

Certificate Program: Shipyard Industry Surface Prep & Coating Training

SSPC Coatings+ 2020

NSRP Joint Project – SP&C, WFD, & EH&S Panels

Robert Cloutier – GD-Bath Iron Works (BIW)



Certificate Program – General Proficiencies

Surface Preparation & Coatings

Why We Paint Ships

- Anti-Corrosive – Epoxies
- Aesthetics
- Anti-Fouling
- UV Resistance / Heat control
- Safety Markings
- Slip Resistance
- Anti-Sweat

Classroom



NAVAL SEA SYSTEMS COMMAND

What's New in NAVSEA Coatings?



**NSRP SPC Panel Meeting
Via Conference Call**

June 2020

Mr. Mark Ingle, P.E.

SEA 05P2

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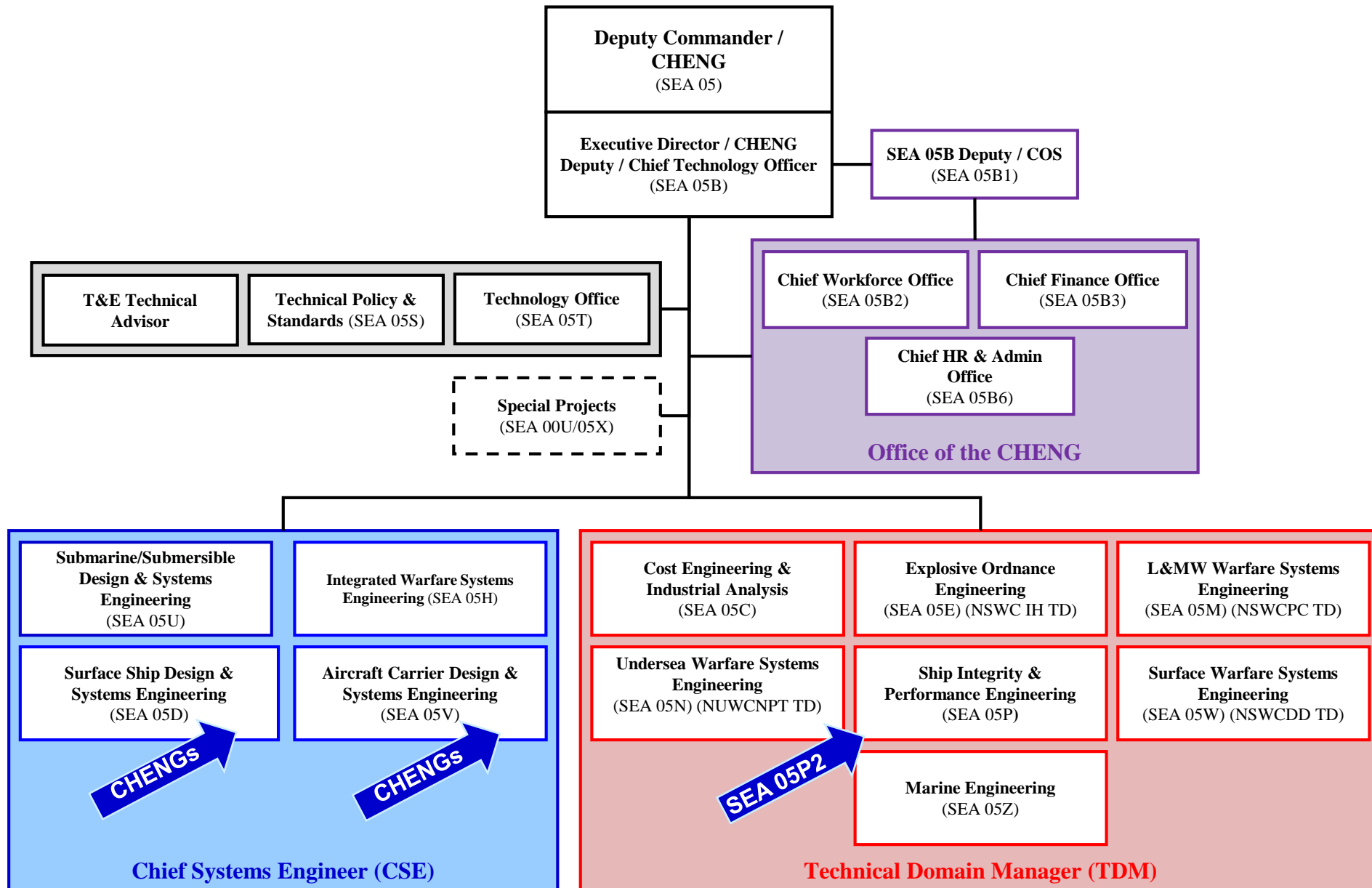
OBJECTIVES

- Summarize evolving Naval Sea Systems Command (NAVSEA) organization and coating requirements:
 - Headquarters NAVSEA organization & objectives.
- Summarize **what's new** in NAVSEA nonskid and maintenance coating cost reduction strategies:
 - Publication of Standard Item 009-32 update.
 - Publication of significant Update to Standard Item 009-124 on Thermal Spray Nonskid (TSN).
 - Publication of updated interior coating and decking specifications in process.
 - Publication of MIL-PRF-24635F to include NRL optimal pigment package.
 - In-service demonstration of spray applied polysiloxane nonskid.
- Summarize **challenges** regarding recent listing of Oxsol 100 on California Proposition 65 list of carcinogens.



Naval Systems Engineering Directorate (SEA 05)

Draft: Sep 2019

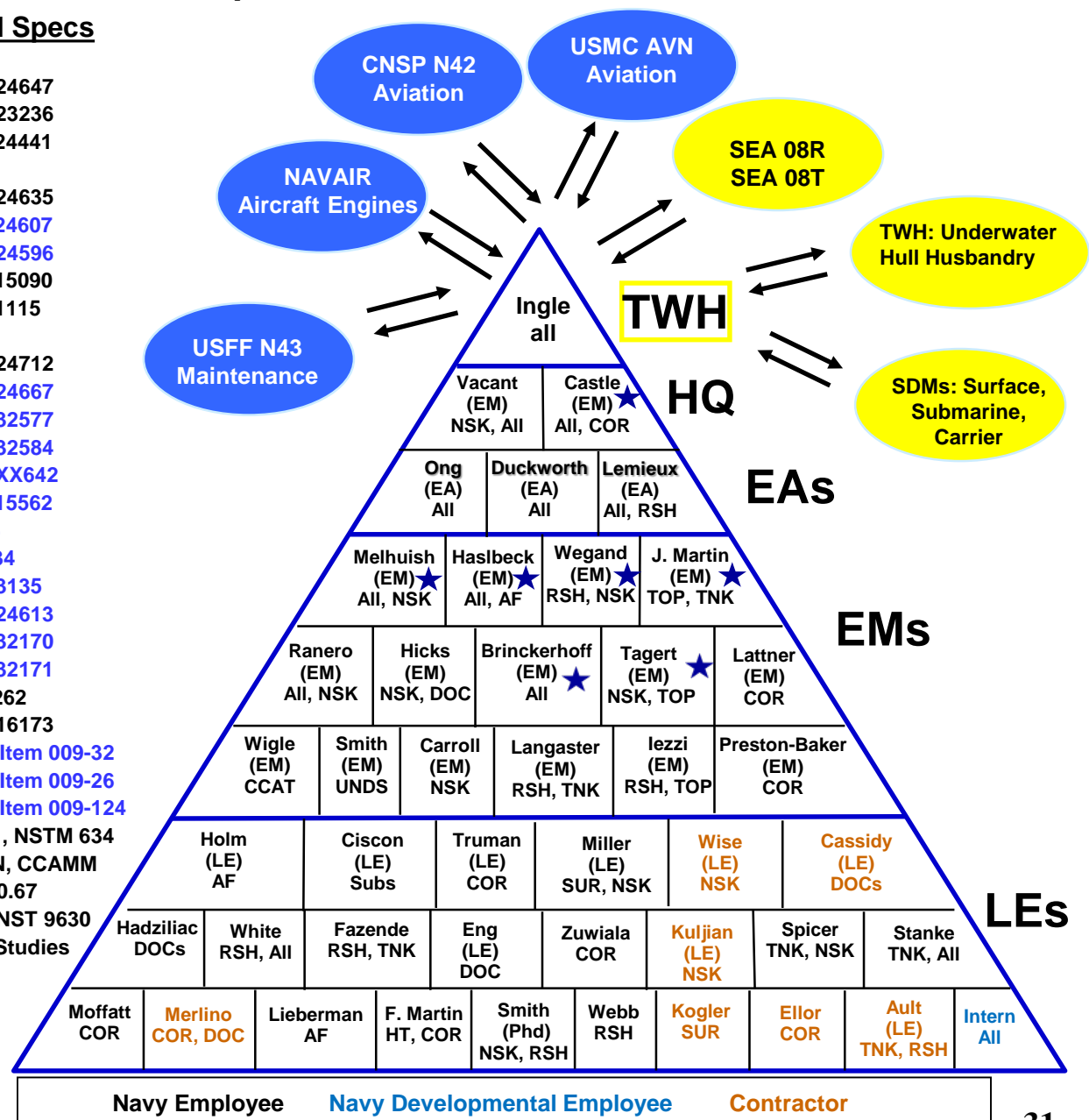


Technical Authority Pyramid - Coatings & Corrosion Control

Draft: Sept. 2019

Code	Product	Related Specs
All	All Technical Products, Managerial	All
AF	Antifouling Coating Systems	MIL-PRF-24647
TNK	Tank Coatings, Epoxy Primers	MIL-PRF-23236 MIL-DTL-24441
PRM	Primers, Single Component	TT-P-645
TOP	Topside, Alkyds & Polysiloxanes	MIL-PRF-24635
INT	Interior Coatings (SEA 08)	MIL-DTL-24607 MIL-PRF-24596 MIL-DTL-15090 MIL-DTL-1115
HT	High Temp Coatings, Metallic	TT-P-28
PWD	Powder, Interior, Cosmetic	MIL-PRF-24712
NSK	Nonskid	MIL-PRF-24667 MIL-PRF-32577
DCK	Deck Coverings	MIL-PRF-32584 MIL-PRF-XX642 MIL-DTL-15562 DDD-C-95 MIL-D-3134 MIL-PRF-3135 MIL-PRF-24613 MIL-PRF-32170 MIL-PRF-32171
SUR	Abrasive blasting, surface prep	MIL-A-22262
SEL	Sealants & Preservatives	MIL-PRF-16173
DOC	Policy Documents	Standard Item 009-32 Standard Item 009-26 Standard Item 009-124
COR	Corrosion, PCOE	NSTM 631, NSTM 634 S636-MAN, CCAMM DODI 5000.67 NAVSEAINST 9630
RSH	Research & Development	Reports, Studies
UNDS	Regulations, Underwater hull	TBD

★ Delegated signature authority

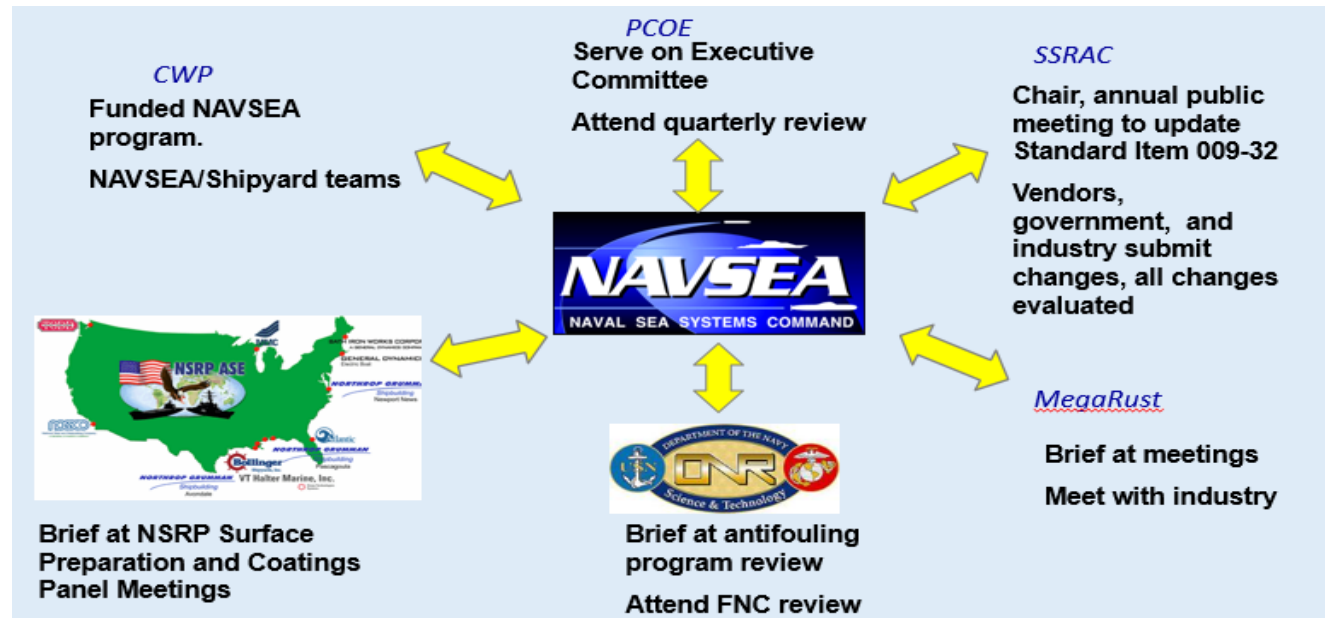


NAVSEA Strategic Business Plan


NAVSEA Strategic Business Plan 2018-2022, has three key mission priorities:

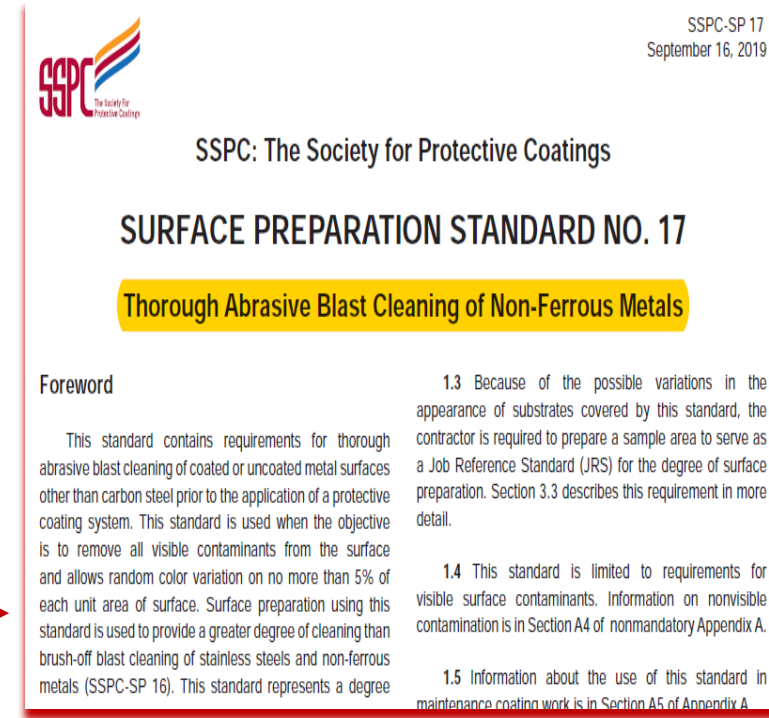
1. On-Time Delivery of Ships and Submarines
2. Culture of Affordability
3. Cybersecurity

NAVSEA addresses these items through continual, ongoing interactions with shipbuilding and ship repair community:



What's new with Standard Item 009-32?

- Published FY-21, Change 2, Standard Item 009-32 on 6 Mar 2020 that includes thirty technical and editorial changes.
- Key changes include:
 - Adding a complete coat of high-performance epoxy primer to the requirements for coating the exterior walking areas on the aluminum island superstructure on LHA/LHD class ships.
 - Reducing the number of coats required to touch-up small-scale damage in submarine potable water tanks by 80%.
 - Standardized coating thicknesses for MIL-DTL-24441 Type IV throughout document at 4-6 mils for all applications except submarine underwater hull that remains at 5 – 7 mils.
 - Incorporating new SSPC-SP 17 standard for aluminum surface preparation. 



Leadership Challenge

Improve Overall Nonskid Performance

- Mar 2017 – Senior NAVSEA / NAVAIR leadership task Flight Deck Readiness Working Group (FDRWG) to improve all aspects of flight deck nonskid service life. FDRWG includes:
 - SEA 05P2, NSWC-PD, NRL
 - SEA 21
 - Fleet Forces
 - NAVAIR technical community
 - Type Commander
 - USMC Aviation
- Nonskid must consistently achieve **required service life** while satisfying **all MIL-PRF-24667C performance requirements**.



Flight Deck Readiness Working Group tasked to improve nonskid service life and performance on all platforms.

FY-21 Update to Standard Item 009-124

Add New Lines To Table One For Repair Areas of Varying Sizes

Published FY-21, Change 1, Standard Item 009-124 on 14 Jan 2020 is significant update that includes three new repair requirements that to **SUPERVISOR** to:

- Define areas to be repaired using chalk, marker, or paint.
- Prepare small-scale areas for repair.
- Validate Standard Item 009-124 requirements are accomplished.

FY-21 STANDARD ITEM 009-124
TABLE ONE, LINE 4 (LESS THAN 20 SQUARE FEET):

SUPERVISOR to: mark individual <20 ft² areas to be repair with chalk.

NAVSEA Approved Technical Representative to: Remove TSN in damage area to expose steel substrate and prepare TSN edge.

CONTRACTOR to:

- Abrasive blast area to SSPC-SP 5 white metal cleanliness.
- Use hand spray to install new TSN



FY-21 STANDARD ITEM 009-124
TABLE ONE, LINE 3 (20 to 200 SQUARE FEET):

SUPERVISOR to: mark ≈30 ft² area to be repaired with chalk.

CONTRACTOR to:

- Use HPWJ to remove TSN.
- Abrasive blast area to SSPC-SP 5 white metal cleanliness.
- Use hand spray to install new TSN.

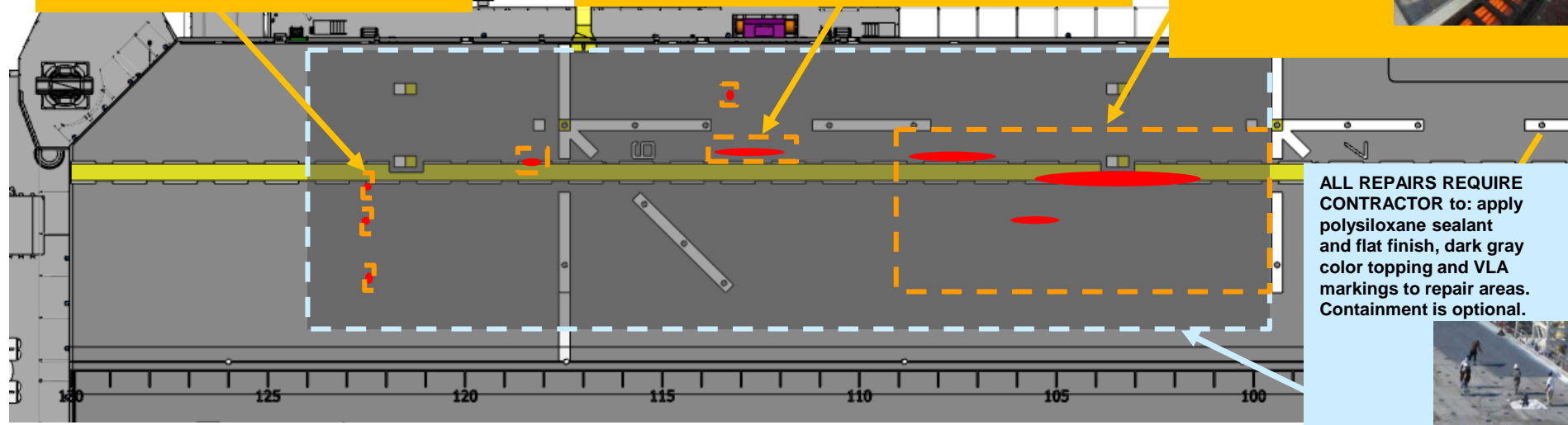


FY-21 STANDARD ITEM 009-124
TABLE ONE, LINE 2 (GREATER THAN 200 SQUARE FEET):

SUPERVISOR to: mark ≈2,000 ft² area to be repaired with chalk.

CONTRACTOR to:

- Use HPWJ to remove TSN.
- Abrasive blast area to SSPC-SP 5 white metal cleanliness.
- Use robotic, 4-head system to install new TSN



ALL REPAIRS REQUIRE CONTRACTOR to: apply polysiloxane sealant and flat finish, dark gray color topping and VLA markings to repair areas. Containment is optional.



SUPERVISOR and NAVSEA Approved Technical Representative with TSN expertise. to support work.

Update to Standard Item 009-124 Process

Includes Nine Government QA Checkpoints - Two (G) Points Eliminated

1.(V)(G) "CONTAINMENT AND VENTILATION INSTALLATION"

Process requires environmental controls on temperature, humidity, and dust. →
Design approved by SUPERVISOR per Standard Item 009-01, 009-03, 009-05, etc.
Re-establishment of containment across deck is contractor verification point (V).
Environmental requirements are 55-90°F ambient temperature, >50°F deck temperature,
Relative humidity <70%, deck temperature >5°F above the dew point as trades person verification point (V).



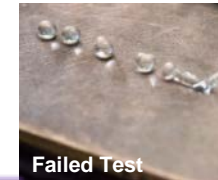
2.(I)(G) "CONDUCTIVITY MEASUREMENT"

Conductivity required (i.e., there are no separate chloride limits) using Bresle or equivalent method.
One reading from first 200 ft²/subsequent 400 ft² with limit of 30 micro-siemens/cm. →
Requires low pressure waterjet cleaning of any areas with high conductivity.



3.(I)(G) "CLEANLINESS PRIOR TO ABRASIVE BLASTING"

Clean and degrease surface by SSPC-SP 1 before surface preparation, requires verification →
using water break test.
One water break test is required for every 200 ft².



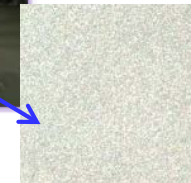
4.(I)(G) "SECONDARY SURFACE PREPARATION"

Requires SSPC-SP 5 white metal blast on both general deck surface →
and welds using requirements in SURFACE PROFILE section.



5.(I)(G) "SURFACE PROFILE"

Measures profile on the SSPC-SP 5 white metal level of cleanliness
created using 50/50 mixture of 16- to 24-grit virgin Al₂O₃ abrasive during surface preparation
within 10 hours of removing old nonskid using very thorough water jet cleaning
to SSPC-WJ 2. Take one reading every 200 ft² and verify compressed air cleanliness.
Requires ASTM D4417 Method B for profile peak height and ASME B46.1 for profile →
texture. Profile shall be between 4.0 and 10.0 mils and texture by
root mean square (RΔq) >0.45 as measured on first 400 ft² and each subsequent 400 ft².

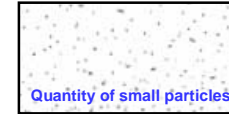


Update to Standard Item 009-124 Process

Includes Nine Government QA Checkpoints - Two (G) Points Eliminated

6.(I)(G) "DUST TEST"

Requires ISO 8502-3 (Rating 2, Class 2) with "just visible" particles no larger → than 40 mils with three readings per 400 ft².



7.(I)(G) "THERMAL HAND SPRAY AND ROBOTIC SPRAY APPLICATION MACHINE SETTINGS"

Requires robot settings are same as those used in Technical Publication 1687 process. → Check and validate settings at start of work shift.

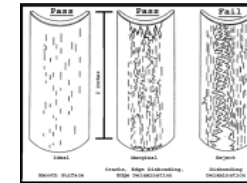
Eliminate current (G) point because settings do not change when machine is moved, can be documented with image of machine and happens too frequently during production.



8.(I)(G) "MANDREL BEND WITNESS PANELS"

Requires three witness panels attached to tie downs to be removed from deck after first TSN coat and bent → 180° over a 2 ¼ inch mandrel at start of each work day. Only slight edge cracking allowed.

Eliminate current (G) point because bent discs provide permanent OQE that government can inspect and are collected too frequently during production.



9.(I)(G) "FILM THICKNESS MEASUREMENTS"

Requires film thicknesses demonstrated in Technical Publication 1687 process → to be measured using modified SSPC-PA 2 method to take five spot readings per spot per every 200 ft² and to locate and repair thin areas on a +/- 3 inch basis.



10.(I)(G) "TSN CLEANLINESS"

Requires wire brush, dry vacuum, or low pressure, vacuum water cleaning, → at 2,500 to 3,000 psi, to clean dust off deck before color top.



11.(I)(G) "COLOR TOPPING HOLIDAY INSPECTION"

Requires wet film thickness of color top and visual inspection of deck. →

Requires dark gray and VLA marking colors to be applied direct to TSN.

SUPERVISOR provides final approval of deck.



Standard Item 009-32 has eight (G) points to ensure nonskid quality while Standard Item 009-124 has nine (G) points.

Update to Standard Item 009-124 Process

New Verification (V) Points Added for Color Topping

10.(I)(G) "TSN CLEANLINESS"

Requires wire brush, dry vacuum, or low pressure, vacuum water cleaning, → at 2,500 to 3,000 psi, to clean dust off deck before color top.



10.a(V) "SEALER APPLICATION"

Requires application of clear, single-pack, water-thin polysiloxane sealer to installed TSN. Back roll sealer. Must be installed within 24 hours of completing cleaning.

10.b(V) "DARK GRAY COLOR TOP APPLICATION"

Requires masking of VLA marking areas and installation of companion → panels in area to be coated. Apply flat finish, single-pack polysiloxane color top and back roll color top with dry roller. Color top must be installed within five days of sealer curing to support foot traffic.

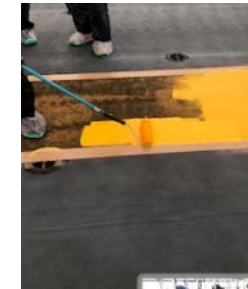


10.c(V) "WFT MEASUREMENTS - DARK GRAY COLOR TOPPING"

Requires worker to verify coverage using WFT gage on companion panels. →

10.d(V) "VLA COLOR TOP APPLICATION"

Requires removal of masking from dark gray color top, re-masking VLA areas → with up to ½-inch overlap onto dark gray color top. Apply flat finish, single-pack polysiloxane color top and back roll color top with dry roller. Color top must be installed within 7 days of sealer curing to support foot traffic.



10.e(V) "WFT MEASUREMENTS - VLA COLOR TOPPING"

Requires worker to verify coverage with WFT gage on companion panels.

11.(I)(G) "COLOR TOPPING HOLIDAY INSPECTION"

Requires wet film thickness of color top and visual inspection of deck. →

Requires dark gray and VLA marking colors to be applied direct to TSN.

SUPERVISOR provides final approval of deck.



Standard Item 009-124 defines requirements for "best practices" process for sealer and flat finish, single-pack, polysiloxane color topping.

Standard Item 009-124

Created Individual Attachments for Each Repair Scope

REPAIR AREA GREATER THAN 200 SQUARE FEET

FY-21 STANDARD ITEM 009-124, TABLE ONE, LINE 2, ATTACHMENT B

SUPERVISOR to lay out area for repair or new material with chalk.

CONTRACTOR to arrange hard masking plates (i.e., minimum 1/8 inch thick by 6 inch wide) to create clean, defined retained TSN edge.

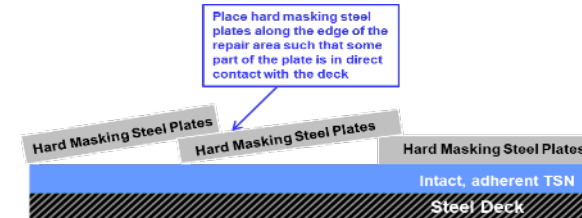
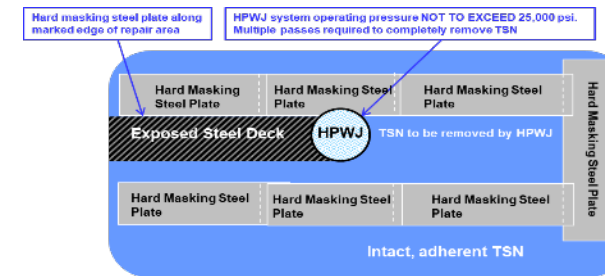
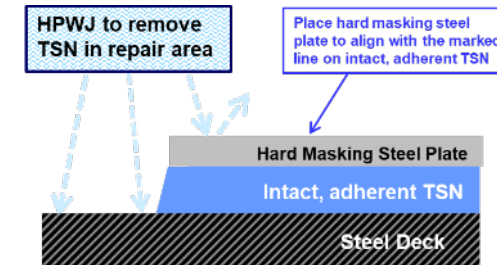
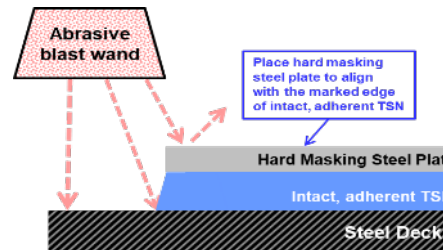
Hard masking plates stacked so that some part of each plate is in contact with deck.

Ultrahigh Pressure Waterjet (UHPWJ) pressure must be less than 25,000 psi.

Excess UHPWJ pressure will undercut TSN.



CONTRACTOR to use 50/50 blend of 16 and 24 grit aluminum oxide blast media to create SSPC-SP 5, white metal level of cleanliness on deck.



NRL lessons learned incorporated into significant update to Standard Item 009-124.

Standard Item 009-124

Created Individual Attachments for Each Repair Scope

REPAIR AREA GREATER THAN 200 SQUARE FEET

FY-21 STANDARD ITEM 009-124, TABLE ONE, LINE 2, ATTACHMENT B

CONTRACTOR to hand sand TSN edge using 80 – 120 grit paper or pad.

Re-arrange hard masking plates to prevent TSN build up on retained TSN.

Arrange hard masking plates with overhang of retained TSN edge.

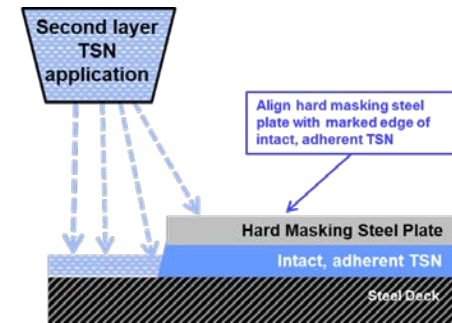
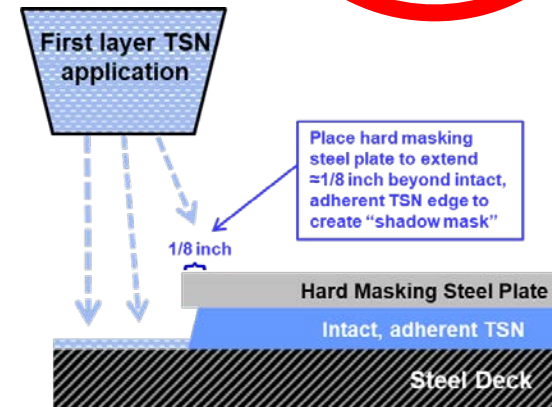
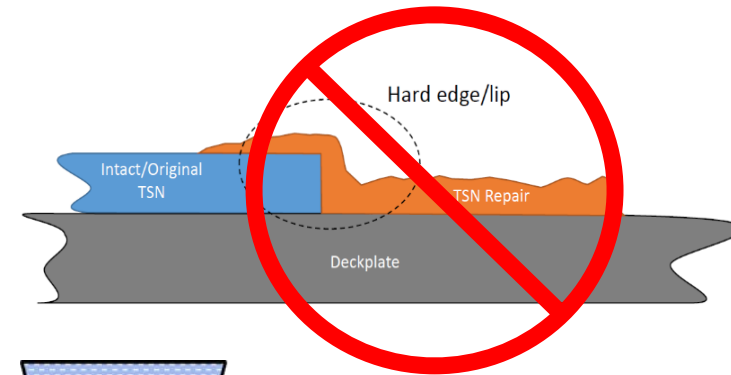
Validate robotic settings and apply first layer of TSN.

Minimum Film Thickness (FT) 25 mils.



Rearrange hard masking plates to align with retained TSN edge and apply second layer of TSN.

Total FT minimum 45 mils.



[NRL lessons learned incorporated into significant update to Standard Item 009-124.](#)

Standard Item 009-124

Created Individual Attachments for Each Repair Scope

REPAIR AREA GREATER THAN 200 SQUARE FEET

FY-21 STANDARD ITEM 009-124, TABLE ONE, LINE 2, ATTACHMENT B

CONTRACTOR to remove the hard masking plates and clean the dust/debris off the deck with a stainless steel wire or stiff nylon bristle brush/broom as approved by the SUPERVISOR and vacuum waterjet.

Apply clean sealant to clean TSN with 24 hours of completing cleaning.

Mask outermost 6 to 18 inches of TSN to prevent application of sealer to TSN tie-in areas where overcoating with MIL-PRF-24667 nonskid.

Back roll sealer using a 1/4 inch or 3/8 inch nap roller, without additional color topping or a roller tray, to minimize the amount of liquid coating on the TSN while ensuring complete coverage.

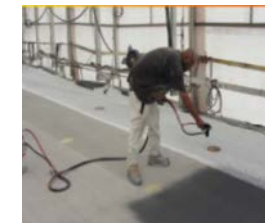
Mask VLA marking areas to prevent application of dark gray color top. Overlap of VLA marking colors onto dark gray must not exceed 1/2 inch.

Complete application of dark gray color top within 5 days of the sealer curing to support foot traffic. Back roll spray applied material.

Mask dark gray color top to final VLA marking locations. Overlap of VLA marking colors onto dark gray must not exceed 1/2 inch.

Complete application of VLA color top within 7 days of the sealer curing to support foot traffic.

Apply NAVSEA-approved TSN sealer.



Standard Item 009-124

Created Individual Attachments for Each Repair Scope

REPAIR AREA LESS THAN 200 SQUARE FEET BUT GREATER THAN 20 SQUARE FEET

FY-21 STANDARD ITEM 009-124, TABLE ONE, LINE 3, ATTACHMENT C

SUPERVISOR to lay out area for repair or new material with chalk.

CONTRACTOR to arrange hard masking plates (i.e., minimum 1/8 inch thick by 6 inch wide) to create clean, defined retained TSN edge.

CONTRACTOR to use 50/50 blend of 16 and 24 grit aluminum oxide blast media to create SSPC-SP 5, white metal level of cleanliness on deck.

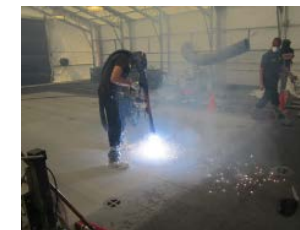
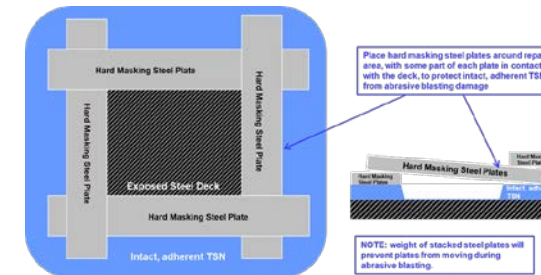
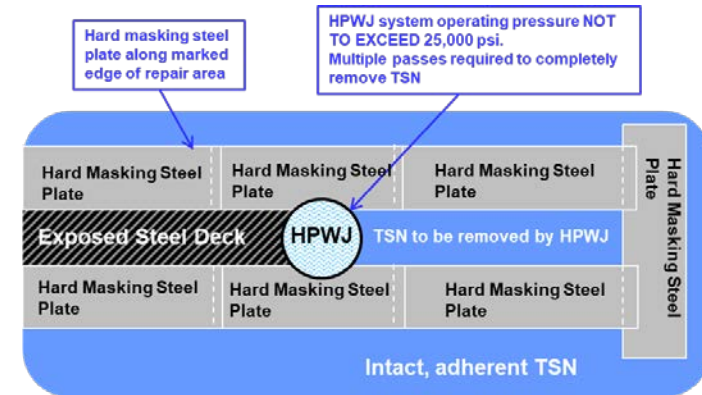
Validate hand spray settings and apply first layer of TSN.

Minimum Film Thickness (FT) 25 mils.

Validate hand spray settings and apply second layer of TSN.

Maximum Film Thickness (FT) 45 mils.

Seal and color top as per Attachment B.



[Hand TSN lance lesson learned incorporated into significant update to Standard Item 009-124.](#)

Standard Item 009-124

Created Individual Attachments for Each Repair Scope

REPAIR AREA LESS THAN 20 SQUARE FEET

FY-21 STANDARD ITEM 009-124, TABLE ONE, LINE , ATTACHMENT D

NAVSEA-approved Technical Representative to lay out area for repair.

- Visual reports from ship.
- Sounding area by tapping with steel tool.

NAVSEA-approved Technical Representative to remove nonskid and prepare area for repair.

- Use power and hand tools to remove TSN
- Repeat sounding to validate that TSN is not undercut.
- Iterative process to prepare exposed steel repair area surrounded by intact, adherent TSN.

CONTRACTOR to arrange hard masking plates (i.e., minimum 1/8 inch thick by 6 inch wide) to create clean, defined retained TSN edge.

Use 50/50 blend of 16 and 24 grit aluminum oxide blast media to create SSPC-SP 5, white metal level of cleanliness on deck.

Spray TSN using hand lance to **maximum** FT of 45 mils.

Seal and color top as per Attachment B.

Validate hand spray settings and apply first layer of TSN.

Minimum Film Thickness (FT) 25 mils.

Validate hand spray settings and apply second layer of TSN.

Maximum Film Thickness (FT) 45 mils.

Seal and color top as per Attachment B.



Update to MIL-DTL-24607 & MIL-PRF-24596 Updates In Process

Fleet Need for New Interior topcoat colors

- MIL-DTL-24607 & MIL-PRF-24596 updates in process and documents released for Specification Review Board (SRB) review ON 20 May 2020.
- Updated to address formulas citing ingredients no longer available, and to update colors.
- Fleet had been requesting to use “bright white” in place of soft white to lighten spaces and increase visibility.
- SEA 05P2 noted need for flat, dark blue as per NSTM 631 Table 631-8-11, Note 9:
“Pastel blue, color number 25526, MIL-DTL-24607 shall be used on bulkheads in CIC spaces and outboard operations and communications spaces with Broad Band Blue Operation Lighting systems. Overheads shall be *insignia blue*, color number 35044.”
- SEA 05P2 / NRL worked with Navy supply system and paint suppliers to determine sales volumes for cited colors. Six of the original eleven colors showed very low sales volume.
 - Sun Glow
 - Rosewood
 - Yellow Gray
- Updates to MIL-DTL-24607 & MIL-PRF-24596 resulted in removal of six colors and addition of two.

[MIL-DTL-24607 & MIL-PRF-24596 in Specification Review Board \(SRB\) process, if interested contact SEA 05P2](#)

Streamlined Interior Topcoat Colors

- Color reduction in interior alkyd specifications reduces logistics and waste.

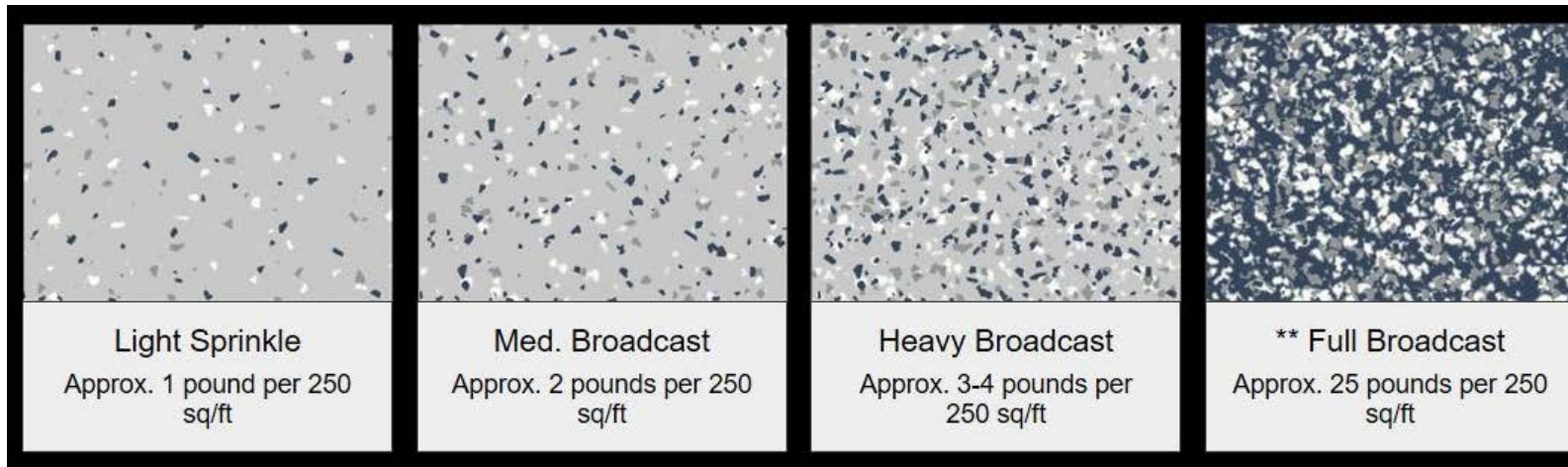
Rosewood #22519	Yellow Gray #26400	Sunglow #23697	Clipper Blue #24516
Pastel Green #24585	Pastel Blue #25526	Bulkhead Gray #26307	Beach Sand #22563
Pearl Gray #26493	Green Gray #26496	Soft White #27880	



Pastel Green #24585	Pastel Blue #25526	Bulkhead Gray #26307	Beach Sand #22563
Insignia Blue #35044	Bright White #27925	Soft White #27880	

MIL-PRF-32584 Cosmetic Polymeric Decking Color Flake Coverage

- Products seeking qualification are tested, including fire/smoke performance, with notional 20% color flake coverage.
- Fleet customers have requested authorization to apply 100% or “full flake” coverage.
- Suppliers of color flake decking routinely support full flake installations, but may not include color flakes with decking kits.
- NAVSEA working with Fleet to define process and support installations with training and oversight of ship’s force work.



[Fleet interest in full flake coverage, NAVSEA responding to waterfront demand signal.](#)

Image source: www.originalcolorchips.com

Key Issue: Fire Performance at Different Chip Levels

- Final decision on color flake decking has been challenging due to conflicting results between qualification tests and testing performed by government, later discovered by NAVSEA to not be in accordance with manufacturer's instructions.

Flake coverage percentage	E662 flaming (max limit is 450)	E662 nonflaming (max limit is 450)	E648 (min limit is 0.45)
20% over system with mfr instructions	141	268	0.88
100% over system with mfr instructions	262	326	0.66
20% over system not i.a.w. mfr instructions	162	240	0.32
100% over system not i.a.w. mfr instructions	261	480	0.2

- NAVSEA has worked with all manufacturers to identify the source of color flakes used during qualification, which will be added to the QPL entry.

[Does full flake coverage need to be a new requirement in next update to Standard Item 009-26?](#)

Topside Coating Specification Update MIL-PRF-24635F Includes Optimal Pigment Package

- Published MIL-PRF-24635F topside coating specification on 21 Apr 2020.
Significant improvements in specification include:

- Complete creation of single-pack topside coating requirements.
- Complete defining Haze, Light, Deck, and Ocean Gray colors by specific LAB values (i.e., not SAE-AMS-STD 595).
- Reduce allowable color variation in U.S. Navy gray colors:

	Color deviation values			
	ΔE	ΔL^*	Δa^*	Δb^*
CIELAB values defined in 3.5.12.a	0.5	0.3	0.3	0.3
SAE AMS-STD-595 color card	1.0	0.5	0.5	0.5

- Utilize commercial, ASTM E903/ASTM G173
Total Solar Reflectance (TSR) measurement of Low Solar Absorbance (LSA) performance.
- Requires use of NRL defined, optimal pigment package to maximize long term color retention and ensure uniform color shift for topside coatings from all manufacturers.

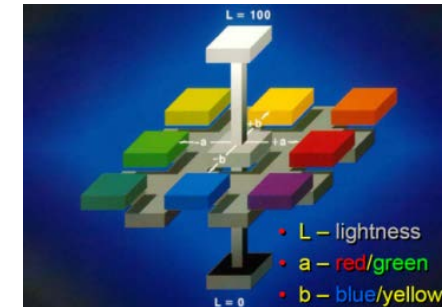


TABLE I. Pigments required for LSA haze gray, LSA deck gray, LSA ocean gray, and LSA light gray.

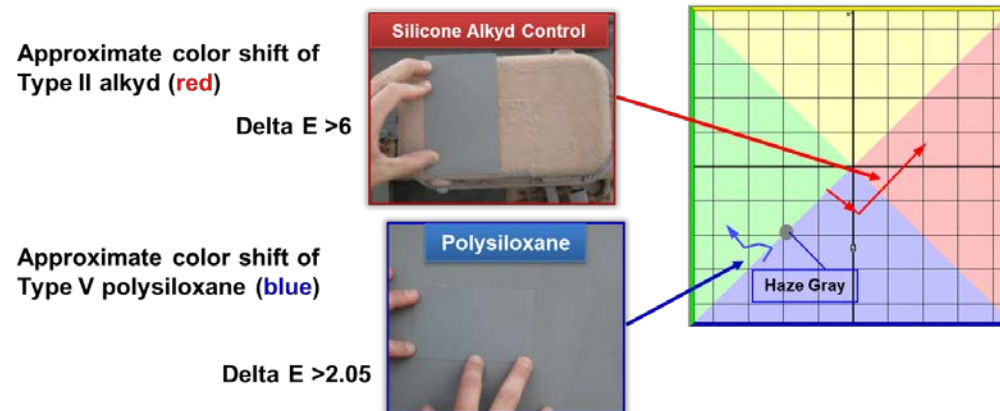
Color	Chemistry	CAS #
White	Rutile titanium dioxide	13463-67-7
Black	Chromium green-black hematite	68909-79-5
Blue	Cobalt chromite green spinel	68187-49-5
Yellow	Nickel antimony titanium yellow rutile	8007-18-9
Yellow	Yellow iron oxide	51274-00-1
Blue	Copper phthalocyanine blue	147-14-8

[Significant update to MIL-PRF-24635 streamlines qualification and improves coating color stability over time.](#)

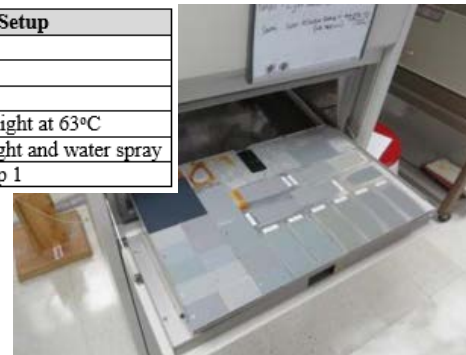
Updated MIL-PRF-24635 Specification Defines Requirements for Specific Pigment Packages

MIL-PRF-24635F defines the specific pigments that must be used to create haze gray, deck gray, ocean gray, and light gray.

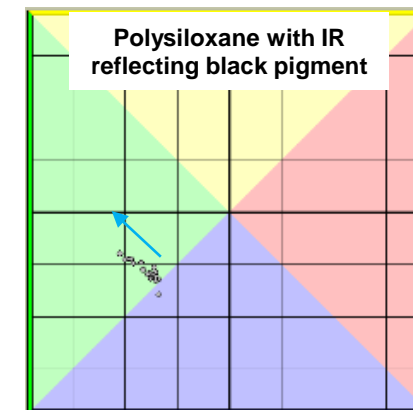
First Generation Polysiloxane LSA (Two Years)



Parmeter	Setup
Duration	2,500 hours
Filter	Day light
Irradiance	0.35 W/m ²
Step 1	102 minutes light at 63°C
Step 2	18 minutes light and water spray
Step 3	Return to Step 1



Polysiloxane With Optimal Pigment Package (Three Years)



- ΔE of 1.08 after 3.2 years
- Gradual shift towards green

[Updated MIL-PRF-24635 requires use of enhanced pigment package to provide consistent, durable color.](#)

Updated MIL-PRF-24635 Specification Defines Requirements for Specific Pigment Packages

MIL-PRF-24635F defines the specific requirements to ensure color match for haze gray, deck gray, ocean gray, and light gray.

3.5.12 Color. The color of the fully cured NAVSEA haze gray, deck gray, ocean gray, and light gray coating s follows:

a. Colors, defined by CIELAB color space, shall match the following:

<u>Color</u>	<u>L*</u>	<u>a*</u>	<u>b*</u>
Haze gray	56.00	-1.83	-1.37
Deck gray	30.28	-1.16	-2.94
Ocean gray	49.53	-1.61	-4.47
Light gray	66.30	-2.09	-0.02

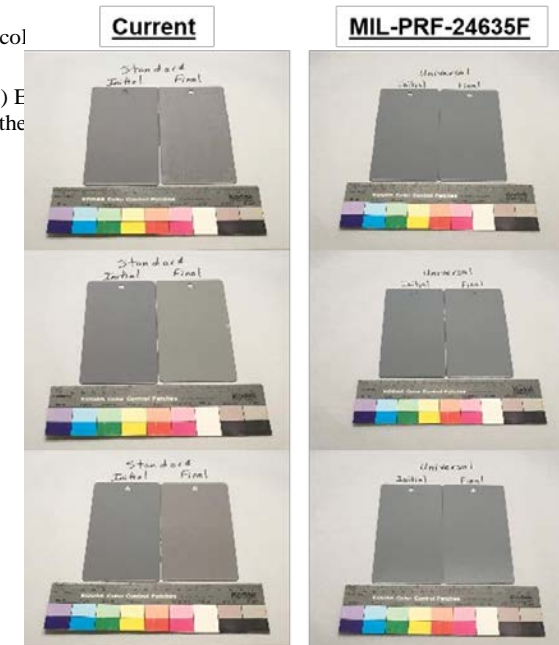
b. All other colors, when used, shall match the SAE-AMS-STD-595 number.

a. Class 3 colors shall be matched to the appropriate SAE-AMS-STD-595 semi-gloss color card if the flat color exist.

3.5.12.1 Color deviation. When tested as specified in 4.5.16.1, the measured color deviation terms, delta (Δ) E from the CIELAB values defined in 3.5.12.a, or specified SAE-AMS-STD-595 color card, shall not greater than the listed below as either positive or negative (+ or -) values:

	<u>Color deviation values</u>			
	ΔE	ΔL	Δa	Δb
CIELAB values defined in 3.5.12.a	0.5	0.3	0.3	0.3
SAE AMS-STD-595 color chip	1.0	0.5	0.5	0.5

- Color requirements enhanced to ensure visual match between haze gray and other colors from:
 - Different vendors.
 - Different batches.



Updated MIL-PRF-24635 requires use of enhanced pigment package to provide consistent, durable color.

Demonstrate Spray Applied Polysiloxane Nonskid and Enhanced Surface Preparation on Aluminum LCS 2 Class Flight Deck

ISSUE: OSR team observe pitting on LCS 2 class flight deck during nonskid removal/replacement.

- Pits up to 2 mm (79 mils) depth.
- Nonskid removal and surface preparation using stainless steel shot could cut into aluminum flight deck.

Need to identify nonskid removal and surface preparation process that does not appreciably wear deck, but prepares surface effectively to support extended nonskid service life.



REQUIREMENTS: FY-19, CH-2, Standard Item 009-32, Table 2, Lines 40 and 41 require application of either MIL-PRF-24667C, Type I or Type V nonskid on flight deck surface preparation in accordance with:

"NEAR WHITE METAL BLAST USING GARNET, ALUMINUM OXIDE, CRUSHED GLASS, WALNUT SHELLS, OR STAINLESS STEEL SHOT - OR - WATERJETTING TO NACE/SSPC-SP WJ-2."

Vacuum [ultra-high pressure waterjetting](#) is contractor's preferred nonskid removal approach, but does not create surface profile. As such, FY-19, CH-2, Standard Item 009-32, paragraph 3.11.6.2 requires that flight deck areas cleaned by waterjet get:

" . . . a minimum of 20 percent of the total area receiving a nonskid system shall be [abrasively blasted](#) to an NACE 2/SSPC-SP 10 level of cleanliness.

Abrasive blasting will correct areas with pitting, but excessive blasting will remove too much aluminum over the 20 year service, potentially compromising the inherently thin aluminum flight deck.

NEW TECHNOLOGY: [Spray applied the MIL-PRF-24667 qualified polysiloxane nonskid over two coats of qualified primer to maximize overall flight deck nonskid system service life.](#)

[Demonstrated removal of nonskid using ultrahigh pressure waterjet operating at <30,000 psi.](#)

[Demonstrated wet abrasive blasting on 100% of flight deck to provide uniform surface profile to maximize primer adhesion and apply two coats of primer to maximize nonskid system corrosion control performance.](#)

[Installed spray applied polysiloxane nonskid over 100% abrasive blasted deck to maximize LCS 2 class flight deck nonskid service life in Oct 2019.](#)

Spray Applied Polysiloxane Nonskid

Coefficient of Friction Can Exceed Requirements for Roller Applied Nonskid Over Time

- Spray applied polysiloxane nonskid Coefficient of Friction (CoF) measured using μ -Deck Meter in as-applied condition and after in-service operational periods on ships. Baseline requirements are for CoF measured using μ -Deck Meter as appear in the MIL-PRF-32577 Thermal Spray Nonskid (TSN) specification.

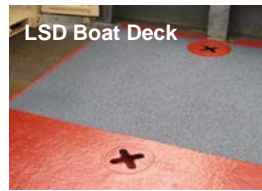


As Applied Flight Deck Nonskid CoF

Spray applied polysiloxane nonskid CoF – 1.37-1.59

Roller applied MIL-PRF-24667, Type I and Type V epoxy nonskid CoF – 1.35-1.45

- In Service CoF of spray applied polysiloxane nonskid measured after shipboard operations.



9 months



CoF – 1.37

CoF – 1.29



26 months



CoF – 1.46 to 1.52

CoF – 1.29 to 1.49

CoF of spray applied polysiloxane nonskid on in-service decks exceeds MIL-PRF-32577 requirements for flight deck TSN.

Additional Specification Updates

- **MIL-PRF-24667 undergoing significant rewrite:**
 - Types based on installation method (i.e., rolled vs. sprayed) and environment (standard vs. extended durability & surface vs. submerged).
 - Removal of Type XI peel and stick nonskid to MIL-PRF-XX642 solid decking specification.
- **MIL-PRF-16173 expansion of class definitions (temporary vs. persistent, hard vs. soft, solvent- vs. steam-removable, etc.).**
- **TT-C-492 update to define types (VOC-based), classes (thermal conductivity), and grade (condensation limit).**
- **TT-P-28J revision out for industry comments on 21 May 2020**
 - Liquid paints no longer limited to aluminum-containing.
 - New class for TSN topcoat.
- **MIL-PRF-32584 found to have significant issues. Interim amendment planned by end of FY-20.**
- **Draft MIL-PRF-XX642 undergoing major revision. Electrical grade mat and sheet to be removed (i.e., SEA 05Z3 cognizance).**

[NSRP SPC team invited to intended to contact SEA 05S to be added to review team for specifications.](#)

Conclusions

- NAVSEA goal is to support USFF N43 Flight Deck Readiness working group by improving nonskid materials and processes.
- NAVSEA expanding applications for TSN and working to transition to standard, waterfront process.
- NAVSEA published FY-21 updates to Standard Item 009-32.
- NAVSEA published FY-21 updates to Standard Item 009-124 TSN application specification that includes new TSN repair procedures.
- NAVSEA to demonstrate new coatings and processes on aluminum flight deck.
- NAVSEA goal to work with NSRP and waterfront community to address evolving regulatory issues.



QUESTIONS?

Regulatory Issue

Oxsol 100 Defined as Carcinogen in California

ISSUE: Oxsol 100 or parachlorobenzyltrifluoride (PCBTF), an exempt solvent used in Navy coatings, was listed under California Proposition 65 as a carcinogen based on a 2018 study from the National Toxicological Program.

South Coast Air Quality Management District, (SCAQMD) proposing to eliminate exempt solvent status.

NAVSEA SPECIFICATIONS

THAT MAY BE AFFECTED: Performance Specifications like MIL-PRF-24635.

Interior Alkyd Specifications like MIL-DTL-24607.

TABLE I. Color name and FED-STD-595 color number.

Ingredients ^{1/} (pounds)	Soft white 27880	Bulkhead gray 26307	Rosewood 22519	Pastel green 24585
Chlorinated alkyd resin ^{2/}	468.71	465.31	468.70	473.80
Titanium dioxide ^{3/}	214.82	211.38	212.91	215.23
Magnesium silicate ^{4/}	74.94	73.85	74.38	75.19
Aluminum trihydrate ^{5/}	195.94	194.52	195.94	198.07
Calcium borosilicate ^{6/}	98.44	97.72	98.43	99.50
Calcium metaborate ^{7/}	95.59	94.90	95.59	96.63
PCBTF ^{8/}	147.83	146.76	147.83	149.44
Paint thinner ^{9/}	35.55	35.30	35.55	35.94
Thixatrop ^{10/}	13.87	13.76	13.86	14.01
Dispersant ^{11/}	3.92	3.89	3.91	3.96
Wetting agent ^{12/}	3.07	3.04	3.07	3.10
Anti-skinning agent ^{13/}	2.91	2.88	2.91	2.94
Cobalt drier ^{14/}	0.92	0.91	0.92	0.93
Zirconium drier ^{15/}	0.91	0.90	0.91	0.92
Yellow oxide paste ^{16/}	---	22.76	20.30	3.54
Lamp black paste ^{17/}	---	8.40	0.39	---
Red oxide paste ^{18/}	---	---	4.62	0.58
Phthalo green paste ^{19/}	---	---	---	1.44
Organic yellow paste ^{20/}	---	---	---	1.77
Phthalo blue paste ^{21/}	---	---	---	0.26
Totals	1357.40	1376.28	1380.22	1377.24

TABLE I. Color name and FED-STD-595 color number - Continued.

NOTES:	
1/	Formulas make approximately 100 gallons of paint.
2/	Becksol 91169-00, Reichold, Inc., Research Triangle Park, NC
3/	ASTM D476, Types I or II
4/	Onyacarb 3, OMYA Inc., Proctor, VT
5/	Aluminum trihydrate, SB-632, J.M. Huber, Edison, NJ
6/	CW-2230, Halox Pigments, Hammond, IN
7/	Calcium metaborate, BuLabFlame Block BL-381 Buckman Laboratories, Memphis, TN
8/	Oxsol 100®, Occidental Chemicals Corp., Dallas, TX (Oxsol 100(r) was used for this formulation)
There are chemically identical alternatives available from other manufacturers.)	
9/	Aromatic Naphtha, Ashland Chemicals, Columbus, OH
10/	Thixatrol SR, Elementis, Hightstown, NJ
11/	Spurso, OMG Americas, Cleveland, OH
12/	Anti-Terra 204, Byk-Chemie USA, Wallingford, CT
13/	Skinol #2, OMG Americas, Cleveland, OH
14/	Cobalt Neodecanonate(12%), OMG Americas, Cleveland, OH
15/	Zirconium Neodecanonate(18%), OMG Americas, Cleveland, OH
16/	5750V, UCD, Division of Rohm & Haas, Lansing, IL
17/	1625V, UCD, Division of Rohm & Haas, Lansing, IL
18/	6080V, UCD, Division of Rohm & Haas, Lansing, IL
19/	5150V, UCD, Division of Rohm & Haas, Lansing, IL
20/	5696V, UCD, Division of Rohm & Haas, Lansing, IL
21/	4800V, UCD, Division of Rohm & Haas, Lansing, IL
22/	7949V, UCD, Division of Rohm & Haas, Lansing, IL
23/	6012V, UCD, Division of Rohm & Haas, Lansing, IL



PCBTF

NRL to be tasked in FY-20 to determine scope of PCBTF use in all NAVSEA qualified and first article specification coatings.

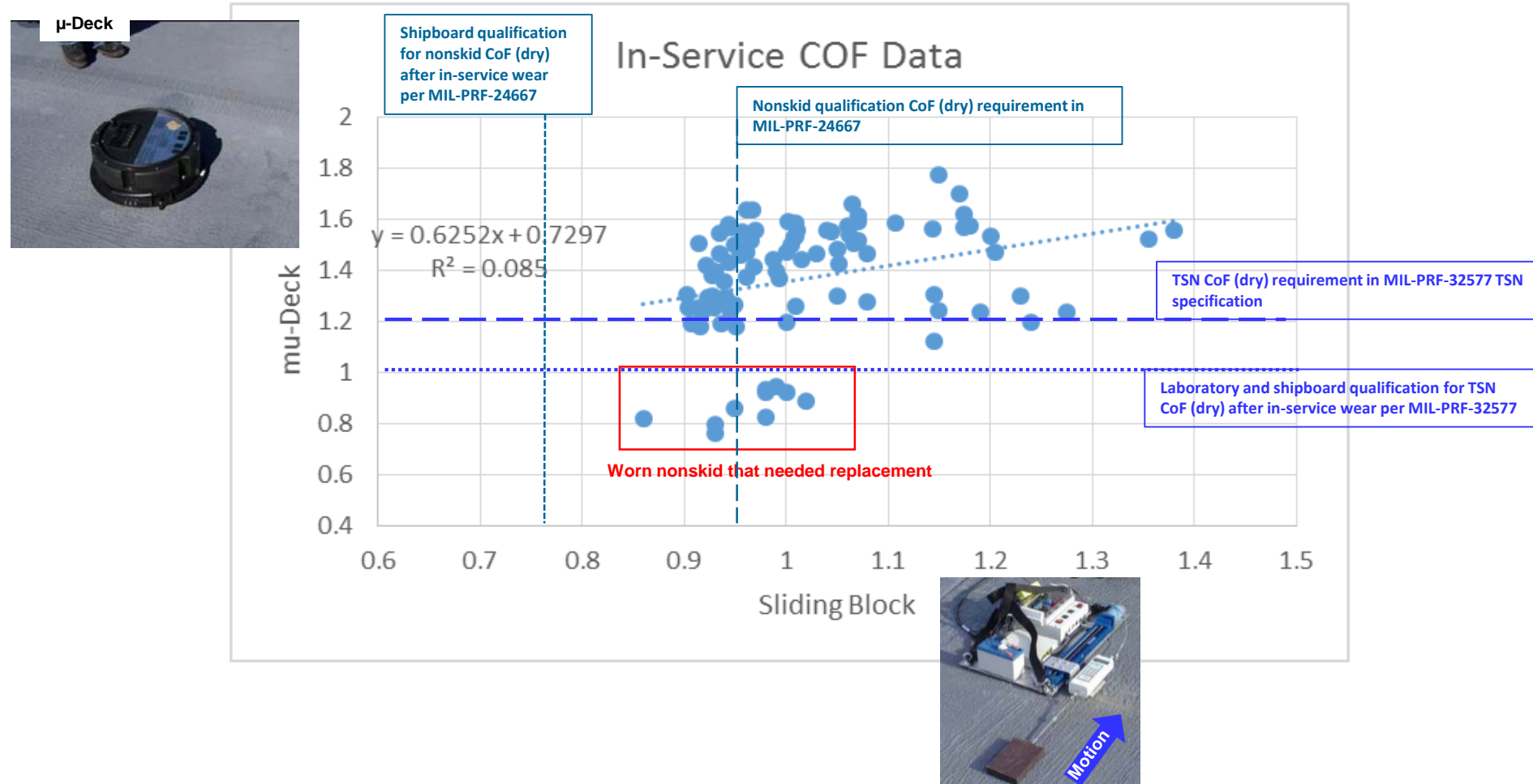
[De-listing of PCBTF as an exempt solvent in California could adversely affect ability of U.S. Navy to coat ships in San Diego, CA.](#)

Proposed MIL-PRF-24667D Specification Update Task

MIL-PRF-32577 Already Requires Improved CoF Measurement Methodology

PLAN: Validate that spray applied, polysiloxane nonskids satisfies by Coefficient of Friction (CoF) requirements in MIL-PRF-32577 and updated MIL-PRF-24667.

BACKGROUND: NAVSEA tracked CoF using μ -Deck Meter and sliding block.
Data collected from general use, roller-applied, MIL-PRF-24667 nonskid in dry conditions.
 μ -Deck Meter data more consistent and useful.



μ -Deck discriminates between acceptable and unacceptable CoF more clearly than sliding block.