

NAVAL SEA SYSTEMS COMMAND



FOR TRANSMITTAL OF UNCLASSIFIED MATERIAL ONLY

FACSIMILE TRANSMITTAL SHEET

MATERIALS ENGINEERING GROUP

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SUBJECT Adhesion Pull Tests over Hydroblasted Surfaces
(Hand-held Etcometer) on USS TARAWA by LBNSV
Cavi-Tech & AmClean surfaces

tolerant" amino-amide epoxies which can be applied over a rust bloom. Surface tolerant paints displace a degree of moisture and contaminants, penetrate and wet out the surface providing for good adhesion between the paint and the steel surface.

F. ADHESION TESTING

In order to determine if adequate adhesion was able to be achieved, a hydroblast test was conducted on the USS Tarawa. The purpose of this test was to evaluate paint adhesion under various surface preparation conditions. Lack of good paint adhesion leads to failures of the coating system and a reduced service life. When good paint adhesion is achieved the service life of the paint can exceed fifteen years. No industry wide standards exist for hydroblast surface preparation, thus standards developed by CAVI-TECH were used. These standards are described in Appendix A.

Five test areas were blasted at approximately Frame 115, strake F on the port side. Test areas 1, 2, and 3 were located on the turn of the bilge. Test areas 4 and 5 were in the area of the boot top line. Each area was approximately 18 x 18 inches. The areas were blasted by CAVI-TECH personnel using their equipment and procedures. After blasting the areas were photographed, visually examined, and surface profiles were measured on the remaining adherent coating and revealed bare metal substrate using testex tape and a microguage. Devoe's Bar

Rust 235 (Buff), a surface tolerant epoxy, was roller applied after the surface had dried and a full rust bloom had developed. Test areas 1,2,4, and 5 were applied to 8 mils wet film thickness (WFT) and test area 3 was inadvertently applied to 11 mils WFT.

Adhesion pull tests were conducted to determine tensile strength. Typically epoxy systems are considered to have adequate adhesion when the pounds per square inch (psi) required to cause failure exceeds 350 psi [7].

Test area 1 was blasted to CB-4 (bare steel blast). A x20 magnifying glass was used to visually examine the bare steel substrate. Examination revealed peaks and valleys to be free from all rust scale and with abrasion evenly distributed. There were minor rust stains seen. Profile readings measured 2.8 mils bare metal profile. After 20 minutes a rust bloom had developed over 100% of the blasted surface. The pull test showed 600 psi tensile strength with 100% cohesive (within the paint) failure.

Test area 2 was blasted to CB-3.5 (blast back to prime coat). Bare metal was exposed over approximately 30% of the total area. These areas developed a rust bloom. Profile readings measured 2.7 mils on the prime coat. The pull test showed 400 psi tensile strength with 100% cohesive failure.

Test area 3 was blasted to CB-2.5 (blast back to intermediate anti-fouling coat). Bare metal was not exposed in this area. Profile readings measured 3.7 mils. The pull test showed 900 psi tensile strength with 100% cohesive failure.

Test area 4 was a fairly severely corroded area where rust scale was tightly adhered and 1/16 to 1/4 inch thick. This area was blasted to CB-4 (bare steel blast). After blasting, no rust scale was evident, but inert carbon and rust stains were evident. Profile readings were not taken due to pitting of the surface from corrosion. Pitting was evenly distributed over the entire surface and 1/16 to 1/4 inches deep. A rust bloom developed over 100% of the surface. The pull test showed 600 psi tensile strength with 100% cohesive failure.

Test area 5 was blasted to CB-2 (blast back to prime coat). The prime coat was poorly bonded in patches which gave way under blasting. Bare metal was exposed over approximately 20% of the total area. Rust bloom developed on these areas. The surface profile measured 2.7 mils on the adherent coating. The pull test showed 600 psi tensile strength with 100% cohesive failure.

Additional tests were previously conducted by Amclean Co. using 30,000 psi ultra high pressure water blast, and coating with Devoe Bar-rust 235. Pull test results showed a mean tensile strength of 630 psi.

The results show that under varying conditions on the underwater hull, hydroblasting left intact the surface profile and adequate adhesion was achieved using hydroblast as a surface preparation method along with a surface tolerant epoxy paint.