HARDWARE INSTALLATION BASICS

Take a walk down a dock or through a boatyard or boat show, look around, and you'll see acres and acres of fiberglass: the "skin" of the modern boat.

In fact, what you're looking at is polyester gelcoat or polyurethane paint. If you had a worm's-eye view, under that gelcoat and paint you would find layers of fiberglass laminate, referred to in the industry as FRP, or fiberglass-reinforced plastic. Essentially, fiberglass is made of thin, hair-like strands of glass—yes, real glass—which create a support network for resin that cures to a plastic-like consistency, albeit it a hard one.

Beneath that, in the decks, cabin, and superstructure, you'll nearly always encounter core material, which might take the form of end-grain balsa, synthetic foam, or a plastic honeycomb structure. Many boatbuilders also use core in the hull, whether throughout or only above the waterline. The purpose of the core is to add rigidity to the otherwise flexible FRP skin. On the other side of the core—the material that is seen on the inside of the boat, inside lockers, or beneath decks, for instance—one finds another similar layer (or layers) of FRP.

This style of fiberglass boatbuilding is referred to as composite core construction. When it's done correctly by the boatbuilder and when it's treated properly by the boat owner and those who work on the boat, it's an immensely strong, reliable method of construction. It does, however, have one primary weakness, and that's water. If water is allowed to enter the core, it will wreak havoc with the structure, and with your wallet.

When it comes to water ingress, the primary culprit is improper hardware installation. Ideally, when a boat is built, the naval architect details where each piece of deck or hull hardware will be placed. Knowing this, the builder laminates into these areas either solid fiberglass or special high-density core that's designed to support the hardware. Then, the folks drilling the holes on the shop floor install the hardware using the accepted method of measure, drill, apply goop, and install.

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The saturated deck core aboard this trawler isn't pretty. The seeds of its failure, however, were sown when the vessel was built. Error number one: plywood was used for the core material. Error number two: the penetrations that were made for the deck hardware, particularly those for the flybridge seats, were not properly closed out. Over the next 10 years, water slowly made its way into the core, wreaking havoc along the way. The result: costly major surgery and core replacement.

However, things aren't always so ideal. Many times, builders fail to install these special hardware pads, or hardware is added after the design is complete or years after the boat is delivered. Thus, another approach to hardware installation is required.

Following is a thumbnail sketch of this procedure. You or your boatyard of choice should follow this protocol religiously whenever a cored composite structure is penetrated for hardware installation.

After the proper location for the hardware has been determined, mark and drill the holes for the fastener. Then, redrill the hole only in the outer layer of fiberglass about half again as large as the previous hole (e.g., a 1/4-inch hole would be redrilled to 3/8 inch). Using a pick, a bent nail, or an Allen wrench chucked into a drill, dig or "reef" out the core material about 1/2 inch around the inside of the hole. (Be sure to wear eye protection while doing this.) From inside the cabin, deck, or hull, cover the hole with masking tape. Then, from outside, fill the void using epoxy that has been thickened to the consistency of mayonnaise; West System 406 or 404 filler works well. (This is often referred to as backfilling, and the entire procedure is known as reefing and backfilling.) Apply the epoxy slowly, using a small brush or syringe to prevent air entrapment. Once the epoxy has fully cured, remove the tape and redrill both

holes, making them slightly oversized, and chamfer the edges of the outer hole to create a space for sealant. (A 1/4-inch fastener would call for a 5/16-inch hole.)

Now, wipe down the area with a damp rag to remove amine blush, which is a water-soluble wax that forms on the surface of cured epoxy. Then, wipe the hardware that you're installing—and the fasteners—with a clean rag that's been moistened with 3M General Purpose Adhesive Cleaner to remove wax, oil, and other contaminants. The propensity of these contaminants to cause sealant failure should not be underestimated; just watch the rag turn black as you wipe down the hardware. Finally, apply polyurethane bedding compound to the bottom of the hardware, as well as to the fasteners. Do not apply bedding compound to the portion of the fastener (including washers, nuts, and backing plates) that will be inside the boat. Omitting sealant here will allow water to leak into the boat when the outer bedding fails, letting you know it's time to re-bed. Bedding on the inside of the fastener will only hold the water in the fastener hole, which may lead to crevice corrosion of the fastener or water penetration into the core.

Wipe up as much of the excess sealant as possible using a clean, dry rag; you should see plenty that squeezed out during the installation process. Finally, wipe down everything with a rag moistened with 3M General Purpose Adhesive Cleaner.

With this approach, you've achieved two ends. First, you've virtually eliminated the possibility of water entering the core where the fastener is installed. Second, and just as important, the epoxy ring you've created prevents the fastener from crushing the core. (A 1/4-inch fastener can exert more than 500 lb. of pressure on the core; four closely spaced fasteners can apply a ton of force.) If the fastener crushes the core, it will almost certainly lead to water ingress because of the funnel-like depression that's created. For this reason, simply coating exposed core with resin, epoxy, or sealant is nearly always inadequate, particularly on highly loaded items like cleats, stanchions, pad eyes, and so forth. All penetrations in cored composites should receive the treatment described here.

—Steve D'Antonio