



U.S. Environmental Protection Agency



U.S. Maritime Administration

This document is one section from the “National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs,” published in May 2006. The reference number is EPA 842-B-06-002. You can find the entire document at <http://www.epa.gov/owow/oceans/habitat/artificialreefs/index.html>.

National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs

Paint

May 2006

PAINT

Narrative Clean-up Goal: Remove harmful exterior hull anti-fouling systems that are determined to be active; remove exfoliating (peeling) and exfoliated paint.

What types of paint and anti-fouling systems are used on ships, and where are they found?

Paint and preservative coatings can be found on both interior and exterior surfaces of a ship. Particularly on older ships, paint may be flammable or may contain toxic compounds, such as polychlorinated biphenyls (PCBs), heavy metals (e.g., lead, barium, cadmium, chromium, and zinc), and biocides. Lead compounds, such as red lead tetraoxide (Pb_3O_4) and lead chromate, have been used extensively in marine paint. Other paints containing biocides, such as organotin (including compounds such as tributyl tin), have been used on the hulls of ships to prevent the buildup of marine organisms (e.g., bacteria, protozoa, barnacles, and algae).

Paints

Paint above the water line (topside paint) is not designed to leach because these paints are designed to protect topside surfaces from physical degradation and do not typically contain antifoulant biocides like that of anti-fouling coatings. However, these paints may contain added biocides.

Anti-fouling System

For most types of candidate vessels for reefing, the paint-related contaminants of concern are limited to exterior hull coatings below the water line. These hull coatings consist primarily of anti-fouling (AF) agents (biocides) such as copper, organotin compounds, and zinc.



Photo courtesy of Laura S. Johnson

Exfoliating ceiling paint on the ex-USS Oriskany before being cleaned.

What are the potential environmental impacts of paints?

Scientific investigations by governments and international organizations have shown that certain anti-fouling systems (AFS) used on vessels pose a substantial risk of both acute and chronic toxicity and other adverse impacts to ecologically and economically important non-target marine organisms. Because this document addresses vessels that would be sunk for the creation of artificial reef habitat, the presence of biocides and other anti-fouling systems that inhibit marine growth are antithetical to this purpose. Furthermore, because anti-fouling systems can be reactivated via physical disturbance and/or biological degradation (e.g., scouring during a storm event or burrowing caused by marine organisms) over time, anti-fouling systems that retain potency may become harmful or be reactivated following the sinking. (See Appendix C)

How should the vessel be prepared; what are the appropriate BMPs for paints?

Anti-fouling Underwater Hull Coatings

If there is minimal active biocide remaining on the vessel, no preparation to the underwater hull area is necessary. It can be assumed that biocide activity is minimal if the anti-fouling coating on a candidate vessel is more than twelve years old **and** essentially all the underwater hull area is covered with marine growth.

When assessing the efficacy of the anti-fouling system, existing documentation relating to the anti-fouling properties of the hull coating could provide supporting information when determining if such coatings should be removed. Sources of such supporting information include, but are not limited to, any documentation related to the following: the type and age of the existing AFS, the most recent repainting or dry-dock cycle, and the most recent underwater hull cleaning. When necessary, such information may be supplemented by a physical, underwater hull examination by trained divers or remote operating vehicles. Repair and maintenance records for the vessel should provide the dates when the vessel was last removed from the water for hull maintenance.

If anti-fouling coatings on candidate vessels are at least twelve years old and essentially all the underwater hull area is covered with marine growth, the AF coatings can be left in place without further evaluation, as they are no longer likely to be harmful. If satisfactory evidence relating to underwater hull coating types and coating application dates is not available, and if the AF coating seems to be inhibiting fouling growth according to established AF paint efficacy, further evaluations should be carried out to ascertain the current anti-fouling properties of the coating. If it is determined that the AFS is active, the system should be removed to prevent the release of the AFS's harmful biocides.

Interior and Exterior, Above the Waterline Paints

In some cases, interior and exterior paints onboard vessels may contribute to debris/floatable materials or contain other contaminants of concern. Interior paint and paint above the waterline should be evaluated according to the guidance presented under the "PCB" and "Solids/Debris/Floatables" sections when appropriate. If paint is found to contain PCBs, then the protocols found in the "PCB" section of this document should be followed.

Removal of intact paints generally is not necessary. Topside paint may contain other constituents, such as trace metals or biocides. Unlike underwater hull paint containing high concentrations of biocides designed to leach rapidly, topside paints are designed for long life. They also may contain significantly lower levels of these substances than hull coatings. However, exfoliating paint (paint that is blistering, peeling, and pitting) and exfoliated paint (paint chips and flakes) should be removed.