# POLYCHLORINATED BIPHENYLS (PCBs)

***Narrative Clean-up Goal:*** Remove all solid material containing PCBs greater than or equal to (≥) 50 parts per million (ppm) unless a disposal permit has been granted under 40 CFR 761.62(c); remove all liquid materials containing PCBs.

### *Environmental Impacts*

PCBs are persistent and bio-accumulative. PCBs bio-accumulate in fatty or lipid rich tissues. PCBs have a limited solubility in aqueous solutions and it is suspected that PCBs can leach into a marine or aqueous environment (sediment and water column) where they can be taken up by organisms in the food web. PCBs bioaccumulate in fish and other animals; PCBs also bind to sediments. As a result, people who ingest fish may be exposed to PCBs that have been released into the environment.

There is a risk of human exposure during vessel preparation and after sinking the vessel. During vessel preparation, typical routes of human exposure include inhalation, accidental ingestion, or dermal contact. After sinking, exposure routes may be limited to accidental ingestion of or contact with contaminated water or ingestion of contaminated fish, shellfish, or crustaceans. (see Appendix C)

### *What are PCBs?*

PCBs belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs, which were domestically manufactured from 1929 until their manufacture was banned in 1979, have a range in toxicity and vary in consistency from thin light-colored liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and many other industrial applications.

### *Where are PCBs found on a ship?*

Although no longer commercially produced currently in the United States, PCBs are present in vessels deployed before the 1979 PCB ban. PCBs are found in both the solid (waxy) and liquid (oily) forms in equipment and materials on ships that were built leading up to the ban. The equipment and materials that may contain PCBs in concentrations of at least 50 ppm include:

- Cable insulation
- Rubber and felt gaskets
- Thermal insulation material including fiberglass, felt, foam, and cork
- Transformers, capacitors, and electronic equipment with capacitors and transformers inside

- Voltage regulators, switches, reclosers, bushings, and electromagnets
- Electronic equipment, switchboards, and consoles
- Adhesives and tapes
- Oil used in electrical equipment and motors, anchor windlasses, hydraulic systems, and leaks and spills
- Surface contamination of machinery and other solid surfaces
- Oil-based paint
- Caulking
- Rubber isolation mounts
- Foundation mounts
- Pipe hangers
- Fluorescent light ballasts
- Any plasticizers

Items containing PCBs may be found throughout a ship and are not easily identifiable or accessible. PCBs may be found in a variety of shipboard materials, but the location and concentration may vary from item to item and within classes of items. PCB containing materials can also vary from ship to ship, and even ships in the same class can contain differing amounts of PCB containing materials. While these materials may be found throughout a ship, several areas on ships may have an increased likelihood of containing PCB bearing materials: areas or rooms subject to high heat or fire situations such as boiler rooms, engine rooms, electrical/radio rooms, or weapons storage areas.

### *Vessel Preparation*

Even though it is not the intent of this document to focus on regulatory requirements, PCBs are regulated for disposal under 40 CFR Part 761, and will be discussed in this context. The regulations require that materials containing PCBs ≥ 50 ppm cannot be disposed in the marine environment. Although the ship itself is being "reused" or "recycled" as an artificial reef, the PCBs have reached the end of their useful life and must be removed and disposed. Disposal requirements are referenced below (also see Appendix B).

Where there is reason to suspect that equipment or components may contain PCBs ≥ 50 ppm, either remove the equipment or component from the vessel, provide proof that the equipment or component is free of PCBs, or apply to EPA for a PCB disposal permit. Thermally removing PCB containing materials is prohibited, as PCBs may volatize or form dioxin or dioxin-like compounds. Because PCB sampling and analytical procedures can be expensive and time consuming, there may be situations when the cost of sampling and analysis far exceed the cost for removal and disposal. In such cases, previous ship to reef projects have shown that removal of all electrical cables and wires suspected of containing some level of PCBs is more economical.

**Liquid Materials Containing PCBs**

Remove all liquid filled electrical equipment suspected of containing PCBs or PCB contaminated dielectric fluid. Materials such as lubricating oils and greases used for winches and cargo-

handling machinery, hydraulic fluids, heat transfer fluids, and waste oils should be removed from the vessel as presented in the "Oil and Fuel" Section of this document.

**Solid Materials Containing PCBs (non-liquid PCBs)**

Remove all solid materials containing PCBs ≥ 50 ppm, which includes but is not limited to felt gasket and faying material, cables, paints, rubber gaskets as well as battle lanterns and fluorescent light ballasts. EPA recognizes that non-liquid PCBs may be difficult to locate and remove and that removal may jeopardize the integrity of the ship. If non-liquid PCBs ≥ 50 ppm are to remain in the vessel, then 40 CFR Part 761 requires you to obtain a PCB disposal permit under 40 CFR 761.62(c).