NAVAL SEA SYSTEMS COMMAND

COATINGS & CORROSION CONTROL TECHNICAL AUTHORITY UPDATE

NATIONAL SHIPBUILDING RESEARCH PROGRAM

Sept. 2008

Mr. Mark Ingle, P.E.

(202) 781-3665

Inglemw@navsea.navy.mil

OBJECTIVES

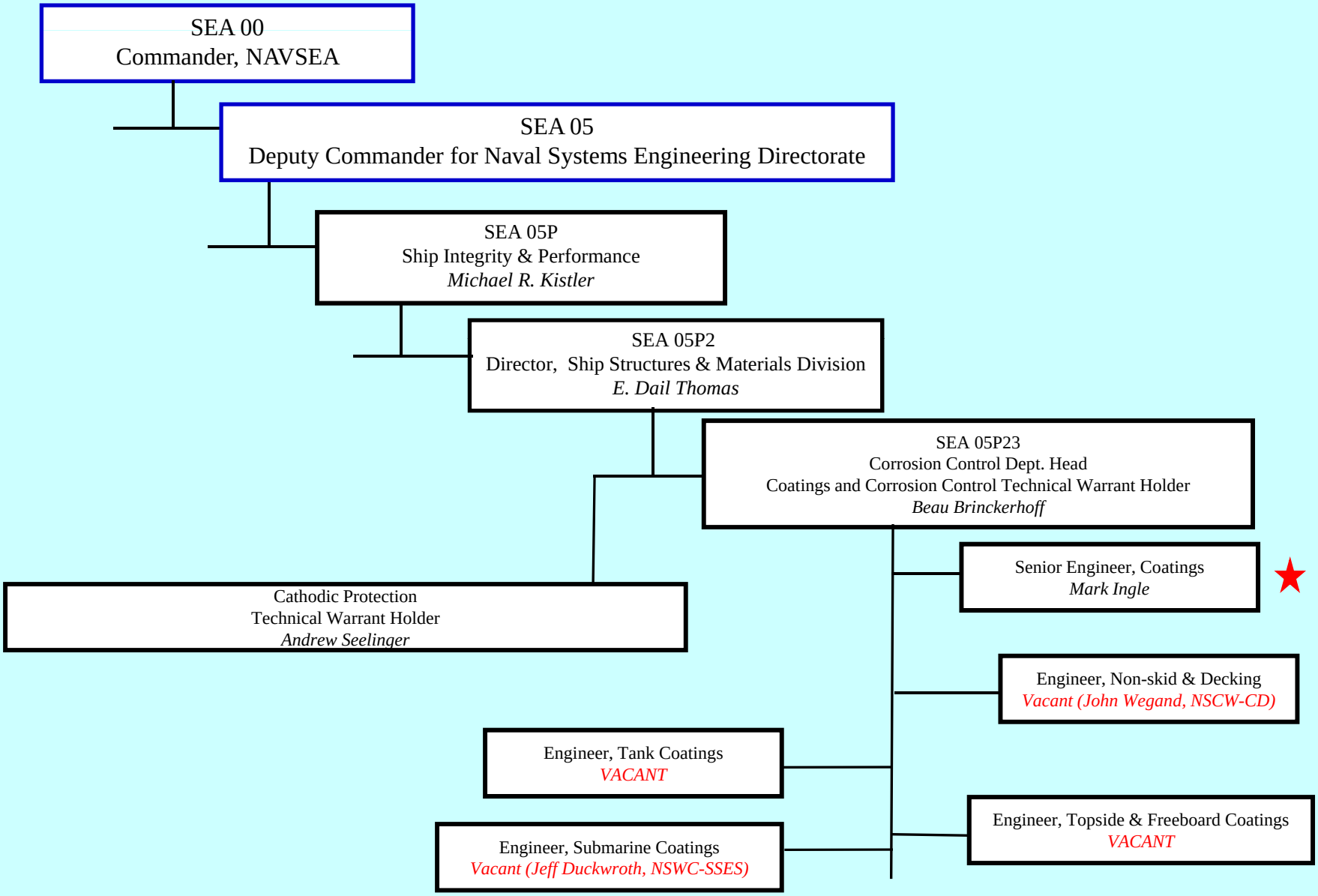
- Summarize NAVSEA personnel changes.

- 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 Preconstruction Primer.

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 contract, RCOH contract, other contracts.**

- **Reducing training, planning, and implementation costs associated with use of multiple documents.**

<u>Accomplishments:</u>

1. **Change 1 to FY-08 and FY-09 Standard Item 009-32 issued on 1 April 2008 including requirements for submarine painting.**

2. **ADM McCoy signed letter, Ser. 05P23/109 authorizing use of Standard Item 009-32 as the universal paints requirements document on 3 July 2008.**

3. **FY-10 Standard Item 009-32, with SEA 08 comments signed 26 Sept. 2008.**

4. **NSTM 631 update complete, final release by 15 Oct. 2008.**

5. **SEA 05U7T writing "Vision" letter describing Standard Item 009-32 and SMS interface and procedures. SMS update to follow.**

6. **SEA 05P letter, Ser. 05P/294, 11 Sept. 2008 "authorizing" single-coat paint for use on all seawater & void applications on new construction and in-service ships.**

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.

Time savings from 3 to 18 days per job.

<u>Accomplishments:</u>

- **Single coat system applied to USS CARTER HALL (LSD-50) in Sept. 2006, inspected in Dec. 2007 – good performance.**
- **Installed in nine submarine tanks on two boats in May 2008 with corrosion sensors in two tanks**
- **QA process developed, demonstrated, and added to FY-10, Standard Item 009-32.**
- **NSWC-CD developed and will implement performance inspection plan in May 2009.**

Use inspection results to estimate 12 or 20 year service life.

June 2008 - Issue Change 2 to FY-09 & Change 1 to FY-10 Standard Item 009-32 to "require" single coat.

July 2008 - Tell community that single coat is required in FY-11 Standard Item 009-32.

Sept. 2008 - Confirm to SEA 00 that single coat is required for all seawater tanks/voids.

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.

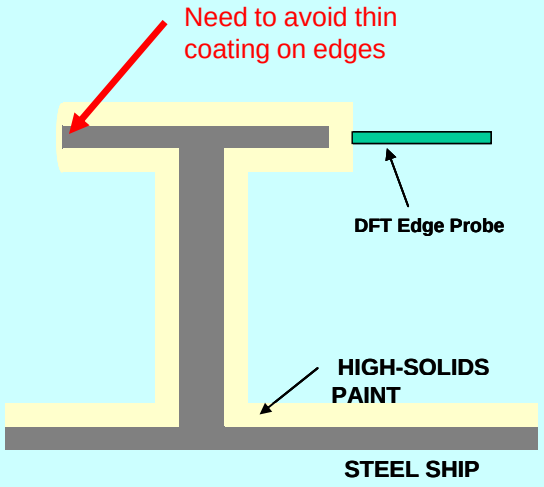
Solution:

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 system applied to two submarine tanks. QA process developed and demonstrated.**
- **Savings 10-20% of overall job time & cost. Estimated savings of $344K on CVN docking.**
- **PPIs for delete stripe coat included in CVN-71 RCOH.**
- **FY-10 Standard Item 009-32 includes process option.**
- **Process proposed to save 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 ltr Ser 5000 - 07T/0226 dtd 3 July 07 provided interim approval to PNSY, with conditional requirements addressing substrates, controls, etc.
- CNO visit to Portsmouth NSY on 8 January 2008.
- Uniform Industrial Process Instruction (UIPI) 1905-115 signed on 31 July 2008.
- New units at, or being procured, for shipyards.

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:

- PSNS & IMF completed side-by-side testing of Surface Profilometer and Soluble Salt Meters last week of July. Report issued and complete Sept 2008.
- Contracts awarded for procurement of starter kits for four Naval Shipyards. Delivery to PSNS & IMF expected in September 2008 with delivery to the other three yards to follow.
- Meeting with FFC at August 2008 Megarust to expressed community interest in automated data download and analysis of paperless QA data from measurement tools.

PSNS estimated, potential cost reduction:

- Submarines - $0K / until paperless approved.
- Carriers - $22K / availability

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. Paint vendors briefed on 17 – 25 Sept. 2008. Group found:**
  - **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).**

<u>Plan to reduce conformance tests to:</u>

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

NAVSEA 05P23 Concept for New Start

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

Problem:

- Surfaces cleaned with hand-lance waterjet equipment tend to develop *Moderate* flash rust which must be removed using a secondary surface preparation (increasing cost).
- Allowing paint application over moderate flash rust will result in cost savings provided risk of premature coating failure is mitigated.

Solution:

- Allow contractors to paint over moderate flash rust on hand-lance-prepared areas.
- Risk of painting over moderate flash rust has been shown to be low by numerous research projects and commercial practice.
- Need to develop tool to determine when surface has high level of flash rust instead of acceptable moderate level.

Accomplishments:

- NSRP completed 2007 project showing Moderate is acceptable.
- NAVSEA and NSRP working to develop tool to determine when flash rust is excessive.
- SEA 05P23 obtained FY-08 and has requested FY-09 funding to develop process / tool.
- NSWC-CD/Contractor developing go, no-go tool.

NAVSEA 05P23 Concept for New Start

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, wipe, or color/characteristics rust. Button pull test, electrochemical, scraping not viable.
   - Plan to demonstrate concept in 2nd or 3rd Quarter FY-09 – candidates?

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.
   - Track savings (i.e., reduced rework, less overall time, reduced staffing, etc.).
   - Use SEA 05P23 tool to adjudicate Heavy to Moderate determination.

4. Process/Tool to be submitted to SSPC for incorporation into SSPC SP-12.

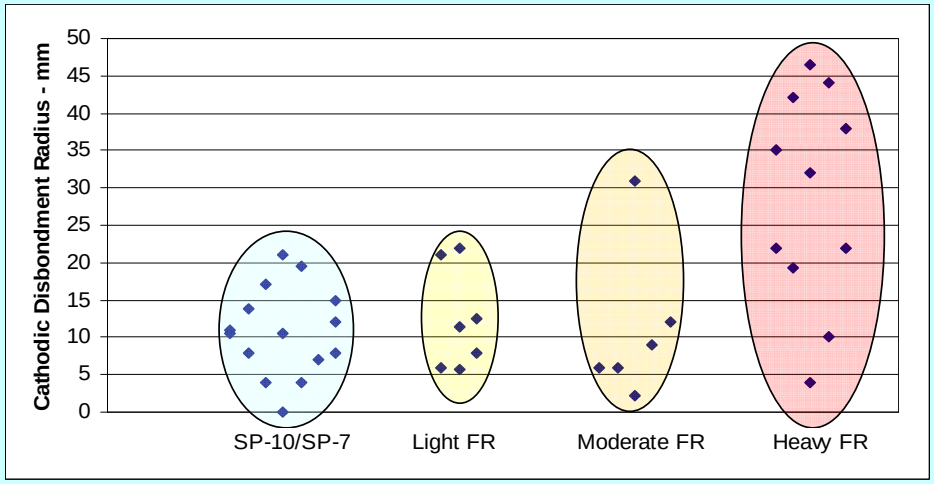
NAVSEA 05P23 Concept for New Start

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 *definitely light flash rust*. 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 *Moderate to Heavy flash rust* which might result from cross-contamination by ongoing adjacent waterjetting operations.
3		Waterjet clean		Pressure Wash	The above *Moderate to Heavy flash rust*, remediated prior to painting.
4		Waterjet clean	Store outside for 3 weeks	None*	Create a *Moderate to Heavy flash rust* 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 *impact of previously rusted steel* on the development of flash rust and subsequent evaluation and performance. *Moderate to Heavy flash rust is expected.*

NAVSEA 05P23 Concept for New Start Preconstruction Primer Retention, NSRP SP-3 Task

Follow-on Tasks to "Improved Rules for Painting U.S. Navy Ships During New Construction and Repair."

- **Follow-on tasks derived from recommendations in Dec. 2007 NSRP report. Plan also leverages paint industry "best practices" and experience.**

- **Develop objective quality evidence to allow retention of zinc-silicate preconstruction primer in critical-coated areas (e.g., underwater-hull, non-skid, tanks). Goal would be SSPC SP-XXX standard for secondary surface preparation of preconstruction primer. Key Issues:**
  - **Unique, long-duration exposure of pre-construction primer on Navy ships.**
  - **Quality of surface profile in blast-house.**

- **Produce panels that fail due to improperly prepared preconstruction primer and work back to a "go, no-go" test for surface cleanliness and profile.**

  <u>Ideas or Approach</u>:

  1. **Modify SSPC SP-10 to allow additional, residual zinc silicate in profile, but require >2 mils of profile after secondary surface preparation.**
  2. **Rapid cure adhesive on ASTM-D-4541 pull-off test buttons.**
  3. **Water-break/water-quality test of substrate quality.**

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?**

NAVSEA 05P23 Concept for New Start
Improve Paperless QA/QC Processes

Problem:

Paperless QA tools program is not as user friendly as it could be. The present system increases time required for the RMC& Contractor to collect and input the paperless data.

Solution:

Work with USFF N434 to Re-visit the software interfaces with electronic QA Tools product to incorporate changes identified during hot-wash, specifically:

- Incorporate instrument upload capabilities allowing data to automatically be transferred from the inspection instruments to the database.
- Improve the e-mail alert OOS system (adjudication notification).

Accomplishments:

- NAVSEA working issue with USFF N434 – June NPCA meeting, July SSRAC meeting, August SERMC meeting, and August Megarust meeting expressed need.
- Megarust partial resolution with improved NST support to USFF.

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