of the coating beyond the area of the X. Test Method B is performed by making a lattice pattern with either six or eleven cuts in each direction in the film to the substrate, the tape is applied over the lattice and removed with the pass/fail criteria for the six blade scribe defined in MIL-DTL-53072. With a range in applied organic coating thickness' from between 3.1 to 20 Mils or 5.6 to 20 Mils, ASTM D3359 states that for coatings having a dry film thickness between 2.0 and 5 Mils, space the cuts 2 mm apart and make a lattice of six cuts per Test Method B. However if the dry film coating is thicker than 5 mils, Test Method A shall be utilized.

- A. Paint adhesion tests shall be performed on clean, uncontaminated, finish painted parts that are fully cured.
- B. Depending on film thickness; 1)Scribe four or six 1" lines completely through the paint finish 1/16" to 3/32" (2mm) apart and scribe another corresponding four or six 1" lines 1/16" to 3/32" apart (2mm), 90 degrees to the first set of lines, or 2)Make an X Scribe in the middle of the panel.
- C. Press a length of commercially available tape that meets A-A-1830 or A-A-884 firmly over the scribe pattern, rubbing out all the air pockets.
- D. After waiting a minimum of 10 seconds, grasp a free end of the tape and at a rapid speed, strip it from the painted surface by pulling the tape back upon itself at 180 degrees. For Method B, the removal of two or more squares of topcoat, topcoat/primer, or topcoat/primer/pretreatment, constitutes a failure. For Method A, a rating less than 4A constitutes a failure. Removal of overspray on flat coatings does not constitute a failure.

Note: Upon discovery of a failure, all production ran before this failure shall be tested until material is found that consistently does not fail.

If it is suspected that failures have been shipped, immediately contact the supplier's Quality Assurance Representative and/or Manager. All failures shall be reworked and reprocessed according to the original specification it was designed to meet.

3. Salt Spray Test:

- A. Salt spray shall be conducted on clean panels representative of the substrate used on the parts, i.e. Abrasive blast, A60 Galvanneal, G90 Galvanized, Stainless Steel, Aluminum, Q-Panel Cold Rolled, Non-Blasted, Non-Pickled Hot Rolled. Minimum size shall be four by twelve inches. Panels can be obtained through ACT Laboratories @ 273 Hillsdale, MI 49249, Phone: 517-439-1485, Fax: 517-439-1652. Panels shall be cleaned, pretreated, and coated per normal paint procedures. The test panels need to correlate with the actual paint sequence used on the part.

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Note: If the parts that are supplied are plastic, fiberglass, or similar non-corrosive product, salt spray tests do not have to be run.

- B.** Run salt spray tests per ASTM B117 as specified in 101-OCT Commercial Topcoat Specification.

If questions exist concerning testing, contact OSK so clarification may be made. Failure to perform paint tests and properly document may result in supplier having to reprocess parts that fail upon use by OSK, their customers, or other suppliers. Failure to perform paint tests and properly document may also result in suspension or loss of painting privileges until satisfactorily resolved.

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SECTION IV

OSK On-Premise Finishing Operations

Note: The following information summarizes the respective area finishing operations at OSK. For material and process specifics, i.e., coating thickness requirements, refer to operation assignments, routings, prints, and/or Vendor Paint Process Check List (Appendix A).

A. General Procedures for North Plant:

The following section outlines the cleaning, treating, and painting of parts at the North Plant Parts Line operation:

1.0 Ferrous Substrates:

1. All rust and loose mill scale must be removed. All rust or mill scale must be removed prior to running the substructure or parts through the five-stage zinc phosphate washer.
2. All parts must be hung on the parts line in such a manner that each part is 100% cleaned. Part shadowing caused when parts are bunched together to optimize production flow runs a high risk in only partial cleaning and ultimately final paint failure. Elimination of part shadowing is well worth the effort to assure the final product is pretreated properly. In addition the parts should be arranged to minimize the transfer of solution from stage to stage.
3. See QCP-31 for chemical operation of the five-stage washer.
4. All parts must be dry, clean, pretreated, and rust free as they are to be protected and masked.
5. If routing specifies, prime parts with primer conforming to MIL-DTL-53022/53030 or commercial grade primer, as specified.

Note: If Heat Resistant Coating MIL-P-14105 is specified, do not prime, but spray the heat resistant coating in the “color” booth.

6. Individual piece parts that are zinc phosphatized and MIL-DTL-53022/53030 epoxy primed shall dry in oven at a ~ 200° F to achieve a tack-free finish. It may be necessary to use Ura-Zen Accelerator 01129CHD or Zenthane Retarder 022CHS for top coat cure depending on temperature and relative humidity of ambient conditions.
7. The following table defines Cab dry times for the different military coatings;

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Coating	Time in Minutes	Temperature F	Wet Film Thickness in Mils.	Dry Film Thickness in Mils.
MIL-DTL-53022/53030	30	180 ~ 260	2 ~ 3	1.0 ~ 1.5
MIL-DTL-53039 min.	30	140	4 min.	1.8 min.
MIL-DTL-53039 max.	45	180	4 min.	1.8 min.
Hentzen Organic Zenthane Zinc Rich, min.	240	140	4.5 ~ 5.0	2.5 ~ 3.5
Hentzen Organic Zenthane Zinc Rich, max.	30 ~ 120	180 ~ 260	4.5 ~ 5.0	2.5 ~ 3.5

8. Those parts that are zinc rich primed require a dust coat of epoxy primer (0.8 ~ 1.25 dry film thickness) prior to CARC top coat.
9. Let part sit to ambient temperature between subsequent coating applications following previous oven cure.
10. Commercial Akzo-Nobel CIP Primer and top coat application guidelines are found in Appendix B of the Commercial top coat specification.
11. Topcoat as specified by CSO or routing.
12. Rust proofing may be required. See routing to determine at what step it should be accomplished. For general reference refer to MIL-HNBK-46164, "Handbook for Rustproofing Military Vehicles and Trailers" or NPO-155, "North Plant Component Rustproofing Work Instructions".
13. Test paint per QCP-131.

2.0 Aluminum Substrates:

1. All aluminum must be processed through the non-hexavalent chromate conversion line or hand processed per MIL-DTL-5541.
2. After chromating, the aluminum must be protected from contaminants and painted in a timely fashion, i.e. 48 hours. If time extends beyond that, the substrate needs remain clean, be stored indoors, and prior to priming the surface, needs to be capable of receiving the primer coat and passing the wet/dry adhesion and salt fog testing requirements. Parts shall be hung on the parts line as soon as possible after the zinc phosphate washer and before the primer booth.
3. Limit the use of SikaFlex 221 P/N 1490170 and other polyurethane sealants on chromated aluminum. Smoothing out the polyurethane sealant for cosmetic appeal can contaminate the adjacent surface and interfere with paint adhesion characteristics. 3M Metal Sealant 2084 P/N 1317520 should be used where ever possible.
4. Validate the weight and performance of the coating applied per MIL-DTL-81706
5. Protect and mask per print or routing.

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6. If routing specifies, prime parts with primer conforming to MIL-DTL-53022/53030, or commercial grade primer, as specified.

Note: If Heat Resistant Coating MIL-P-14105 is specified, do not prime, but spray the heat resistant coating in the prime booth.

7. Flash primer off for a minimum of 15 minutes.
8. Dry in oven at a 200°F-220°F to achieve a tack-free finish.
9. Cab structures shall be oven dried at between 100°F to 135°F to achieve a tack-free finish.
10. Topcoat as specified by CSO or routing.
11. Bake topcoat at between 185°F-220°F to achieve a tack-free finish.
12. Rust proofing may be required. See routing to determine at what step it should be accomplished.
13. Test paint per QCP-131.

3.0 Zinc Plated or Galvanized Substrates (in general follow Aluminum Section above):

1. Clean, per applicable method II through v, specification TT-C-490
2. Pretreatment:
 - Treat per MIL-DTL-5541, Type II, Class 1A modified for Zinc; or
 - Lightly abrasive blast create a lightly frosted surface; or
3. Prime per the following:
 - Apply MIL-DTL-53022, or
 - Apply MIL-DTL-53030
4. Topcoat per the following:
 - Apply MIL-DTL-53039

4.0 Two Part Polyurethane Chip and Abrasion Resistant Coating Application

1. Mask off areas that are not to be coated
2. Applied to a prepainted CARC surface.
3. CARC surface shall be clean and oven dry following time and temperature requirements of Table in Section A7.
4. Apply Chip and Abrasion Resistant Primer over the CARC surface to a thickness visually described as a hazy white glossy film is achieved. The CARC color should be visible through the primer.

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5. Let cure at ambient for 45-90 minutes to a tack-free state.
6. Apply one continuous coat of the two part polyurethane coating.
7. Allow previous coat a minimum of 1 min. cure time prior to application of spatter coat for textured appearance.
8. Let applied coating sit for 15-30 minutes prior to de-masking area.

5.0 General Procedures

1. FHTV and LVSR Cabs as well as the MTRV Cargo Body currently incorporate OSK Materials Standard 97NS sheet steel. This is a hot dip galvanized steel of G90 coating weight per ASTM A653 with a min. zinc coating on both side of 0.8 Mils. Piece parts for the respective cabs are zinc phosphatized prior to assembly.
2. As of this documents latest revision Reman HEMTT cabs are grit blasted to a white to near white metal finish and MIL-DTL-53022/53030 Epoxy Primed to a 4.5 ~ 5.0 mil dry film thickness within 4 hours. New HEMTT cabs shall be zinc phosphatized, assembled, washed, zinc rich primed, body filled, sealed, epoxy primed and top coated per MIL-DTL-53072.
3. Paint thickness checks should be made on each type of cab that is painted, per every four hours. Commercial cabs shall have a minimum 1.5 mils of CIP primer, 2.5 mils minimum of top coat for a total minimum thickness of 4.0 mils. Monorail Primer from Sikkens shall be at 1.5 mils minimum.
4. In all applications, faying surfaces of components shall be sealed with 3M 2084 prior to application of organic zinc rich primer.

B. General Procedures for South Plant:

1. Ferrous substrates:
 - All rust and/or mill scale must be removed.
 - Clean entire part with Hydrite Chemical Company #4567, OSK P/N 1946930 Waterbased Soap Solution, or equivalent following; 1) Materials Engineering performance qualification, and 2) Use approval by Environmental Engineering.
 - Prime as required.
 - Flash primer off for a minimum of 15 minutes.
 - Cure at ambient conditions or in curing oven at between 135° F to 145° F for a period of time sufficient to achieve a tack-free finish. Cure time is dependent on ambient conditions as well as mass of material being coated.
 - Top Coat as required and let cure at ambient conditions or in curing oven at between 135 to 145° F for a period of time sufficient to top coat. Cure time is dependent on ambient conditions as well as mass of material being coated.
 - Inspect paint and test per QCP-131.

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2. Aluminum substrates:

- Clean entire part with Hydrite Chemical Company #4567, OSK P/N 1946930 Waterbased Soap Solution, or equivalent following; 1)Materials Engineering performance qualification, and 2)Use approval by Environmental Engineering.
- Conversion Coat aluminum with OSK P/N 709040X, Coral Chemical Surcoat 919 using portable sprayer or clean lint free cloth at ambient temperature. It will take 5 to 10 minutes for the aluminum to reach a gold iridescent shade.
- Then the area shall be spray or wiped off with water on a clean lint free cloth. The chromated region must be primed in a timely fashion, i.e. within 16 hours. If time extends beyond that, the substrate needs remain clean, be stored indoors, and prior to priming the surface, needs to be capable of receiving the primer coat and passing the wet/dry adhesion and salt fog testing requirements.
- Prime as required.
- Flash primer off for a minimum of 15 minutes.
- Cure at ambient conditions or in curing oven at between 135 to 145° F for a period of time sufficient to achieve a tack-free finish. Cure time is dependent on ambient conditions as well as mass of material being coated.
- Top Coat as required and let cure at ambient conditions or in curing oven at between 135 to 145° F for a period of time sufficient to top coat. Cure time is dependent on ambient conditions as well as mass of material being coated.
- Inspect paint and test per QCP-131.

5. Axles:

- Using a portable sprayer clean/degrease axle with Chem-Station #5810 diluted accordingly at ambient conditions. Let product sit on axle for a period of time between 5 and 10 minutes.
- Using high-pressure, hot-water rinse axle.
- Prime as required.
- Flash primer off for a minimum of 15 minutes.
- Cure at ambient conditions or in curing oven at between 135 to 145° F for a period of time sufficient to achieve a tack-free finish. Cure time is dependent on ambient conditions as well as mass of material being coated.
- Top Coat as required and let cure at ambient conditions or in curing oven at between 135 to 145° F for a period of time sufficient to top coat. Cure time is dependent on ambient conditions as well as mass of material being coated.
- Inspect paint and test per QCP-131.

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General Procedures for West Plant:

Clean and Pretreatment - Chassis Bay

Process	Process Notes
Spot clean w/ Fremont 3045 - 100% at between ambient. Let cleaner work for 5 minutes minimum being careful to keep the cleaner wet on the surface. Caution should be exercised to avoid leaving the product dry prior to rinsing.	<ul style="list-style-type: none"> a. Spray soiled areas using tank sprayer b. Repeat spray as required to keep areas moist c. Allow cleaner to work for 5 minutes minimum
Power spray w/ Fremont 3045 – 2.0% @ 140°F to 160°F for 5 to 10 minutes	<ul style="list-style-type: none"> a. Mist spray entire part to wet all surfaces b. Spray wash part using overlapping, circular spray pattern c. Keep all surfaces wet for 5 minutes minimum
Power rinse w/clean - clear water @ 140°F to 160°F for 5 to 10 minutes	<ul style="list-style-type: none"> a. Spray rinse part using overlapping, circular spray pattern b. Flood areas that trap wash solution with water c. This removes the 3045 product from the surface. If left on the surface during application of 608, the two products neutralize each other and the resulting pretreatment does not take full advantage of the chemistry afforded the Freemont products
Power spray w/Fremont 608 – 1.5% @ 140°F to 160°F for 5 to 10 minutes being careful to keep surface wetted with the product prior to final rinse.	<ul style="list-style-type: none"> a. Mist spray entire part to wet all surfaces b. Spray wash part using overlapping, circular spray pattern c. Keep all surfaces wet for 5 minutes minimum
Power rinse w/clean - clear water @ 140°F to 160°F for 5 to 10 minutes	<ul style="list-style-type: none"> a. Spray rinse part using overlapping, circular spray pattern b. Flood areas that trap wash solution with water

Clean and Pretreatment - Main Bays

Process	Process Notes
Spot clean w/ Fremont 3045 - 100% at ambient for 5 minutes minimum being careful to keep the cleaner wet on the surface. Caution should be exercised to avoid leaving the product dry prior to application of next step.	<ul style="list-style-type: none"> a. Spray soiled areas using tank sprayer b. Repeat spray as required to keep areas moist c. Allow cleaner to work for 5 minutes minimum
Power rinse w/clean - clear water @ 140 to 160°F	<ul style="list-style-type: none"> a. This removes the 3045 product from the surface. If left on the surface during application of 608, the two products neutralize each other and the resulting pretreatment does not take full advantage of the chemistry afforded the Freemont products.
Power spray w/ Fremont 608, 1.5% @ between 140°F to 160°F	<ul style="list-style-type: none"> a. Mist spray entire part to wet all surfaces b. Spray wash part using overlapping, circular spray pattern c. Keep all surfaces wet for 5 minutes minimum
Power rinse w/clean - clear water @ 140°F to 160°F	<ul style="list-style-type: none"> a. Spray rinse treated areas using overlapping, circular spray pattern b. Flood areas that trap wash solution with water

The process is aimed at making the final clear water rinse the last operation before coating application. This minimizes the possibility of contaminants being trapped in the primer or topcoats and maximizes the cleaning/pretreatment benefits for supplemental organic coating application.

Spot Derust

Spot derust w/DuPont 5717S, 5 – 10 min., ambient, @ 100%). Typically performed following tape application and prior to paint booth exposure	<ul style="list-style-type: none"> a. Spray rusted areas using spray bottle b. Sand as required c. Repeat spray as required to keep areas moist d. Allow material to work for 5 minutes minimum e. Wipe Clean
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1. Military and Commercial Chassis Paint:

- Clean and Pretreat per above process sequence.
- Mask as required with grease, aluminum foil, tape, plugs, silicone, etc.
- Spot Prime Mil-C-53022 per MIL-DTL-53072 and let cure 15 to 30 minutes at ambient. This time at ambient is directly related to primer thickness. Greater thickness of applied primer may require a longer time at ambient to avoid out gassing and blistering of the topcoat.
- Top Coat MIL-DTL-53039 per MIL-DTL-53072 and let cure 30-45 minutes at 110 to 150° F.
- De-mask
- Return to South Plant for Final Assembly

2. Military and Commercial Main Bay:

- Sand and Bodywork - Touch-up paint blemishes, adhesion scribes, replace damaged parts, and assemble components as needed.
- Clean and Pretreat bare ferrous surface per above process sequence.
- If bare aluminum is exposed, conversion coat aluminum with OSK P/N 709040X, Coral Chemical Surcoat 919 using portable sprayer or clean lint free cloth at ambient temperature. It will take 5 to 10 minutes for the aluminum to reach a gold iridescent shade. Then the area shall be spray or wiped off with water on a clean lint free cloth. The chromate region must be primed in a timely fashion, i.e.16 hours. If time extends beyond that, the substrate needs to remain clean, be stored indoors, and prior to priming the surface, needs to be capable of receiving the primer coat and passing the wet/dry adhesion and salt fog testing requirements.
- Lay out camo pattern as needed on Military Vehicles
- Top Coat Military camouflage pattern and cure at 125 to 135° for 55 minutes
- Those military vehicles requiring a color deviation from standard Forest Green, i.e. Desert or Israeli Tan, shall be top coated and cure at 130 to 140° F for 90 to 120 minutes before being removed from oven.
- Commercial vehicles shall be CIP Epoxy primed with Akzo-Nobel, Sikken's product
- Let cure at ambient for 10-30 minutes. Again, this time at ambient is directly related to primer thickness. Greater thickness of applied primer may require a longer time at ambient to avoid out gassing and blistering of the topcoat.
- Top Coat Akzo-Nobel product 2-3 Color Coats. If clear coating the topcoat allow 15 to 20 minutes flash time for solid colors and 30 minutes for metallics.
- Apply Clear Coat as required and cure 15 to 30 minutes depending on relative humidity and temperature before moving in to dry oven
- Without Clear Coat cure organic commercial system at 130 to 150° F for a minimum of 1 hour.
- With Clear Coat cure organic commercial system at 130 to 150° F from 1 to 2 hours.
- Test paint per QCP-131
- Trim truck out per operation assignments.
- Rustproof as required per model.

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Robert M. Hathaway
VP, Materials and Process Engineering

APPENDIX B

Coating Test Methods

Test Method	Date
003TM	11/12/02
005TM	11/12/02
006TM	11/12/02
009TM	11/12/02
010TM	11/12/02
012TM	11/12/02
015TM	11/12/02
016TM	11/12/02
017TM	11/12/02
018TM	11/12/02
019TM	11/12/02
020TM	11/12/02
021TM	11/12/02
022TM	11/12/02
023TM	11/12/02
024TM	11/12/02
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027TM	11/12/02
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030TM	11/12/02

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATIONS

HIDING POWER OF PAINT - WET FILM

These are methods of determining the hiding power of a wet film.

2A - WET FILM

APPARATUS

1. Black and white PFUND Cryptometer with a No. 2.0 (.002 inch) wedge top plate.
2. Shore Viewer with two 100 watt bulbs.

MATERIAL

- 1.. Run all colors as listed in the applicable material specification. Any color formulated after initial approval must also meet specification given.

PROCEDURE

1. Run this test five times for each paint sample being tested.
2. Place approximately 2 to 3 milliliters of paint which has been prepared for testing in the center of the black and white base plate of the cryptometer.
3. Place the No. 2.0 top plate over the deposited paint and press down lightly but uniformly on the top plate.
4. Move the top plate to the right until the entire length of the line of demarcation has disappeared completely. Record the etched number appearing directly under the lower right edge of the place. Move the top plate slowly to the left until the line of demarcation reappears. Record the etched number as before. If the paint is light in shade, it is suggested that the test be conducted by drawing the paint from the white half across the black half of the cryptometer. Conversely, if the paint is dark in shade, it should be drawn from the black half across the white half. In all cases, the cryptometer should be placed so that the scale is read on the right and the pegs of the top place are on the left.
5. For all catalyzed coatings, this test must be conducted within one hour after the addition of the catalyst.

CALCULATIONS

Calculate the average of the ten cryptometer readings.

REPORT

Report the average cryptometer reading in square feet per gallon.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

TOUGHNESS OF PAINT

This is a method for evaluating the toughness of a dry film of paint.

APPARATUS

1. Recirculating oven capable of maintaining a temperature of 49 +/- 3 deg. C (120 +/- 5 deg. F)
2. Mandrel, 0.375 inch (9.52mm) in diameter.

MATERIAL

1. Steel panels as listed in material specification.
2. Run all colors specified for testing in material specification.

PROCEDURE

- 1.. Prepare the following quantity and type of panels for the grade of paint being tested according to the procedure.
 - a. Two steel panels without additional accelerator.
 - b. Two steel panels with accelerator if accelerator is specified as optional or necessary in material specification.
 - c. Two steel panels shall be run for each bake cycle that is specified in the material specification for either an accelerated or non-accelerated coating as specified.
3. Age the prepared panels for 72 hours in a recirculating oven at 49 +/- 3 deg. C (120 +/- 5 deg F) remove and cool to 21 to 27 deg. F (70 to 80 deg. F).
4. Bend each panel 180 degrees around a mandrel with a diameter of 9.5 mm (0.375 inch). The bend will be made such that the painted surface of the panel is put into tension.
5. Examine the paint film in the area of the bend with the unaided eye; any evidence of chipping, flaking, or cracking will constitute a failure.

Note: The first 1/4" is exempt.

- 6.. For those coatings where two panels are prepared, both will pass. For those coatings where two or more panels are prepared, both air dried test panels and oven dried test panels will pass.

REPORT

Report whether the paint passes or fails this test.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

HARDNESS OF PAINT

This is a method of determining the hardness of a dry film of paint.

APPARATUS

1. Recirculating oven capable of maintaining a temperature of 50 +/- 2 deg. C (120 +/- 5 deg.
2. Leads ranging in hardness from 5B to 6H and lead holder. Eagle-Turquoise, or equivalent.

MATERIAL

1. Bonderite 37 zinc phosphated steel panels as specified in material specification.
2. No. 1 emery paper.

PROCEDURE

1. Prepare the appropriate quantity and type of panels based on the material listed above and the colors specified in the material specification. Run each color per ambient air dry, oven dry cycle, and acceleration specified in material specification.
2. Test the hardness immediately after the panels have been prepared for all oven bake and accelerated for the time duration given. For all ambient air dry, age the prepared panels for 72 hours in a recirculating oven at 38 +/- 2 deg. C (104 +/- deg F), remove and cool to 21 to 27 deg. C (70 to 80 deg F) prior to testing.
3. Square off the hardest (6H) pencil on No. 1 emery paper and insert into a head holder so that no more than 5 mm (0. 2 inch) of lead projects beyond the end of the holder.
4. Place the lead in contact with the painted surface and at a 45 degree angle to it. Push the holder firmly forward 1/4 inch with approximately equal downward and forward pressure.
5. Examine the panel with the unaided eye to determine if the lead has cut through the paint film to either bare metal or a previous layer of paint for a distance of at least 1/8 inch. If the lead has not cut the paint, then record the hardness of the paint as 6H; if it has, repeat steps (3) and (4) and (5) using the next softer lead, 5H.
6. Proceed through the following sequence of successively softer leads until a lead that does not cut the paint is found: 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, and 5B.
7. Record the hardness of the paint for each of the panels.

REPORT

Report the minimum hardness value obtained from all panels tested.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

INTERCOAT ADHESION OF PAINT

This is a method for evaluating the ability of a dry film of paint to adhere to a dry film primer or a dry film to top coat.

APPARATUS

Recirculating oven capable of maintaining a temperature of 49 +/- 3 deg. C (120 +/- 5 deg. F).

MATERIAL

1. Bonderite 40 zinc phosphated steel panels as specified in material specification.
2. No. 360 sandpaper.
3. Transparent cellophane tape per Federal Standard PPP-T-42.
4. Tack rag.
5. Scribing knife.

PROCEDURE

1. Prepare panels in the following manner:

Note: For purposes of this test each group of 4 panels coated per one topcoat color specified will be referred to as a series.

- a.Prime 1 series of panels (per each topcoat color specified) with specified primer, and cure primer with ambient air (77 deg F) for 72 hours. Topcoat 2 of the 4 panels (per each topcoat color specified). If oven bake is option of standard in specification, prime 1 series of panels (per each topcoat color specified) and topcoat 2 panels of each series (per each topcoat color specified) after 10 minutes flash, bake with hottest oven cycle listed. If accelerated cure is an option prime 1 series of panels (per each topcoat specified) let flash for 10 minutes and topcoat 2 panels of each series (per each color specified) accelerated at maximum acceleration specified to meet cure cycles.
 - b.For purposes of testing primer recoatability with primer consider the primer as an additional topcoat color when topcoat colors are listed for testing.
2. Wet sand all of the prepared panels for one-half of their length with No. 360 sandpaper. Wash these panels in water, dry wipe with industrial grade xylene, dry with absorbent paper and wipe with a tack rag. Mask top two inches of panel.
 3. Each series of panels shall be top coated (over both the primed and the primed and top coated panels) with the color of the top coated panels previously used in 1 a. The cure cycles shall duplicate those specified in paragraph 1 a.
 4. For all grades, age the panels for 72 hours in a recirculating oven at 49 +/- 3 deg. C (120 +/- 5 deg. F) , remove and cool to 21 to 27 deg. C (70 to 80 deg. F).

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5. Using the scribing knife, scribe a 25 x 25 mm (1 x 1 inch) "X" on both the sanded and unsanded areas of all the panels down to bare metal.
6. Press transparent tape firmly onto each scribed "X" and then remove with a sharp upward motion. Examine each tape for evidence of adhering paint.
7. Using No. 360 sandpaper, wet sand the enamel topcoat to a feather edge at each of the scribed lines comprising the "X". Examine the sanded feather edge for evidence of separation between the coats.

REPORT

Report the following information:

1. Tape appearance:
The paint will pass if none of the tapes examined show evidence of adhering paint.
2. Feather edge appearance:
The paint will pass if none of the feather edges show evidence of separation between the coats.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

ACCELERATION ADHESION OF PAINT

This is a method for evaluating the ability of a dry film of paint to adhere to a surface after immersion in water.

APPARATUS

1. Recirculating oven capable of maintaining a temperature of 49 ± 3 deg. C (120 ± 5 deg. F).
2. Bath capable of maintaining a temperature of 38 ± 3 deg. C (100 ± 5 deg F).

MATERIAL

1. All substrates listed in material specification.
2. Absorbent paper, Kleenex, Kimwipes, or equivalent.
3. Razor blade.
4. Transparent cellophane tape per Federal Standard PPP-T-42.

PROCEDURE

1. Prepare 1 panels of each substrate with primer and topcoat.
2. Age the prepared panels for 72 hours in a recirculating oven at 49 ± 3 deg. C (120 ± 5 deg. F), remove and cool to 21 to 27 deg. C (70 to 80 deg. F).
3. Place the panels in a water bath maintained at 38 ± 3 deg. C (100 ± 5 deg. F) for 24 hours, remove and dry with absorbent paper.
4. Allow the panels to recover for 4 hours in air at 21 to 27 deg. C (70 to 80 deg. F).
5. On each panel, crosshatch a minimum area of 645 sq mm (one square inch) into 1.6 mm (1/16 inch) squares by cutting through the paint film with a new razor blade.
6. Press transparent cellophane tape firmly onto the cross hatched area of each of the panels, and then remove with a sharp upward motion in a direction of 90 degrees to the painted surface.
7. Examine each of the panels with the unaided eye. Determine and record the percentage of the cross-hatched area on which the paint film has remained for each of the panels.

REPORT

Report the minimum percentage adhesion observed from all of the panels tested.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

INITIAL GLOSS OF PAINT

This a method for determining the glossiness of a dry film of paint immediately after application.

APPARATUS

Glossmeter, Gardner, or equivalent.

MATERIAL

Bonderite 40 zinc phosphated steel panels.

PROCEDURE

1. Prime and topcoat 6 panels (if the following requirements exist) for each color listed. Air dry 2 of the panels for 72 hours and oven dry 2 of each color for 3 hours at 125 deg F. and if accelerator is specified as a requirement accelerate the remaining two panels and air dry for 24 hours.
2. Using the appropriate glossmeter angle for the reading required (20 or 60 degrees) , determine the initial gloss reading of each of the panels. For those coatings where both a 20 degree gloss reading and a 60 degree reading are required, both will be run. For those grades where two panels are prepared, both will be tested. For those grades where two or more panels are prepared, air dried, oven dried panels, and/or accelerated panels will be tested.

REPORT

Report the minimum 60 degree glossmeter reading obtained for each color from all the panels tested for those graded requiring a 60 degree reading. For those grades requiring a 20 degree glossmeter reading, again report the minimum 20 degree glossmeter reading obtained from all the panels tested. For those grades where both a 60 degree and a 20 degree requirement are listed, report both minimums.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

SALT SPRAY TEST FOR PAINT

This is a method for evaluating the ability of a dry film of paint to resist corrosion upon exposure to a salt spray.

APPARATUS

1. Salt spray equipment per **ASTM B 117** (latest issue).
2. Scribing knife.
3. Ruler capable of measuring lengths within +/- 0.4 mm (+/- 1/64 inch).

MATERIAL

1. Bonderite 37 zinc phosphated steel panels and aluminum panels with Alodine conversion coating.
2. Absorbent paper, Kleenex, Kimwipes or equivalent.

PROCEDURE

1. One panels on steel and 1 panels on aluminum should be primed and painted for each time duration on the material specification. Mil thickness on primer should be 1.2 mil +/- .2 mil. Topcoat readings should be 2.2 mils +/- .2 mil.
2. Age the prepared panels for 72 hours at 49 +/- 3 deg. C (120 +/- 5 deg. F).
3. Using the knife, scribe an "X" on each test panel. Cut through the paint to bare metal.
4. Conduct the salt spray test on each of the panels by following the procedure outlined in ASTM B 117.
5. At the conclusion of the specified test period, remove the panels, wash with clean water and dry with absorbent paper.
6. Examine the painted surface of each of the panels for evidence of blistering.
7. Measure the amount of creepage from the scribed line. Panels should be evaluated per ASTM designation.

REPORT

Report the following information:

1. Dry film appearance: The paint will pass if each of the test panels exhibits a dry film which shows no evidence of blistering. Corrosion creepage: Report the maximum amount of corrosion creepage observed on all of the panels in inches.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

HUMIDITY TEST FOR PAINT

This is a method for evaluating the ability of a dry film of paint to withstand degradation upon prolonged exposure to humid environment.

APPARATUS

Humidity cabinet equipment per Federal Standard No. 141a, Method 6201, Optional: QCT humidity cabinet available from the Q-Panel Company, 15610 Industrial Parkway, Cleveland, Ohio 44135.

MATERIAL

1. Bonderite 37 zinc phosphated steel panels.
2. Fiberglass panels.

PROCEDURE

1. Prepare the following panels for test:
 - a. Four steel panels - 2 primed, 2 primed and top coated.
 - b. Four fiberglass panels - 2 primed, 2 primed and top coated.
 - c. Four Aluminum panels - 2 primed, 2 primed and top coated.
 - d. This test shall be repeated for all colors specified in the material specification.
 - e. Where there are 2 identical panels prepared one panel shall be cured 72 hours at 77 deg F. and the second panel shall be forced cured for 3 hours at 120 deg F. If accelerator is a requirement in the material specification then the air dried panel shall be accelerated.
2. Place the panels in the humidity cabinet and conduct the humidity test per Federal Standard No. 141a. Method 6201, at a temperature of 38 +/- 1 deg. C (100 +/- 2 deg. F) and a relative humidity of 100% for the specified test period. Optional QCT Cabinet: Place the panels face down on top of the cabinet so that the test surface is exposed to the humid atmosphere. Conduct the humidity test at a temperature of 38 +/- 3 deg. C (100 +/- 5 deg. F) for the specified test period.
3. At the conclusion of the specified test period, immediately examine the painted surface of each of the panels with the unaided eye for evidence of blistering. Both the primed and the primed and painted panel will be examined for evidence of darkening. Examine also for excessive crazing or glass pattern.

REPORT-Report whether the paint passes or fails this test. The paint will pass if each of the panels exhibits a dry film which shows no blistering immediately after removal from the humidity cabinet at the conclusion of the specified test period. Both air dried test panels and oven dried test panels will pass. The primed panel and the primed and painted panel will pass when not exhibiting excessive crazing or glass pattern.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

SOUTH FLORIDA EXPOSURE TEST FOR PAINT

This is a method for evaluating the ability of a dry film of paint to withstand degradation upon prolonged exposure in a South Florida environment.

APPARATUS

1. Exposure racks positioned in a suitable South Florida location.
2. 60 degrees glossmeter, Gardner, or equivalent.

MATERIAL

1. Bonderite 37 zinc phosphated steel panels.
2. Mild detergent.
3. Cleaner-waxer compound. DuPont No. 7 or equivalent.
4. Absorbent paper, Kleenex, Kimwipes or equivalent.

PROCEDURE

1. Prepare 2 panels for each color primed and top coated (for this test consider primer a color).
2. To prevent rusting, cover the remaining unpainted surfaces on each of the panels with a protective coating such as a primer or lacquer.
3. Position the panels in South Florida at a 5 deg. angle facing south and expose for the time period specified in the material specification.
4. At the end of each month of the specified exposure time, wash the exposed panels with a mild detergent, rinse with clean water and dry with absorbent paper.
5. At the end of the last month of the specified exposure time, clean the exposed panels, as in Step (5), and then examine each panel with the unaided eye for evidence of cracking, checking, peeling, blistering, bronzing, rusting or corrosion.
6. For those grades with a minimum gloss requirement after initial exposure, determine and record the gloss reading using a 60 degree glossmeter.
7. For those grades with a color change requirement after initial exposure, polish a portion of each exposed panel with a cleaner-waxer and then determine the degree of color change between each of the exposed and polished panels and an exposed and polished standard panel approved by Oshkosh Corporation.
8. For those grades with an extended exposure requirement, reposition the exposed and polished panels in South Florida as in Step (5). Continue exposure until a total of 12 months exposure time has elapsed. Again, clean the panels at the end of each month as in Step (5).
9. At the conclusion of the twelfth month, wash and dry the panels, as in Sept (6), and then examine each panel with the unaided eye for evidence of checking or cracking.

REPORT - Report the following information;

- 1)Surface condition after exposure: The paint will pass if the best of the air dried primer only test

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panels, the best of the air dried primer plus enamel test panels, the best of the oven dried primer only test panels and the best of the oven dried primer plus enamel test panels all show no cracking, checking, peeling, blistering, bronzing, rusting or corrosion after the specified exposure period,

2)Gloss after exposure: The paint will pass if the minimum 60 degree glossmeter reading obtained from all the primer plus enamel test panels meets the minimum gloss requirement after exposure specified in the appropriate grade sheet for the enamel used as the topcoat, and

3)Color change after exposure and polish: The paint will pass if the best of the primer plus enamel test panels shows a degree of color change no greater than the approved exposed and polished standard panel for the grade of paint used as the topcoat.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

DISTILLED WATER IMMERSION TEST FOR PAINT

This is a method for evaluating the ability of a dry film of paint to withstand degradation due to immersion in distilled water.

APPARATUS

1. Bath capable of maintaining a temperature of 21 to 27 deg. C (70 to 80 deg. F).
2. 60 degrees glossmeter, Gardner, or equivalent.

MATERIAL

1. Bonderite 37 zinc phosphated steel panels.
2. Distilled water.
3. Absorbent paper, Kleenex, Kimwipes or equivalent.

PROCEDURE

1. Prepare the following test panels for test:
 - a. Three steel panels - 1 primed, 2 primed and top coated.
 - b. Ambient air dry the 1 primed and top coated panel for 72 hours at 77 deg. F. Oven dry the remaining panels at 120 deg. F for 72 hours. If accelerator is specified for use in the material specification the air dry panels shall be accelerated to meet the specification.
 - c. Panels shall be prepared as in above test for each color specified in the material specification.
2. To prevent rusting, cover the unpainted surfaces remaining on each of the panels with a protective coating such as a primer or lacquer.
3. At the conclusion of this aging period, determine and record the initial gloss reading of each of the panels using the 60 degree glossmeter.
4. Immerse the panels in a bath of distilled water maintained at a temperature of 21 to 27 deg. C (70 to 80 deg. F), to a depth equivalent to two-thirds of the panel length for the specified time period.
5. At the conclusion of the specified immersion period, remove the panels from the distilled water bath and dry with absorbent paper.
6. Immediately examine the painted surface of each of the panels for evidence of blistering.
7. After examining the panels, age them for two hours in still air at 21 to 27 deg. C (70 to 80 deg. F).
8. Examine the painted surface of each of the panels for evidence of color change.
10. Determine and record the gloss reading after immersion of each of the panels, again using the 60 degree glossmeter.

REPORT - Report whether the paint passes or fails this test. The paint will pass if each of the test panels exhibits a dry film which shows no blistering immediately after removal from the liquid and no appreciable color change, nor more than two points loss of gloss two hours after removal from the liquid. Both air dried test panels and oven dried test panels will pass.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

ETHYLENE GLYCOL IMMERSION TEST FOR PAINT

This is a method for evaluating the ability of a dry film of paint to withstand degradation due to immersion in a 50% aqueous ethylene glycol solution.

APPARATUS

1. Bath capable of maintaining a temperature of 82 +/- 3 deg. C (180 +/- 5 deg. F).
2. 60 degree glossmeter, Gardner or equivalent.

MATERIAL

1. Bonderite 37 zinc phosphated steel panels.
2. Distilled water.
3. Ethylene glycol.
4. Absorbent paper, Kleenex, Kimwipes, or equivalent.

PROCEDURE

1. Prepare the following test panels for test:
 - a. Three steel panels - 1 primed, 2 primed and top coated.
 - b. Ambient air dry 1 of the primed and top coated panels for 72 hours at 77 deg. F. Oven dry the remaining panels at 120 deg. F for 72 hours. If accelerator is specified for use in the material specification the air dry panels shall be accelerated to meet the specification.
 - c. Panels shall be prepared as in above test for each color specified in the material specification.
2. To prevent rusting, cover the unpainted surfaces remaining on each of the panels with a protective coating such as a primer or lacquer.
3. At the conclusion of this curing period, determine and record the initial gloss reading of each of the panels using the 60 degree glossmeter.
4. Prepare a solution of 50% distilled water and 50% ethylene glycol, fill the bath and bring to a temperature of 82 +/- 3 deg. C (180 +/- 5 deg. F).
5. Immerse the panels in this bath to a depth equivalent to two-thirds of the panel length for five minutes.
6. At the conclusion of the specified immersion period, remove the panels from the bath and dry with absorbent paper.
7. Immediately examine the painted surface of each of the panels for evidence of blistering.
8. After examining the panels, age them for two hours in still air at 21 to 27 deg. C (70 to 80 deg. F).
9. Examine the painted surface of each of the panels for evidence of color change.
11. Determine and record the gloss reading after immersion of each of the panels, again using the 60 degree glossmeter. –

REPORT - Report whether the paint passes or fails this test. The paint will pass if each of the test panels exhibits a dry film which shows no blistering immediately after removal from the

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liquid and no appreciable color change, nor more than 10 points loss of gloss two hours after removal from the liquid. Both air dried and both oven dried test panels will pass.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

SOLVENT RUBBING TEST

This is a method for evaluating the resistance of a dry paint film to aromatic hydrocarbons. It shall be conducted on clean, uncontaminated, finish painted parts that have adequate drying time. If ambient air temperature does not dry paint adequately, take the following steps to ensure paint is cured.

APPARATUS

1. Recirculating oven capable of maintaining 60 +/- 3 deg. C (140 +/- 5 deg. F).
2. Timer with sweep second arm.

MATERIAL

1. **Acetone or Methyl Ethyl Ketone "MEK"**
2. Gauze pads.
3. Bonderite 37 zinc phosphated steel panels.

PROCEDURE

1. Prime and topcoat a panel.
2. Allow a minimum flash-off time of 15 minutes prior to heat lamp exposure.
3. Age panel with heat lamp for 1 hour at a distance of 10" to 12" from the surface. Check periodically to avoid solvent popping or over heating.
4. Allow surface to return to room temperature. Minimum of 30 minutes cool down required.
5. Test in accordance with the requirements set forth in MIL-DTL-53072.
6. Saturate gauze pad with acetone or methyl ethyl ketone "MEK" and briskly rub the painted surface for ten seconds to remove any dry over spray. Turn rag over if necessary and briskly rub the same area with 20 strokes approximately six inches in length.
7. Evidence of actual paint removal: that is the top coat removed down to the primer is an evidence of an unacceptably catalyzed topcoat or an uncured film.

REPORT

Document results.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

ACID SPOT TEST

This is a method for evaluating the resistance of a dry paint film to industrial atmosphere.

APPARATUS

Recirculating oven capable of maintaining 60 +/- 3 deg. C (140 +/- 5 deg. F).

MATERIAL

1. A solution of 0.5% hydrochloric acid in distilled water.
2. Small eyedropper.
3. Bonderite 37 zinc phosphated steel panels.

PROCEDURE

1. Age panel at 55 +/- 3 deg. C (120 +/- 5 deg. F) for 72 hours and cool to 21 to 27 deg. C (70 to 80 deg. F).
2. Apply a drop of the acid solution to the painted surface and allow it to evaporate overnight (16 hours).
3. At the end of the evaporation period, wash the panel with water and compare test area to the remainder of the panel. Any change in gloss and/or color will constitute a failure.

REPORT

Report pass or fail.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

COLD CRACK TEST

This is a method for evaluating the resistance of a dry paint film to large temperature changes.

APPARATUS

1. Recirculating oven capable of maintaining 66 +/- 3 deg. C (150 +/- 5 deg. F).
2. Freezer capable of maintaining -32 deg. +/- 3 deg. C (-25 +/- 5 deg. F).
3. Humidity cabinet capable of maintaining 100% relative humidity at 38 deg. C (100 deg. F).

MATERIAL

Two Bonderite 37 zinc phosphated steel panels.

PROCEDURE

1. Apply .9 to 1.2 mil of primer to 2 panels and bake at 120 deg. F for 72 hours. After prescribed baking, dry sand, solvent wipe and tack off.
2. To one panel, apply 1.5 to 2.0 mils of paint, flash and bake at 250 deg. F for 30 minutes. To the second panel, apply 1.5 to 2.0 mils of paint accelerated to meet drying requirements in the material specification, flash and bake at 220 deg. F for 30 minutes.
3. Repeat Steps (1) and (2). Final thickness will be 5.2 to 5.6 mils of topcoat material. This includes the original coat over primer.
4. Age panels at 140 +/- 5 deg. F for 72 hours and cool to 70 to 80 deg. F.
5. Expose panels to the following cycle of environment conditions:
 - a. 100 deg. F and 100% relative humidity for 16 hours.
 - b. -25 deg. F for 4 hours.
 - c. 150 deg. F for 2 hours.
 - d. 70 to 80 deg. F for 2 hours.
6. After eight complete cycles, examine panels. there will be no checking, dulling, or blistering after eight cycles. One or more of the above will constitute a failure.

REPORT

Report pass or fail.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

MINIMUM CURE CYCLE TEST

This is a method for determining the minimum cure cycle of paint.

APPARATUS

- 1.. Recirculating oven capable of maintaining the specified temperature within +/- 3 deg. C (+/- 5 deg. F).

MATERIAL

- 1.. Bonderite 37 steel panels.

PROCEDURE

1. Run this test for each paint color specified in material specification.
2. Apply 1.5 mil of primer to two panels. Allow to flash 20 minutes then apply topcoat. The first panel should be air dried at 70 deg. F. (if accelerator is specified the air dry panel should be accelerated) the oven dried panel should be dried at 120 deg. F for 3 hours.
3. After the specified cure time both panels should be tested for hardness.

RECORD

Test results should be recorded as pass or fail with the alpha-numerical value recorded for both panels.

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OSHKOSH CORPORATION COATING TEST METHODS SPECIFICATION

SCAB CORROSION CREEPBACK OF PAINT SYSTEMS ON METAL SUBSTRATES

This test method outlines the procedures to be followed when evaluating scab corrosion resistance on painted metal substrates, such as steel, zinc coated steel and aluminum. Scab corrosion is the loss of paint adhesion and corrosion of the base metal which results in the distortion or upheaval of the paint film.

REFERENCED SPECIFICATIONS

GM4298P Salt Spray Testing
GM9102P Corrosion Creepback Test Method

EQUIPMENT REQUIRED

1. Electrical film thickness measuring device.
2. Humidity cabinet. Hot pack Model 417632 automatic environment test cabinet, or equivalent (operated at 60 +/- 1 C and 85% RH).
3. Air circulating oven capable of operating at 60 +/- 1C.
4. Cold cabinet capable of operating at -25 C.
5. Plastic reservoir (open top) for 5% sodium chloride solution immersion.
6. Sodium chloride, 5% solution at room temperature.
7. Air blow-off apparatus per.
8. Nonmetallic racks for test samples.
9. Carbide tip scribing tool, 60 deg. angle.
10. Straight edge, to be used as a guide for scribing tool.
11. Measuring scale in millimeters.

PANEL PREPARATION

1. Prepare 2 panels each primer and each substrate.
2. Prepare 2 panels each primer, each substrate, and topcoat 81 white topcoat.
3. Cure panels for 72 hours at 120 deg. F.

TEST PROCEDURE

1. Visually examine the painted surface and record any adverse conditions, such as sags, solvent pops for scratches.
2. Measure paint film thickness in three locations on each panel and record the average film thickness.
3. Scribe the test panel with X from one end to another.
4. Place the test panels with the scribed mark in horizontal position on a suitable nonmetallic rack.
5. Expose the panels for 20 cycles unless otherwise specified in the material specification.
6. Exposure cycle.

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7. Monday. Only:

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8. Hold the samples at 60 C for 1 h in air-circulating oven.
9. Transfer the samples to cold cabinet at -25 C and hold for 30 minutes.
10. Transfer the samples to 5% sodium chloride solution at temperature, immersing for 15 minutes.
11. Take the samples out of sodium chloride solution and hold at room temperature for 1 h 15 minutes.
12. Transfer the samples to humidity cabinet, holding for 21 h (Monday only).
13. Tuesday through Friday.
14. Transfer the samples to 5% sodium chloride solution at room temperature, immersing for 15 minutes.
15. Take samples out of sodium chloride solution and hold at room temperature for 1 h 15 minutes.
16. Transfer the samples to humidity cabinet; hold for 22 h 30 minutes.
17. Saturday and Sunday.
18. Samples shall remain in humidity cabinet over the weekend.
19. The exposure sequence described above from Monday to Monday constitutes five cycles.
20. After completion of the last cycle, remove the test panels from the cabinet and immediately rinse with warm water.
21. Visually examine the samples for failure, such as corrosion and loss of adhesion or blistering, record the observations.
22. Perform the air blow-off adhesions after visual examination by holding a 80psig air source with 1/4" minimum nozzle 45 deg. to horizontal (panel being horizontal).
23. After air blow-off, evaluate the scribe line corrosion creepback (loss of adhesion between paint film and steel) by scribe line. Measurements shall be taken at intervals of 15 mm along the scribe line. Calculate the average of multiple measurements.

ACCEPTANCE CRITERIA

Unless otherwise specified, the scab corrosion creepback of 5.0 mm maximum (total of both sides of scribe line) shall be acceptable.

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OSHKOSH CORPORATION
COATING TEST METHODS SPECIFICATION

PAINT ADHESION PROCEDURE

This test is a method of determining adhesion of paint to bare substrate, and topcoat to primer.

MATERIAL

1. Test all substrates listed in material specification.
2. Razor blade.
3. Adhesion testing tape. FED-SPEC A-A-1830.

PROCEDURE

1. Paint adhesion tests shall be conducted on 3 clean, uncontaminated, panels that have been primed, and flashed for 15 minutes then top coated. Restrain heat lamp over area to be tested so that a substrate temperature of 175 to 185° F is maintained for a minimum of 1 hour. Monitor temperature of substrate to avoid overheating and solvent popping. Allow surface to return to room temperature. Minimum of 30 minutes cool down required. Test in accordance with the requirements set forth in TT-C-490 and Mil-Std-193. To monitor temperature of substrate utilize a thermometer or temperature recording decals, Model TH-612.3 from Paul N. Gardner Company, Inc., 316 NE 1st St., Pompano Beach, FL 33060, 1-800-762-2478
2. Scribe four 1" lines completely through paint finish 1/16 to 3/32 inch apart.
3. Scribe another four 1" lines 1/16 to 3/32 inch apart 90 degrees to the first set of lines. The resulting pattern to be nine squares.
4. Press a length of A-A-1830 or A-A-884 firmly over the scribed pattern, rubbing out all the air pocket.
5. Wait ten seconds minimum grasp a free end of the tape and at a rapid speed strip it from the painted surface by pulling the tape back upon itself at 180 degrees. The removal of two or more squares of topcoat, topcoat primer, or topcoat primer pretreatment coating constitutes test failure.

REPORT

1. Results of adhesion test should be recorded as passing or failing for each panel.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

SKYDROL RESISTANCE TEST

This is a method for evaluating the ability of a dry film of paint to withstand degradation due to immersion in skydrol.

APPARATUS

1. 60 degrees glossmeter, Gardner, or equivalent.

MATERIAL

1. Bonderite 37 zinc phosphated steel panels.
2. Skydrol fluid.
3. Absorbent paper, Kleenex, Kimwipes or equivalent.

PROCEDURE

1. Prepare the following test panels for test:
 - a. Six steel panels - 6 primed and top coated.
 - b. Ambient air dry 2 of the primed and top coated panels for 72 hours at 77 deg F. Oven dry the remaining 2 panels at 120 deg F for 72 hours. Run the remaining two if accelerator is specified for use in the material specification the air dry panels shall be accelerated to meet the specification.
 - c. Panels shall be prepared as in above test for each color specified in the material specification.
2. To prevent rusting, cover the unpainted surfaces remaining on each of the panels with a protective coating such as a primer or lacquer.
3. At the conclusion of this aging period, determine and record the initial gloss reading of each of the panels using the 60 degree glossmeter.
4. Immerse the panels in a bath of skydrol at a temperature of 70 to 80 deg. F, to a depth equivalent of two-thirds of the panel length for the specified time period.
5. At the conclusion of the specified immersion period, remove the panels from the skydrol bath and dry with absorbent paper.
6. Immediately examine the painted surface of each of the panels for evidence of blistering.
7. After examining the panels, age them for two hours in still air at 21 to 27 deg. C (70 to 80 deg. F).
8. Examine the painted surface of each of the panels for evidence of color change.
9. Determine and record the gloss reading after immersion of each of the panels, again using the 60 degree glossmeter.

REPORT - Report whether the paint passes or fails this test. The paint will pass if each of the test panels exhibits a dry film which shows no blistering immediately after removal from the liquid and no appreciable color change, no more than two points loss of gloss two hours after removal from the liquid. Both air dried test panels and oven dried test panels will pass.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

AFFF (FOAM) RESISTANCE TEST

This is a method for evaluating the ability of a dry film of paint to withstand degradation due to immersion in AFFF and then exposed to UV rays.

APPARATUS

1. 60 degrees glossmeter, Gardner, or equivalent.

MATERIAL

1. Alodine treated aluminum.
2. AFFF.
3. Absorbent paper, Kleenex, Kimwipes or equivalent.
4. QUV Cabinet.

PROCEDURE

1. Prepare the following test panels for test:
 - a. Prepared 5 primed and top coated panels.
 - b. Ambient air dry 1 of the primed and top coated panels for 72 hours at 77 deg F. Oven dry the remaining panel at 120 deg F. for 72 hours. The remaining panel shall be accelerated if accelerator is specified for use in the material specification.
 - c. Panels shall be prepared as in above test for each color specified in the material specification.
 - d. Repeat panel preparation for the aluminum and fiberglass.
2. To prevent rusting, cover the unpainted surfaces remaining on each of the panels with a protective coating such as a primer or lacquer.
3. At the conclusion of this curing period, determine and record the initial gloss reading of each of the panels using the 60 degree glossmeter.
4. Immerse the panels in a bath of 3% AFFF at a temperature of 70 to 80 deg. F, to a depth equivalent to two-thirds of the panel length for 1 hour, 4 hours, 24 hours and 168 hours.
5. At the conclusion of the specified immersion period, remove the panels from the bath and dry with absorbent paper.
6. Immediately examine the painted surface of each of the panels for evidence of blistering.
7. After examining the panels, age them for two hours in still air at 21 to 27 deg. C (70 to 80 deg. F).
8. Examine the painted surface of each of the panels for evidence of color change. If panel is at the end of the 1, 4, or 24 hours period replace panel and repeat steps 5, 6, 7, and 8. If panel is at the end of the 168 hours period continue with step #9.
8. Determine and record the gloss reading after immersion of each of the panels, again using the 60 degree glossmeter. - Place panels in QUV for 1000 hours. QUV should utilize the QFS-40 bulbs with settings of 8 hours UV/70 deg. C, 4 hours CON/50 deg. C inspect every 168 hours.

REPORT - Report whether the paint passes or fails this test. The paint will pass if each of the test panels exhibits a dry film which shows no blistering immediately after removal

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from the liquid and no appreciable color change, nor more than five points loss of gloss two hours after removal from the liquid. Both air dried test panels and oven dried test panels will pass.

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COATING TEST METHOD SPECIFICATION

ULTRAVIOLET (QUV-A) RESISTANCE TEST per ASTM G53

This is a method for evaluating the ability of a dry film of paint to withstand degradation due to exposure to UV rays.

APPARATUS

1. 60 degrees glossmeter, Gardner, or equivalent.
2. QUV cabinet.

MATERIAL

1. Bonderite 37 zinc phosphated steel panels.
2. Absorbent paper, Kleenex, Kimwipes or equivalent.

PROCEDURE

1. Prepare the following test panels for test:
 - a. Nine steel panels primed and top coated.
 - b. Ambient air dry 3 of the primed and top coated panels for 72 hours at 77 deg F. Oven dry 3 panels at 120 deg F for 72 hours. Air dry 3 panels with accelerator if accelerator is specified for use in the material specification.
 - c. Panels shall be prepared as in above test for each color specified in the material specification.
2. To prevent rusting, cover the unpainted surfaces remaining on each of the panels with a protective coating such as a primer or lacquer.
3. At the conclusion of this curing period, determine and record the initial gloss reading of each of the panels using the 60 degree glossmeter.
4. Place panels in QUV for 1000 hours. QUV should utilize the QFS-40 bulbs with settings of 8 hours UV/70 deg. C, 4 hours CON/50 deg. C. Inspect every 168 hours.

REPORT

Report whether the paint passes or fails this test. The paint will pass if each of the test panels exhibits a dry film which shows no blistering, no appreciable color change, nor more than five points loss of gloss. Both air dried test panels and oven dried test panels will pass.

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OSHKOSH CORPORATION COATING TEST METHOD SPECIFICATION

GRAVELOMETER TEST

This is a method for evaluating the ability of a dry film of paint to withstand degradation upon exposure to physical abrasion.

MATERIAL

1. Bonderite 40 zinc phosphated steel panels.
2. Fiberglass panels.
3. Aluminum panels.

PROCEDURE

1. Prepare the following panels for test:
 - a. Four steel panels - 1 primed, 3 primed and top coated.
 - b. Four fiberglass panels - 1 primed, 3 primed and top coated.
 - c. Four aluminum panels - 1 primed, 3 primed and top coated.
 - d. This test shall be repeated for all colors specified in the material specification.
 - e. Where there are 3 identical panels prepared one panel shall be cured 72 hours at 77 deg F. and the second panel shall be forced cured at 125 deg F. The third panel should be accelerated at the maximum amount specified by the coating manufacturer to meet the material specification.
2. Test the above panels in accordance with SAE J400 and ASTM D3170.
3. At the conclusion of the specified test period, immediately examine the painted surface of each of the panels.

REPORT

Report whether the paint passes or fails this test. The paint will pass if each of the panels meet the criteria specified in the material specification.

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VP, Materials and Process Engineering

Addendums to the Specification

Deviations:

1. Any deviation from the materials and processes defined in this specification needs direct approval from OSK. Contact Robert Hathaway @ 920-233-9347. Subcontracting of part painting, needs specific authorization from OSK or the respective coating manufacturer to verify conformance to this document. This requirement is subject to periodic audits by OSK or an approved OSK representative.

Zinc Rich Primer:

2. When zinc rich primer is required, only Hentzen Coating's, Urethane Organic Zinc Rich Primer and respective MIL-DTL-53022 sealer primer and MIL-DTL-53039 CARC Top Coat are approved for use on OSK components.

Suppliers of Commercial OSK Components:

3. The interchangeability among Akzo-Nobel/Hentzen primers and top coats show no signs of incompatibility for Commercial Applications. This information shall be used during the transition from Commercial Hentzen coatings to Akzo-Nobel. It is required by OSK that a total Akzo-Nobel commercial coating system be used when the transition is complete.

Suppliers of Military Components:

4. The use of organic finishes on military components is restricted to those standards referenced in Section II under "Military Vehicle Contract Finish Requirements". Coatings must conform to the respective military standards and commercial item descriptions listed. Coatings that meet the respective standards are acceptable for production of OSK military components.

Hexavalent Chrome Wash Primer Restriction:

5. The use of Wash Primer per DOD-P-15328 - Primer (Wash), Pretreatment (Formula No. 117 for Metals) & MIL-C-8514 defined as a Type III Pretreatment for Ferrous Materials in TT-C-490 is prohibited for use on OSK military and commercial vehicles.

Hexavalent Chrome Conversion Coating Restriction:

6. The application of hexavalent containing chrome conversion coatings on Oshkosh Corporation products is prohibited and shall be replaced with approved compositions free of hexavalent chromium as defined by MIL-DTL-5541 and MIL-DTL-81706, Type II, Class 1A and Class 3

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Rework of Organic Zinc Rich or Galvanized Steel Surfaces that have subsequently been CARC Top coated

7. This procedure is recommended when reworking a Chemical Agent Resistant Coating, (CARC) that has an organic zinc rich primed steel substrate or has been hot-dip galvanized. The following steps shall be taken to bring the region back to its original corrosion resistant state:
 - Sand, i.e., feather, back the CARC top coat, the epoxy primer, and the organic zinc rich coating or galvanized finish through to bare metal.
 - Apply a dry film thickness of .0025" to .0035" Zinc Rich Zenthane[®], 09443FMU, Primer by Hentzen Coatings, Inc., overlapping the feathered edges of the previous zinc rich or galvanized application. @50% RH and 77°F the coating will be Dry to Touch in 15 min., Dry to Handle in 2 hrs., and fully cured in 7 days, @180°F and 25%RH it will be Dry to Touch in 5 min., Dry to Handle in 10 min., and dry to recoat in 30 min. @ 180°F, and reach full cure in 24 hours.
 - After the zinc rich is dry to handle, apply the epoxy primer, MIL-DTL-53022 or MIL-DTL-53030 being careful to overlap the feathered edges. The primer should be applied to a dry film thickness between .001" and .0015" thick with one full coat. Allow the primer to set to touch, which is typically between 15 and 45 minutes depending on the ambient cure conditions per MIL-DTL-53072.
 - The topcoat must be applied to the epoxy primer in a timely fashion to avoid scuff sanding. I would conservatively state that parts could be stored outdoors for a maximum of 4 days and then brought in-house, washed of any dirt or debris and top coated without scuff sanding. The MIL-DTL-53022 epoxy primer develops full chemical properties in 3 weeks, so if the components are kept undercover out of direct sunlight for a maximum period of 3 weeks they can be assembled to the truck and top coated without scuff sanding. Exceeding this storage boundary conditions outlined with as-primed parts, can result in topcoat adhesion failure if the primer is not scuff sanded.
 - After the primer is set to touch, apply the Chemical Agent Resistant Coating (CARC) topcoat per MIL-DTL-53072 with MIL-DTL-53039. Feather the topcoat in over the initial coating to complete the reword operation. The cure times and temperatures for the systems following the descriptions outlined in MIL-DTL-53072.

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VP, Materials and Process Engineering

Rework of Components that have been Primed using Cathodic Electrodeposition, i.e., E-Coat, and subsequently CARC Top coated.

8. This procedure is recommended when reworking a Chemical Agent Resistant Coating, (CARC) that has a Cathodic Electrodeposited primed substrate. The following steps shall be taken to bring the region back to its original corrosion resistant state:
 - Sand, i.e., feather back the CARC top coat and electrodeposited primer (E-Coat) to bare metal bare metal.
 - Using clean, dry compressed air remove fines, and any other loose debris from the area.
 - Apply epoxy primer, MIL-DTL-53022 or MIL-DTL-53030 being careful to overlap the feathered edges. The primer should be applied to a dry film thickness between .001” and .0015” thick with one full coat. Allow the primer to set to touch, which is typically between 15 and 45 minutes depending on the ambient cure conditions per MIL-DTL-53072.
 - The topcoat must be applied to the epoxy primer in a timely fashion to avoid scuff sanding. I would conservatively state that parts could be stored outdoors for a maximum of 4 days and then brought in-house, washed of any dirt or debris and top coated without scuff sanding. The MIL-DTL-53022 epoxy primer develops full chemical properties in 3 weeks, so if the components are kept undercover out of direct sunlight for a maximum period of 3 weeks they can be assembled to the truck and top coated without scuff sanding. Exceeding this storage boundary conditions outlined with as-primed parts, can result in topcoat adhesion failure if the primer is not scuff sanded.
 - After the primer is set to touch, apply the Chemical Agent Resistant Coating (CARC) topcoat per MIL-DTL-53072 with MIL-DTL-53039. Feather the topcoat in over the initial coating to complete the reword operation. The cure times and temperatures for the systems following the descriptions outlined in MIL-DTL-53072.

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Internal Surfaces of Fuel Tanks, Hydraulic Reservoirs, and Air Tanks

9. Unless specifically required, the internal surfaces of fuel tanks, hydraulic reservoirs, and air tanks shall be free of organic coatings. The successful application of coatings to these containers is highly dependent on surface preparation, and compatibility with the fluid which is contained. This does not however restrict the use of chromate conversion coatings on the interior of aluminum containers. Chrome conversion coatings offer enhanced corrosion prevention and control without the risk of adhesion failure.

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Zinc Rich Primer

10. Those suppliers requested by Oshkosh Corporation and/or its related divisions, i.e., McNeilus Truck Manufacturing, and Pierce Manufacturing, to apply zinc rich primer are restricted to using only that zinc rich primer manufactured by Hentzen Coatings, of Milwaukee, WI under the name Zinc Rich Zenthane Primer, 09443FMU-3. This restriction is placed on those components requiring zinc rich primer in an effort to provide a product with corrosion prevention and control equivalent to that predicted through accelerated corrosion testing. Deviation from this primer to another zinc rich primer without formal authorization could result in part rejection and component rework expense charged back to the supplier.

In accordance with Mil-P-26915C, when salt fog testing panels they shall be prepared, cleaned, and sequentially coated to leave the various layers coated to the salt fog. Hence, the panels shall have a region with zinc rich primer only, zinc rich primer plus epoxy primer sealer MIL-DTL-53022 or Mil-DTL-53030, and zinc rich primer plus epoxy primer sealer plus Chemical Agent Resistant Coating (CARC) topcoat, Mil-P-53039. The panel coating systems shall be fully cured prior to salt fog exposure. The panels shall not be scored and should be exposed to ASTM B117 for a total of 336 hours. After this period of time the coating of the primer and primer plus sealer and primer plus sealer and topcoat shall show no blistering, wrinkling or loss of adhesion. There shall be no rusting or other visual evidence of panel corrosion.

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VP, Materials and Process Engineering

Hot Rolled Pickled and Oiled Steel

- 11 It is highly recommended that Oshkosh Corporation along with our respective suppliers produce weldments and fabrications from steel plate in the hot rolled pickled and oiled condition. This is not a requirement but merely a recommendation to provide Oshkosh Corporation products the best possible corrosion prevention and control measures. Without the pickling treatment, hot rolled steel retains a scale left from the high temperature rolling operation. This scale can be tightly adhering and difficult to remove from a phosphate pretreatment standpoint as well as during grit blasting. The mill scale, if left on the part, is anodic to the steel substrate. What this means is that when moisture enters the permeable membrane of the primer and topcoat organic coating, the mill scale remaining will set up a galvanic reaction with the steel parent material producing corrosion product and initiating a blister and loss of local adhesion. The organic coating system is permeable to moisture; hence it is of the utmost importance that all scale, regardless of how tightly adhering it is, be removed prior to painting. The hot rolled pickled and oiled product is somewhat more expensive than the standard hot rolled material, however, the time and effort to remove the scale and the corrosion potential with the standard hot rolled material more than makes up for the difference in raw material cost.

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UNCONTROLLED
 DOCUMENT

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Repair of Cross Hatch Adhesion Test (Scribe Test) Sites and Superficial Damage of CARC Primed and Top Coated Organic Zinc Rich or Galvanized Steel Surfaces

12. This procedure is recommended when repairing an area on a CARC painted zinc rich primed or galvanized steel surface that has been scribed or whose surface needs to be cosmetically repaired due to superficial damage of the CARC coating. This procedure is recommended when reworking a Chemical Agent Resistant Coating, (CARC) that has an organic zinc rich primed steel substrate or has been hot-dip galvanized. The following steps shall be taken to bring the region back to its original corrosion resistant state:

- Degrease Region and remove any dirt, oil or grease with Blue Shower[®] or Equivalent
- Sand, i.e., feather, back the CARC topcoat, and the epoxy primer.
- Stop sanding when the white epoxy primer has been feathered back and a dull gray mat finish is exposed. Depending on the component this is either the zinc rich primer or the galvanized surface. **Do Not** continue sanding through to bare metal, which will appear shinny compared to the gray mat finish of the zinc coatings. It is less intrusive to the corrosion prevention and control measures to not sand through the scribe marks to bare metal then it is to sand through the scribe marks to bare metal.
- Apply epoxy primer, MIL-DTL-53022 being careful to overlap the feathered edges. The primer should be applied to a dry film thickness between .001" and .0015" thick with one full coat. Allow the primer to set to touch, which is typically between 15 and 45 minutes depending on the ambient cure conditions per MIL-DTL-53072.
- The topcoat must be applied to the epoxy primer in a timely fashion to avoid scuff sanding. I would conservatively state that parts could be stored outdoors for a maximum of 4 days and then brought in-house, washed of any dirt or debris and top coated without scuff sanding. The MIL-DTL-53022 epoxy primer develops full chemical properties in 3 weeks, so if the components are kept undercover out of direct sunlight for a maximum period of 3 weeks they can be assembled to the truck and top coated without scuff sanding. Exceeding this storage boundary conditions outlined with as-primed parts, can result in topcoat adhesion failure if the primer is not scuff sanded.
- After the primer is set to touch, apply the Chemical Agent Resistant Coating (CARC) topcoat per MIL-DTL-53072 with MIL-DTL-53039. Feather the topcoat in over the initial coating to complete the reword operation. The cure times and temperatures for the systems following the descriptions outlined in MIL-DTL-53072.

This addendum shall be used only when the coating system passes the adhesion test and there is no evidence of intercoat or substrate adhesion failure. Refer to PS100-02 for Instructions on Repairing Adhesion Failures in this Paint System

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Rework of Steel or Aluminum Surfaces that have subsequently been CARC Top Coated

13. This procedure is recommended when reworking a Chemical Agent Resistant Coating, (CARC) that has an aluminum or steel substrate. The following steps shall be taken to bring the region back to its original corrosion resistant state:

- Sand, i.e., feather, back the CARC topcoat and the epoxy primer through to bare metal.
- Clean area of debris using a clean lint-free cloth. If necessary the cloth may be dampened with acetone or MEK prior to cleaning. Solvents should be allowed to flash off prior to subsequent primer application.
- Apply the epoxy primer, MIL-DTL-53022 or MIL-DTL-53030 being careful to overlap the feathered edges. The primer should be applied to a dry film thickness between .001" and .0015" thick with one full coat. The epoxy primer, MIL-DTL-53022, known by Hentzen Coatings, Inc. as White High Solids Epoxy Primer 4488WEP-33/4489CEH-33, has approximately 44% by volume solids in the mixed state. Therefore, a wet film thickness of between .0016" - .0023" should be applied to obtain the dry film thickness required. Allow the primer to set to touch, which is typically about 2 hours depending on ambient cure conditions per MIL-DTL-53072.
- After the primer is set to touch, apply the Chemical Agent Resistant Coating (CARC) top coat per MIL-DTL-53072 with MIL-DTL-53039. Feather the topcoat in over the initial coating to complete the rework operation. The CARC top coat, MIL-DTL-53039, known by Hentzen Coatings, Inc. as Zenthane[®] Aliphatic Single Component Camouflage Polyurethane Coating has approximately 50% volume of solids so that a wet film application of .0036" minimum is required to achieve the .0018 minimum dry film thickness required by MIL-DTL-53072. This product when cured under ambient conditions will achieve full chemical properties in 1 – 1.5 weeks. However, because we are primarily concerned with spot touch-up activity the use of a heat lamp is highly recommended. Using a thermometer next to the surface, adjust the heat lamp to a temperature between 120 – 160 deg. F. Stay as close to the upper end of this range as possible without exceeding. Let the heat lamp dwell on the area of repair for approximately 3 hours.