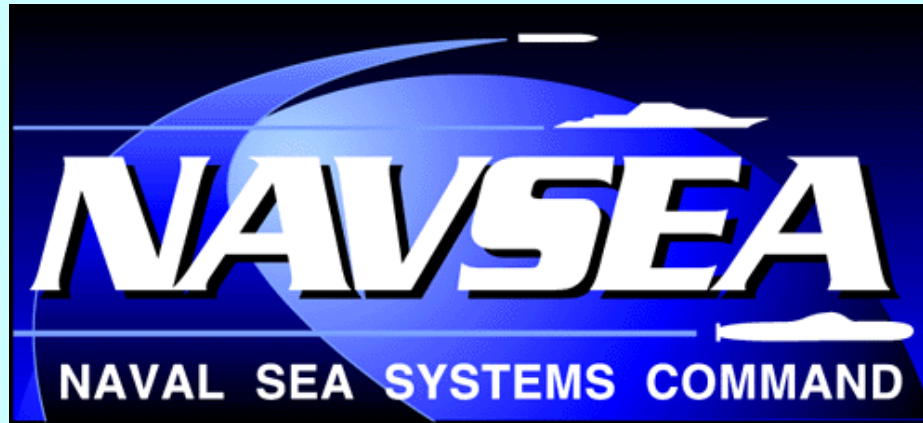


NAVAL SEA SYSTEMS COMMAND

COATINGS & CORROSION CONTROL STATUS UPDATE



NATIONAL SHIPBUILDING RESEARCH PROGRAM

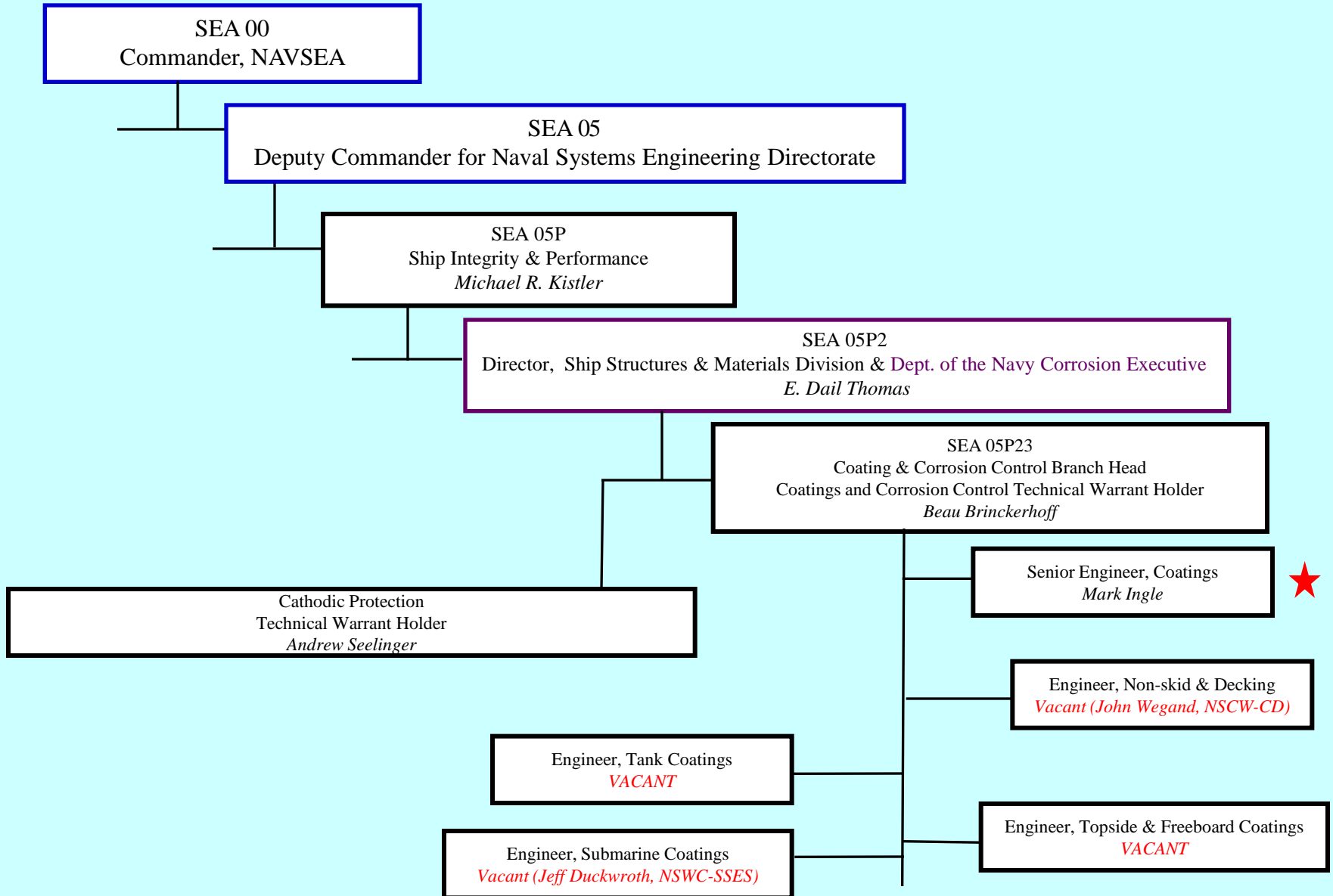
March 2009

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OBJECTIVES

- Summarize NAVSEA personnel changes.
- Summarize NAVSEA Progress toward reducing coating application costs:
 - Standard Item 009-32 as a Universal Paints Requirements Document.
 - Cumbersome Work Practices tasks:
 - Delete Stripe Coat.
 - Rapid Cure, Single Coat.
 - Allow “Moderate” Level of Flash Rust
 - Induction Heating Coating Removal.
 - Paperless QA & QA Tools.
- Summarize NAVSEA documentation improvements and updates:
 - Paint Task Force.
 - Specification Update (Paint Conformance Testing).
- Discuss potential future interface with NRSP Research Projects:
 - Retention of high-solids coatings in tanks.

NAVSEA Corrosion Control & Coatings Organization



Universal Paints Requirement Document

- **Navy currently applies coatings to ships in accordance with:**
 - **NSTM 631 – Submarines & carrier maintenance painting & ship's force painting.**
 - **Standard Item 009-32 – Maintenance work on ships.**
 - **Submarine Maintenance Manual (SMS), 631-081-015 – Maintenance work on subs.**
 - **New construction & RCOH contracts – new construction work.**
- **Reducing training, planning, and implementation costs associated with use of multiple documents.**

Accomplishments:

- **Change 1 to FY-10 Standard Item 009-32 issued on 9 March 2009 including single-coat paint issues:**
 - Use of single-coat paints is only option presented for ballast tanks and voids. Application of solvent bearing or multi-coat paints in ballast tank/void would require DFS.
 - Includes options for single-coat in fuel tanks.
 - Single-coat can support 20-year docking cycle using 50% RH and violet-light inspection of optically active pigment inherent in all single-coat paints.
- **High-solids MIL-PRF-23236, Type VII, three-coat (or two coat with the stripe coat coat being deleted) systems approved for potable-water service on carriers.**
- **NSTM 631 update complete, final released on 1 Nov. 2008. Document includes references to Standard Item 009-32 for painting requirements.**
- **SEA 05U7T planning to update Submarine Maintenance Manual by April 2009 to reflect that Standard Item 009-32 is the “universal paint requirements document.”**

Single Coat Preservation System

Portsmouth Naval Shipyard / SEA 05P23

Problem:

Ultra-high-solids coatings require three coats (i.e., primer, stripe coat, and top coat) = Excessive Labor.

Legacy coatings require 24-hours between coats and seven days before service, for total process time of >14 days.



Solution:

Single-coat system based on application of a single color of paint, during a single coating evolution in the tank, with multiple passes of the paint gun.

Cure time only one to three hours before touchup and one day before service for total, nominal process time of two days.

Accomplishments:

- Installed in nine submarine tanks on two boats in May 2008 with corrosion sensors in two tanks. NSWC-CD report indicates:
 1. Two painters assigned to each gun to keep up production.
 2. Fingering and new tips required in first 20 minutes of work.
 3. Lines needed cleaning frequently.
 4. 70% of tank area could be sprayed, remainder needed touch-up.
 5. Cartridges had problems with tube leakage and tip hardening.
 6. Brushing out of 1/8th full, 1-gallon bucket preferred.
 7. Edge and flat DFT readings met 20-30 mil thickness requirement.



CWP reports savings of up to 20% possible for CVN (\$433K) availability.

Contactors report savings of 26% possible.

Paint material cost premium of 30% is issue.

Risk of implementing single-coat is low.

Delete Stripe Coat

Puget Sound Naval Shipyard / SEA 05P23

Problem:

Legacy coatings retain 30% thickness on edges, stripe coat required to establish minimum required coating thickness.

UHS coatings retain about 70% thickness on edges, may be able to delete stripe coat; replace stripe coat process with OQE on paint application.

Solution:

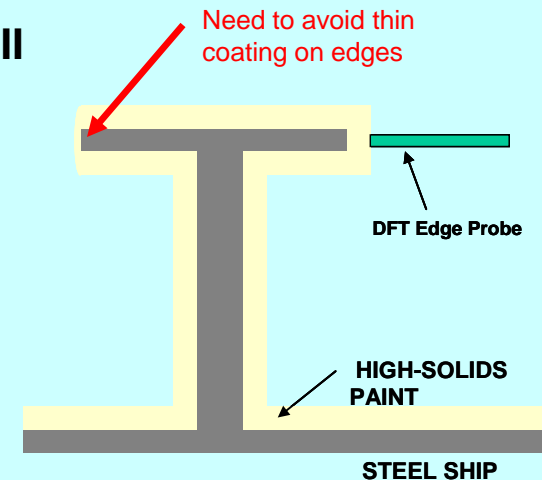
Eliminate the stripe-coat requirement for UHS, with seawater applications initially, then all UHS systems.

Add additional OQE checks of flat areas in close proximity to edges to ensure minimum coating thickness obtained.



Accomplishments:

- Delete-stripe-coat applicable to MIL-PRF-23236, Type VII coating approved in Change 1 to FY-10 Standard Item 009-32 for carrier potable-water tanks.
- Savings 10-20% of overall job time & cost. Estimated savings of \$344K on CVN docking.
- Process saving time on CVN-65 overhaul.



Induction Heating Coating Removal

Portsmouth Naval Shipyard / SEA 05P23

Problem:

Current methods of coatings removal require media (e.g., mineral grit, shot, water, etc.), or cumbersome hand tools.

Solution:

Use of the Induction Heating (IH) Coatings Removal System; coating stripped from heated substrate.

Accomplishments:

- NAVSEA Itr Ser 5000 - 07T/0226 dtd 3 July 07 provided interim approval to PNSY, with conditional requirements addressing substrates, controls, etc.
- Uniform Industrial Process Instruction (UIPI) 1905-115 signed on 31 July 2008.
- Each Naval shipyard has at least one induction heat unit. Qualification in process at all yards.
- Units to be used to remove rubber in battery boxes on submarine in April 2009.



PSNY projects, potential cost reduction:

Submarine - \$93K / availability.

Carrier - \$57K / availability.

Surface Condition Measurement Tools

Puget Sound Naval Shipyard / SEA 05P23

Problem:

Existing surface measurement technology is expensive, labor intensive, and has poor repeatability.

Solution:

Identify and qualify improved surface inspection tools. Verify these tools are compatible with the Paperless QA Initiative.

Dry Film Thickness (DFT) meter.

Surface Profile meter.

Soluble Salt/Conductivity meter.



Accomplishments:

- Paperless QA policy statement signed jointly by SEA05P23 and USFFC.
- POA&M for paperless QA being developed by contractor/NSTC/USFFC/SEA05 and will be finalized on 25 March 2009.
- POA&M defines CQATK initiative completion as development of the procedures and the training package; and demonstration of tool usage, data collection, and data transfer by a single shipyard.
- Working with all concerned to overcome two barriers for transfer of data from tools to Paperless QA including NMCI security constraints. :
 - DADMS approval received by Echelon II, awaiting Echelon I approval (first step for software to NMCI). EDS testing not yet started (4 to 8 month test period).
- Developing detailed process maps of data transfer process to determine codification and training requirements: establish working group (shipyards, RMC's, Commercial yards) at NACE in March 2009.
- Obtain listing in Navy's Metrology Requirements (NAVSEAINST 4734.1B) for Calibration (2 of 3 tools complete).



Cumbersome Work Practices

Surface Condition Measurement Tools

QA Tools Distro List	PSNS	PNS	NNS	PHNS	Totals
QA Inspection Tool	Qty	Qty	Qty	Qty	Qty
Elcometer 224 Model T	4	8	4	4	20
RPCT Soluble Salt Meter RPCT-07-001	3	3	3	3	12
Elcometer 456 (DFT)	4	0	4	4	12
Totals	11	11	11	11	44



SURFACE PROFILE

Elcometer 224 Model T or
ElectroPhysicTR200

Both have resolution to 0.1 mil

Elcometer has memory and
USB, while ElectroPhysic just
has USB.



SALT METER

Rich Parks, soluble salt meter
RPCT-07-001 or

Elcometer 130 SCM400 Salt
Contamination Meter

Both have 0.1 uS/cm resolution

RPCT has memory, USB and
data transfer



DRY FILM THICKNESS

Elcometer 456, QNIX 8500
Premium, PosiTector 6000
MemoryF90S3, or Oxford
Instruments CMI233-RSMP1

All have 0.1 mil resolution

All have memory, USB and data
transfer

Coating Specification Conformance Testing

SEA 05P23 / NAVSEA / Shipbuilders / Shipyards

- SEA 05P23 alerted to paint specification conformance testing not being conducted by paint vendor or shipbuilder or shipyard – too many tests, duplicative approaches, too time consuming.
- SEA 05P23 interim solution to use procedure analogous to *40 CFR 63 NESHAP* for signed certification.
 - Vendors certify paints meet requirements even without tests and signature on form legally commits company to conformance.
 - Policy renewed in Naval Message 180518Z AUG 08.
- Shipyard-lead LEAN event funded and initiated. SEA 05P23 conducted baseline brief on 28 Aug. 2008. Final documents submitted 29 Jan. 2009.

Inconsistent requirements across specifications.

- Unique tests in non-skid, high-heat, powder, etc.
- Specifications for simple alkyds can have up to 19 conformance tests.
- Specifications include duplicative tests (e.g., brush, spray, and roll, or % volatiles, % solids, % water, and VOC).

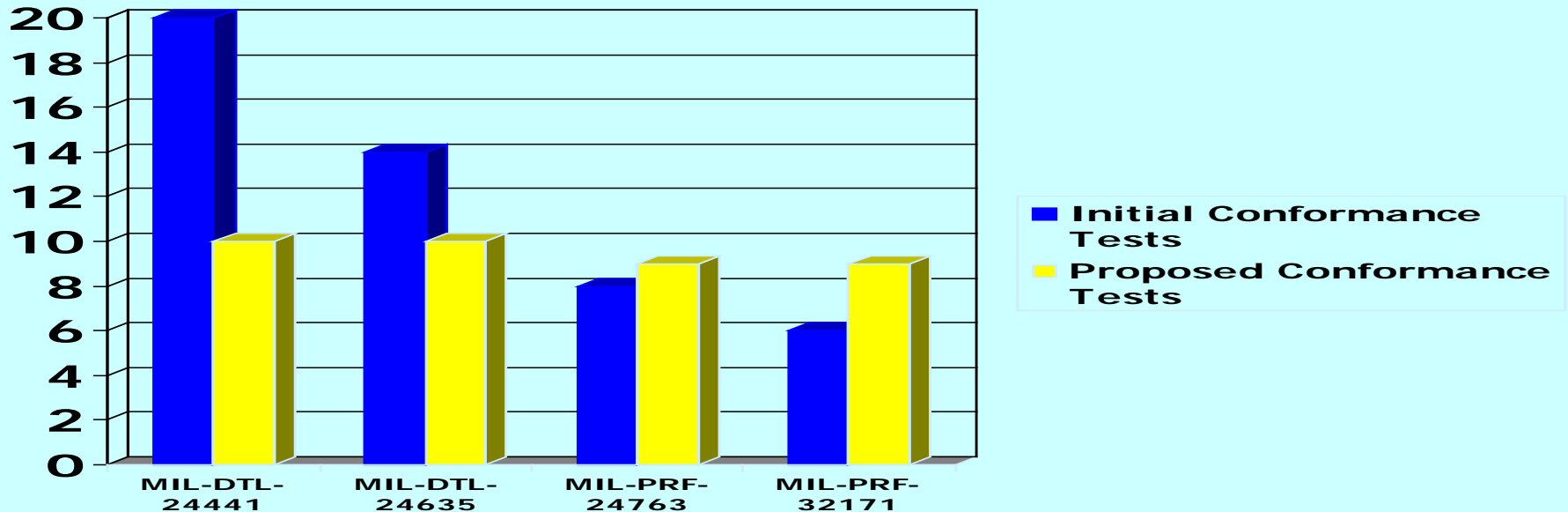
Plan to reduce conformance tests to:

Viscosity	Weight/gallon	Fineness of Grind
Flash Point (receipt)	Sag resistance	Color
Dry Time	Gloss	

Coating Specification Conformance Testing

SEA 05P23 / NAVSEA / Shipbuilders / Shipyards

- SEA 05P23 prepared first four set of specifications to include reduced conformance testing and submitted to Specification Improvement Board for public comment on 29 January 2009.
 - MIL-DTL-24441, epoxy primer, including 17 slant sheets.
 - MIL-PRF-24635, topside, silicone alkyd and polysiloxane.
 - MIL-PRF-24763, topside, acrylic.
 - MIL-PRF-32171, interior, wear resistant coating (including modification to asbestos limit from 5% to 0.5%).



NSRP SP-3 Project to Reduce Costs by Allowing Retention of Flash Rust

NAVSEA Approach:

1. Industry to provide estimated cost savings for underwater-hull coating with Moderate instead of Light level of flash rust.
2. SEA05P23 to modify Standard Item 009-32 to allow underwater-hull coating over “Moderate” level of flash rust. Timing dependent on tool/process development.
 - Tool/process to be rapid, reproducible, implementable in shipyard.
 - Likely candidates based on tape, used in conjunction with a “tint” measuring device already used by police to ticket cars for dark windows.
3. Industry & SUPSHIP to implement Moderate level of flash rust:
 - Use established SSPC, SP-12 Criteria to adjudicate flash-rust level.
 - Require surfaces to satisfy established 30 mScm conductivity requirements.
 - When rust level debated with contractor/yard, use SEA 05P23 tool to adjudicate Heavy to Moderate determination.
4. Process/Tool to be submitted to SSPC for incorporation into SSPC, SP-12.



NAVSEA 05P23 Concept for New Start Retention of High-solids Paint, NSRP SP-3 Task

- **New start, CWP task initiated by PSNS. Goal would be to reduce the time & money required to blast off intact, adherent high-solids coatings during repair.**

SEA 05P23 concept is as follows:

- 1. SP-1 entire tank, use water or steam to reduce chlorides as much as possible even from fissures or cracks in paint.**
- 2. Obtain SSPC, SP-10 on all bare areas of the tank. Areas of tight, adherent paint surrounding bare steel shall be retained.**
- 3. Residual, tight, adherent paint shall have a uniform color (e.g., no staining or residual oil, dirt, or rust); shall have no lifting, pulling or delamination visible with the unaided eye at edges; and shall have a minimum profile of 2-mils (note: there shall be no maximum profile on retained paint). Within a given PA-2 measurement area, profile on bare steel and profile on retained paint shall be evaluated as separate data sets.**
- 4. Coating shall be applied to bare steel areas in a stripe coat mode to overlap existing paint a < full, specified coating thickness.**
- 5. The final or second pass of the paint gun shall apply coatings to the entire tank and should not exceed 50-mils even over areas of retained paint.**
- 6. All standard QA/QC procedures & 50% RH shall be used in the tank and UV-light shall be used to inspect the coating for holidays and defects.**
- 7. The final tank shall be considered a 10-12 year tank coating for purposes of planning and re-inspection.**



NAVSEA 05P23 Concept for New Start Preconstruction Primer Retention

Problem:

- 009-32 and the NVR require PCP be removed from critical coated surfaces prior to applying coating system.

Solution:

- Allow PCP to be retained on surfaces with appropriate QA/QC checks and Paint manufacturers approval as per commercial process around the world.
- NAVSEA suggests producing panels that fail due to improperly prepared preconstruction prime and work back to a "go, no-go" test for surface cleanliness and profile.
 1. Require >2 mils of profile and SP-10 surface cleanliness, and <85% RH during surface preparation and PCP application.
 2. Clean up installed plate using either blasting or pressure wash.
 3. Water-break/water-quality test of substrate quality.

Accomplishments:

- Completed a DFS test on USS VICKSBURG (CG-69). PCP was over coated with UHS tank lining.
- Plan to inspect performance in FY-09.



NAVSEA 05P23 Concept for New Start Relax Relative Humidity Requirements

Problem:

- Standard 009-32 requires the contractor to maintain the relative humidity in a tank or void space at a maximum of 50% from the start of surface preparation to cure of the topcoat.

Solution:

- Relax relative humidity requirement to 85% unless the manufacturer's recommendation is more restrictive.
- Paint manufacturers' product data sheets typically require that relative humidity be no greater than 85%.
- The IMO PSPC requirement is to maintain relative humidity below 85%.

Accomplishments:

1. FY-10 Standard Item 009-32 clarified to show that low, 50% relative humidity for 15 – 20 year service life – 85% for 10 – 12 year service life.
2. Select coating options based on work planner needs.
3. Need data on savings, how often is 85% achieved with no control, while 50% requires control? Working group established with NSRP to evaluate this issue.

Key issue is the ability to predict long-term performance.



Conclusions

- **NAVSEA goal is to reduce coating application costs from new ship acquisition through to ship disposal.**
- **NAVSEA making progress toward:**
 - **Making Standard Item 009-32 the Universal Paints Requirements Document.**
 - **Implementing findings of Cumbersome Work Practices tasks:**
 - **Delete Stripe Coat.**
 - **Rapid Cure, Single Coat.**
 - **Induction Heating Coating Removal.**
 - **Paperless QA & QA Tools.**
- **NAVSEA progressing with improvements in documentation:**
 - **Paint Task Force.**
 - **Specification Update (Paint Conformance Testing).**
- **NAVSEA would encourage NRSP SP-3 research projects evaluating:**
 - **Retention of Flash Rust.**
 - **Retention of Preconstruction Primer.**



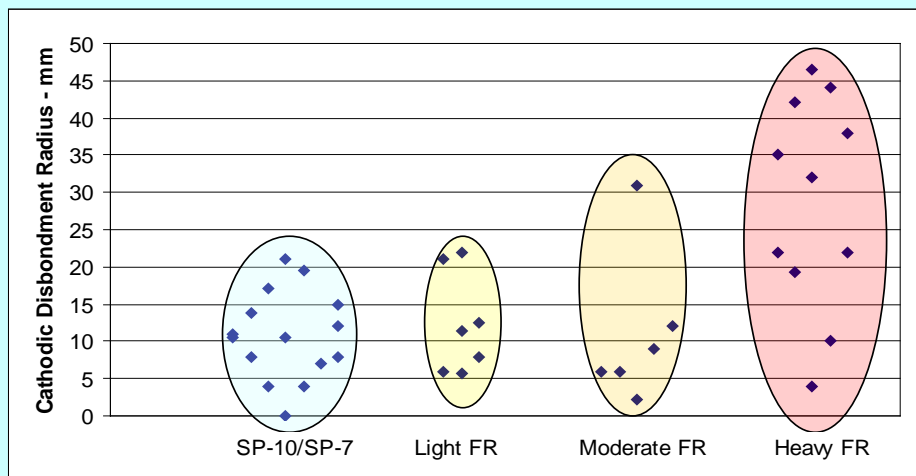
Backup slides

NAVSEA 05P23 Concept for New Start

NSRP SP-3 Project to Reduce Costs by Allowing Retention of Flash Rust

Project Findings to Date:

- There is little (known) risk associated with painting over “Moderate” flash rust
 - Elzly, Ocean City Research, paint company test data supports conclusion.
 - NSRP field data supports this conclusion.
 - Day to day painting in commercial yards support conclusion.
- Painting over Heavy flash rust will not result in catastrophic failure of underwater hull paint in near term,
 - Laboratory testing of cathodic disbondment is only consistent discriminator.
 - Anecdotal observations from ships in service and paint company support accepting the Moderate level of flash rust.



NAVSEA 05P23 Concept for New Start

NSRP SP-3 Project to Reduce Costs by Allowing Retention of Flash Rust

	Initial Condition	Initial Prep.	Flash Rust Development	Remediate	Rationale
1	Old steel with paint intact or new, blasted steel with light “yard rust”	Waterjet and blow down	Store inside for as short of a duration as possible	None*	Create a condition which is <i>definitely light flash rust</i> . Although prepared with hand lance equipment, the condition is intended to simulate the condition achieved with vacuum equipment.
2		Waterjet clean	Store in “tented” environment to retain humidity, operate pressure washer or UHPWJ equipment to create humidity and cross-contamination.	None*	Intended to create a <i>Moderate to Heavy flash rust</i> which might result from cross-contamination by ongoing adjacent waterjetting operations.
3		Waterjet clean		Pressure Wash	The above <i>Moderate to Heavy flash rust</i> , remediated prior to painting.
4		Waterjet clean	Store outside for 3 weeks	None*	Create a <i>Moderate to Heavy flash rust</i> under conditions which represent the longest time which waterjetted steel might conceivably be exposed.
5	Old, pitted steel or new steel which has been exposed in a seawater tidal zone	Waterjet clean	Same as 2 and 3.	None*	Investigate the <i>impact of previously rusted steel</i> on the development of flash rust and subsequent evaluation and performance. <i>Moderate to Heavy flash rust is expected.</i>