



EPA Grant Tasks Timeline

	Start Date	End Date
Assemble Work Group	01/01/08	03/31/10
Examine Current Coatings/Methods	01/01/08	04/01/08
Examine Alternative Coatings/Methods	01/01/08	05/01/08
Develop Panel Test Protocol	04/01/08	06/01/08
Conduct Panel Tests	06/01/08	10/01/08
Analyze Results / Select Best Coatings	10/01/08	01/01/09
Develop Boat Test Protocols	01/01/09	03/01/09
Conduct Boat Tests	03/01/09	10/01/09
Analyze Results	10/01/09	02/01/10
Prepare Report	12/01/09	03/31/10

Test Coating Categories

50 ALTERNATIVE COATINGS

- ❖ 17 Zinc Coatings
- ❖ 5 Non-Zinc Organic Biocide Coatings
- ❖ 28 Non-Biocide Coatings

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Reference Coatings

- ❖ Identified routinely used coatings to use as QC standards
- ❖ Selected commonly used high and low copper content coatings
 - AF-33 (33% Cu)
 - Super KL (51-75% Cu)

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Test Coating Information

❖ All coatings delivered by May 16

Send to:

San Diego Unified Port District
Materiel Support & Management Center
1411 West Palm Street
San Diego, CA 92101
Attn: Env Services Hull Paint Project

❖ Preparing schedule of the application of coatings with boatyards and coating suppliers

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Panel Testing Draft Protocol



❖ Panel Preparation

❖ Paint Application

❖ Site Location

❖ Cleaning

❖ Assessment

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Panel Preparation

❖ Size

- Use 12 x 12 fiberglass panels for 1 paint/cleaning option

❖ Surface Preparation

- Follow preparation process for new boats
- Drill ½ inch holes to facilitate attachment to PVC frame
- Gel coat base applied to all panels
- Sand and clean prior to applying test coatings

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Application of Paints

❖ Applied at boatyards per instructions from coating suppliers

- Application mechanisms
- Undercoats, thinners, number of coats, etc.

❖ Coating suppliers encouraged to be present

❖ Coatings applied to both sides of panels

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Site Location



(Photo by Geoff Swain, FIIT)

- ❖ Attached to floating docks in Shelter Island Yacht Basin (SIYB)
- ❖ PVC Frames
 - Each paint applied to 3 panels
 - 1 paint or 3 panels / frame

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Arrangement of Panels

- ❖ Located in boat slips
- ❖ Separated by category to avoid cross contamination
- ❖ South facing
- ❖ Constant depth exposure

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Cleaning Protocol

❖ Consistent Cleaning Regime per Paint

- One “no clean” panel
- One panel cleaned to suppliers recommendations (method and frequency)
- One panel cleaned with a soft cloth or diaper every 3 weeks

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Cleaning Protocol

❖ Standard frequency has changed from 2 weeks to 3 weeks

- Coating suppliers' recommendations may need to be altered

❖ Consistency in person(s) cleaning

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QA/QC

❖ Negative Controls

- Blank panels with no gel or test coating to characterize fouling community in SIYB
- 1 set of blank panels with gel coat only to isolate effectiveness of cleaning methods

❖ Cleaning Controls

- 1 no-clean panel for each test coating
- Evaluate effectiveness of each paint when not cleaned

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Assessment Measures

❖ Fouling Assessment

- Evaluate percent cover and categories of fouling (i.e., algal slime, hard growth, etc.)
- ASTM D3623-78a standard method
- Photographs



❖ Cleaning Assessment

- Level of cleaning effort
- Pre- and post-cleaning fouling assessment
- Post-cleaning coating condition assessment

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Fouling Performance Rating

Rating	FR Rating	Description of Fouling Typically Observed
1	100 to 95	A clean foul-free surface; or soft fouling present - with algal spores and other biological slimes present; light silting; paint still visible beneath fouling
2	94 to 80	Soft and/or hard fouling present; Slime as dark green patches with yellow or brown colored areas; moderate silting; painted surface may be obscured by fouling
3	79 to 60	Soft and hard fouling present; grass filaments up to 3 inches in length; or flat network of filaments, green, yellow or brown in color; or soft non-calcareous fouling such as tunicates or sea squirts projecting up to ¼ in height; Calcareous fouling up less than ¼ inch in diameter or height may be present (i.e., tubeworms)
4	59 to 40	Soft and hard fouling present; combination of tubeworms and barnacles less than ¼ inch in diameter or height.
5	< 40	Composite Fouling present; combination of tubeworms and barnacles, may be greater than ¼ inch in height and dense; barnacles growing on top of another; lengthy, soft algae; soft sedentary animals without calcareous covering growing over various forms of hard fouling

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Cleaning Assessment Rating

Rating	Cleaning Effort
1	Light pressure: very easy to remove growth with one wipe
2	Light to medium pressure: still easy to remove growth but may require two or more passes in some areas to remove growth
3	Firm effort: firm scrubbing and continuous passes required to remove fouling growth
4	Hard effort: With very hard physical effort, growth presented a challenge to remove but could be removed using specified cleaning mechanism.
5	Using specified cleaning mechanism and hard effort, growth was unable to be removed.

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Post-Cleaning Coating Condition

Rating	Coating Condition
1	New, slick finish, still shiny if appropriate to type of coating
2	Shine is gone or surface is lightly etched on all of coating, no physical blemishes or defects
3	Some blemishes or defects in coating less than 20% of panel
4	Some blemishes or defects in coating on 20%-50% of panel
5	Blemishes or defects on over 50% of panel

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Data Analysis

- ❖ Identify coatings that are:
 - ❖ Effective in repelling or preventing growth
 - ❖ Relatively easy to clean

- ❖ Test coatings moving on to next phase
 - Coatings that meet either of the above criteria
 - Coatings that prove to be effective relative to reference coatings (perform at or better than)

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Criteria to Move to Next Phase

- ❖ Coatings with pre-cleaning Fouling Performance rating of 1 or 2 for all panels throughout duration of this phase
- ❖ Coatings consistently obtaining cleaning ratings of 1-2, returning the Fouling Performance rating to 1 or 2 with minimal effort

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Criteria to Move to Next Phase

- ❖ Coatings with a 3 or higher Fouling Performance rating on the no-clean panel, but maintaining a rating of 1 or 2 on either of the cleaning regime panels
- ❖ Panels with a 3 or higher pre-cleaning fouling rating must have both:
 - Post-cleaning fouling rating of 1 or 2
 - Cleaning rating ranging 1-3

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Upcoming Schedule

May 6 – 16

- ❖ Suppliers to provide test coatings

May 19 - 30

- ❖ Application of test coatings to panels

May 30

- ❖ Deadline to email supplier recommended cleaning for second panel to Dr. Wolf

June 2

- ❖ Panel testing phase initiated

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Project Contact Information

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