Elements of a Habitable (and Safe) Interior

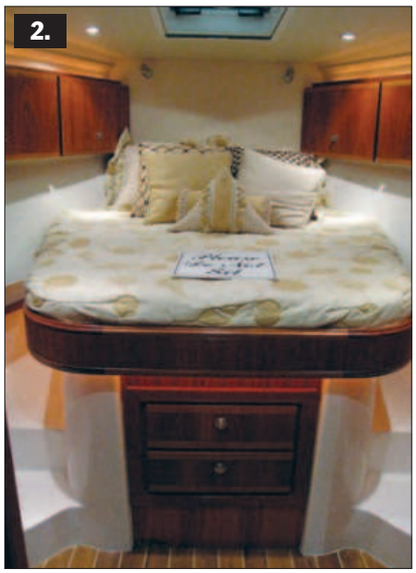
There's no marine equivalent to *Architectural Graphic Standards*—a volume of data guiding design for residential buildings and facilities. But there are best practices that more production companies would do well to follow, for successful accommodation spaces in their powerboats.

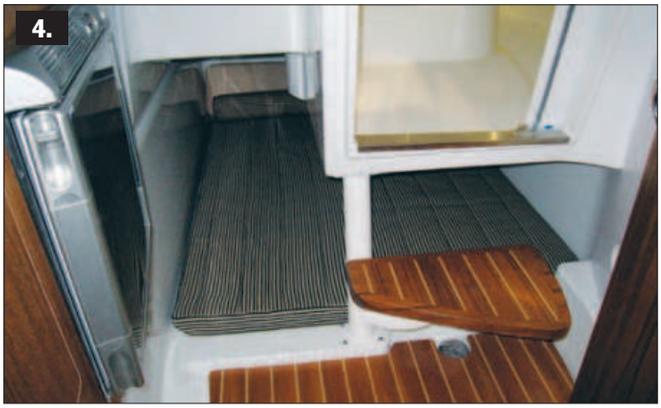
by Eric Sorensen

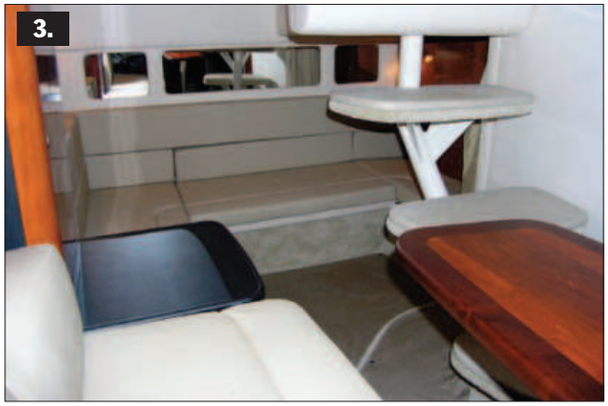
Above—*A galley done right: double sink, natural light through a large port, ample storage and work space, recessed cooktop, and grabrails at the workstation and companionway steps. The boat is a Formula 45 (14.6m).*

Comfort and utility in a boat's accommodations are essential to most cruiser owners, but interior features are also easy to exaggerate during a sales pitch. It's common to read in manufacturers' brochures that so-and-so's 33-footer (10m) sleeps six—only to discover upon inspection down below that, in fact, four of those eager overnighters had better be less than 5′8″ (173cm) tall if they're going to stretch out comfortably on the boat's undersized berths. Since exaggerated claims lead to disappointed customers, the best policy is to design and build a boat that comfortably accommodates well-fed adults of average height.

So let's look at some problematic design elements in powerboat accommodations, including: berth accessibility and size, cabin details, companionways and stairs, galleys, hatches and windows, and heads.







Berth Accessibility

While a standard rectangular bed fits easily on a flat floor in a square room with vertical walls and more than 7′ (213cm) of headroom, designing a fixed berth for a boat presents a series of challenges. The cabin sole might be flat, but it's just as likely to be on a slight slope in relation to the waterline. Unless we're talking about a large vessel with interior staterooms, at least one bulkhead or wall is going to be irregular because it's the inside surface of the hull and cabintop. And headroom is likely to be barely 6′ (183cm).

Also, most boats get narrower toward the bow, and due to deadrise the beam gets smaller still as you go lower in the hull. In the overhead, many modern powerboats have foredecks that slope down as you move forward, with the result that in a typical 30′ (9.1m) boat, headroom goes from just over 6′ at the companionway to a little over 5′ (152cm) at the forward berth.

One strategy to accommodate length and width in any forward berth is to increase the chine beam and therefore the half-angle of entry forward; and also to keep the chines low to the waterline, creating a more voluminous interior. Since boats often sell at boat shows, and not at 25 knots in a chop and headwind, the strategy just cited is the solution for many manufacturers. This accommodations-driven design compromise is immediately evident on a sea trial in anything but flat-calm conditions on the majority of powerboats being built today. The trick is to build the boat on a good-running bottom, and still get the interior volume you need for competitive accommodations. It can be done: just take a look at any of the production designs delivered by C. Raymond Hunt Associates of Boston (for Grady-White, Alden, Wellcraft, Grand Banks' Eastbay line, the larger Four Winns) or Bernard Olesenski of the Isle of Wight (for Princess, Fairline).

Another favorite strategy for fitting

***1**—The full forebody sections of a Carver 47 (14.9m) slow the boat in modest seas but accommodate an 81" (206cm) berth. **2**—The forward berth of a Bertram 360 (12m), raised to fit, is accessible via steps on both sides. **3**—This Sea Ray's open midcabin provides 38" (96cm) of seated headroom, and mirrors that help it seem more spacious. **4**—Another midcabin with a berth that's too tight for anyone sleeping to port, and a mattress that's too short and too thin.*

a larger berth forward is to raise it higher off the sole to take advantage of extra hull beam, thanks to flare in the topsides. Which, of course, also makes the berth difficult to get in and out of. In that case, the best solution is to build molded steps on either side of the berth. Ideally, his-and-hers stairs allow either companion to get into or out of bed without crawling over the other.

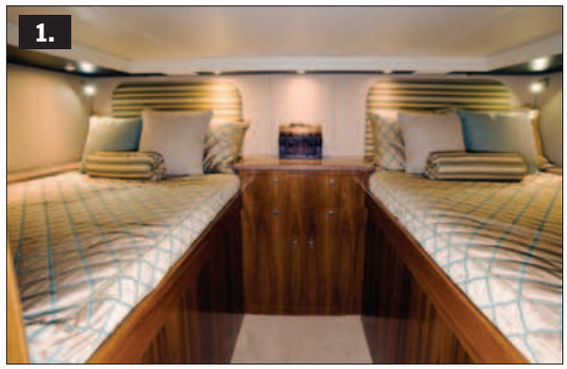
Beneath the berth there should be drawers opening at the aft end. Forward of the drawers the berth or mattress should lift up for access to a storage bin below. This is also where some builders install an air conditioner. In that application make sure the unit is quiet enough when running so it doesn't disturb the berth's occupants.

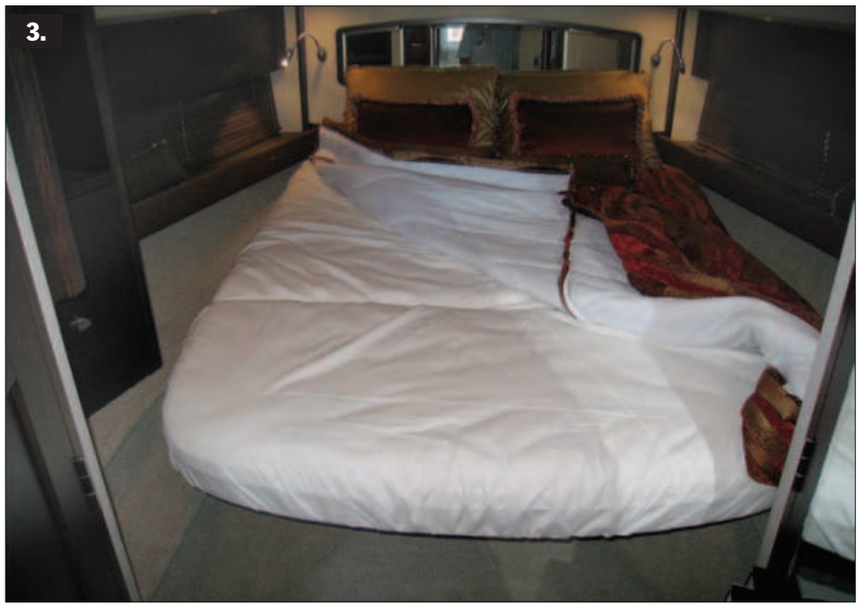
In many cabin models, there's a forward berth that sleeps two, a dinette that converts to a twin, and often a midcabin berth below the helm. Climbing up into the forward berth can be a challenge, but the entry to the midcabin berth often presents the other extreme. Either the horizontal clearance between the companionway stairs, or ladder, and the side of the midcabin entrance is too narrow; or the opening to the midcabin is too low. Aim for 38″ (96cm) of seated headroom in the midcabin berth to make it suitable for seated reading. At least 30″ (76cm) of width is needed to comfortably enter and exit the midcabin.

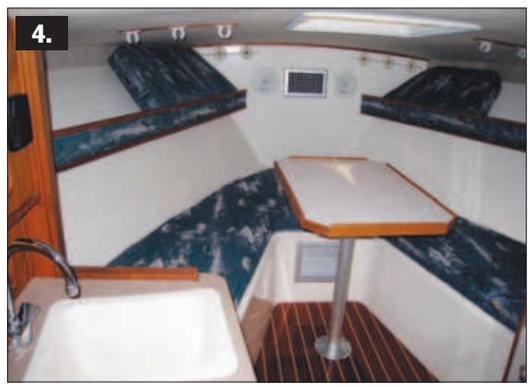
Open companionway stairs or ladders make the midcabin feel less closed off and claustrophobic. The combination of a large opening plus open stairs helps make the space more livable.

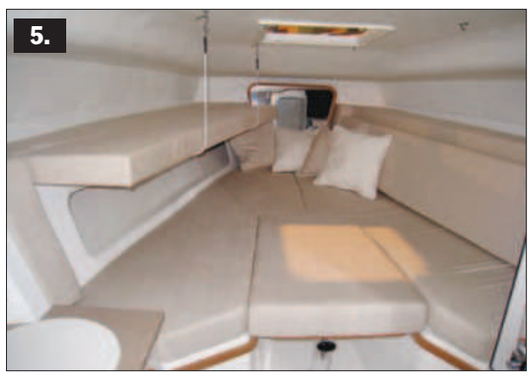
Berth Size

Invariably I see builders skimping on berth size. To make good the claim that their 33-footer sleeps six, they install one berth that can actually sleep two adults, and two more doubles that are maybe a meager 68″ to 72″ (172cm to 183cm) long. Even if you're 70″ (178cm) tall, you feel cramped sleeping on a 72″ berth. I advise buyers to avoid boats with any berths less than 76″ (193cm), and to look for at least one berth—likely to be in the master stateroom, or anyway the master berth—that is 80″ (203cm), just like their queen- or king-size bed at home.









***1**—A Volvo IPS drive enabled designers of the Spencer 43 (13.1m) to fit a pair of berths where the engineroom would ordinarily be. **2**—Though this sportfisherman is equipped with a clever slide-away upper berth, both berths—at 74" (188cm)—are too short. **3**—At the push of a button the forward berth on the Chaparral 400 (12.8m) folds down at the crease, opening more cabin space when the berth isn't needed; and rises back up into a 79" (200cm) mattress. **4**—A 28' (8.5m) sportfisherman fitted with a too-short 68" (172cm) forward berth. **5**—This cabin offers 79" berths, but the upper one suffers from limited headroom.*

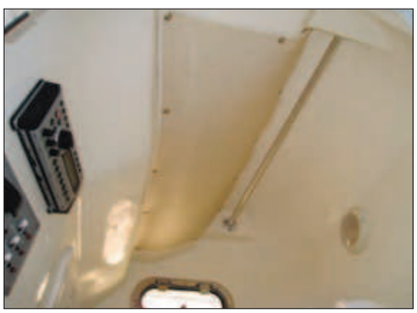
Also, if a berth is less than 60″ (152cm) wide, a couple is going to feel cramped. If you're building boats with any berth less than 76″, make it a policy to point that out, proactively, to prospective buyers so they're not cursing you during their first night on board. It may be that one 80″ and two 74″ or 76″ berths will suit their needs, but make sure you leave the conscious decision to them—if you want them back as repeat customers. It's best not to cram too much into a too-small boat, including absurdly undersized berths.

Aside from actual dimensions, you should consider mattress quality and thickness. If you're selling a 28- to 30-footer (8.5- to 9.1m) with a 3″ or 4″ (8cm or 10cm) foam mattress, count on disappointed owners having a miserable night on board—and telling their neighbors about the experience.

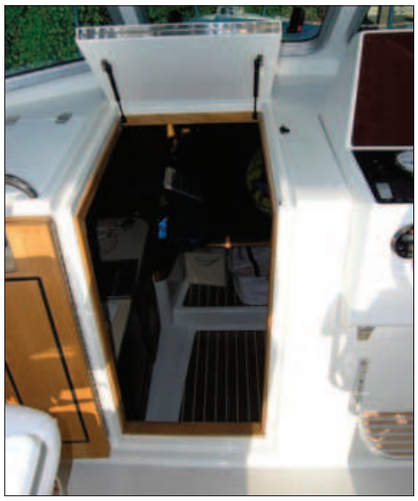
Cabin Details

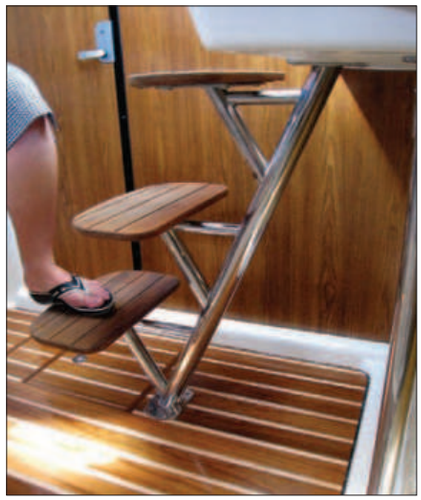
Often overlooked when scoping out a boat at the boat show are the number and placement of handholds. The American Boat & Yacht Council's technical standards in this regard offer good guidance. In section H-41.5 we find: "Handhold devices or grab rails shall be installed to assist personnel in the use of companionways, ladders, and stairways.... All handhold devices and grab rails shall be securely fastened, and shall withstand a load of 400 pounds (182kg), in any direction, at any point, along their length without failure such that they no longer perform their intended purpose."

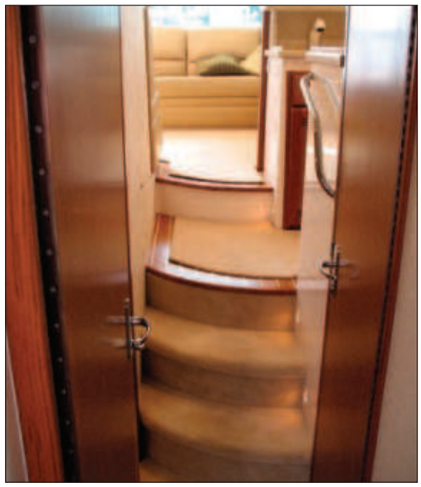
Regardless of how well designed the hull is, every planing (and semi-planing) boat will bounce and lurch under way. Having grabrails close at hand is essential regardless of where you happen to be in the cabin.



Pursuit locates a handy grabrail overhead in the tight interior of its 280 center console.







Above—*The companionway of this 29-footer (8.8m) is too narrow; and the folding hatch interferes with the view from the helm.* ***Above right—****These steps are unevenly spaced and too steep, making access to the cabin unnecessarily hazardous.* ***Right—****The Cabo 40 (12.3m) has near-perfect home-like stairs with easy risers and a well-placed handrail.*

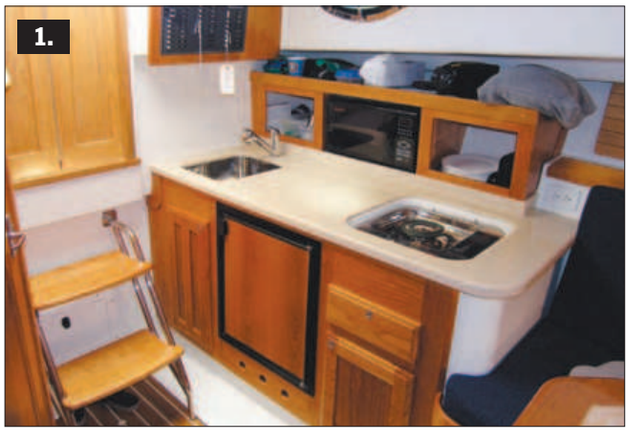
Probably the most important location is at the companionway's long drop from the bridge deck to the base of the ladder. Grabrails are also important around the galley, so you won't lose your balance or fall against a hot stovetop or oven.

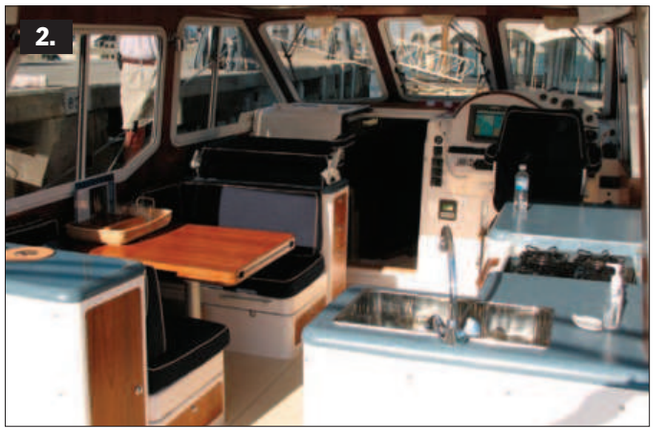
Headroom makes all the difference when it comes to perceived cabin size. Some 34′ (10.4m) boats from reputable builders have less than 6′ of headroom at the companionway. That's unforgivable when you realize other builders provide another 6″ to 8″ (15cm to 20cm) in the same area—without creating a boxy profile. In a 26′ (7.9m) express cruiser, look for 74″ (188cm) headroom at the companionway (sloping downhill as you move forward), and 78″ to 80″ (198cm to 203cm) in a 36- to 40-footer (11- to 12.1m).

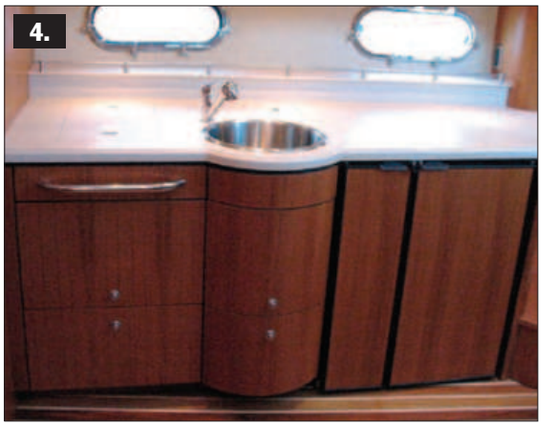
Companionways and Stairs

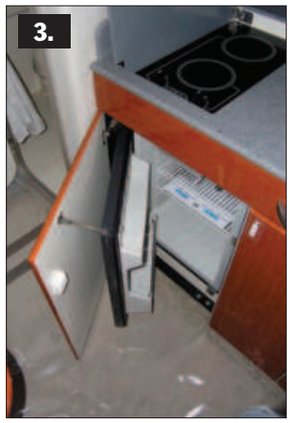
The more user-friendly the rise and run of the companionway stairs, the safer and easier it will be to climb into and out of the cabin. The closer the builder gets to an angle of 7″ (18cm) rise by 11″ (28cm) run, the better. And, as in residential construction, it's important that each step be the same height. Why? Because if you run up a set of 7″ stairs, and the top step is 7½″ to 8″, you're very likely to trip over it, since we naturally adjust our gait on the way up or down. Unfortunately, many boats have uneven stairs, often with a bigger step at the top or bottom.

American Boat & Yacht Council section H-41.8: "A change in elevation greater than 12 inches (305mm) to a flying bridge, companionway, or walkway, shall be provided with a ladder or step(s). Each ladder . . . shall be capable of withstanding a vertical downward static load of 400 pounds (182kg) without permanent deformation in excess of ¼ inch (6.5mm). The load shall be distributed over a 4-inch (102mm) width at the center of the tread or rung. The minimum distance between the outside surface of the rung or tread to the adjacent structure shall be 5 inches (127mm). Step or rung spacing shall not be in excess of 12 inches (305mm). Handhold devices or grab rails to aid in climbing shall be









***1**—The compact galley aboard a Back Cove 29 (8.8m). It includes a proportionally large countertop, with work space between the sink and recessed stove. **2**—The True North 38 (11.5m) has a galley-up arrangement with generous work space and ventilation. **3**—Details on the Formula 31 PC (9.6m) include a clever door-on-door for the fridge, and a switch that shuts off power when the stove lid closes. **4**—The Tiara 3900 (11.8m) Sovran's galley is also a great work space thanks to natural light, a toekick even at the unusual central sink installation, and a grabrail.*

provided with the ladder or steps, or shall be installed on adjacent structure."

The stair or ladder tread surface is also important: a rubbery nonskid finish will keep users upright—that and, if possible, a handrail all the way down the length of the stairs, like a banister at home.

Galleys

Every galley should have a fiddle rail around the countertop perimeter to keep pots, pans, food, and utensils from sliding off. Recessing the stovetop works well, for the same reason. If the stove has a cover, it should close a micro switch when lowered, to cut off power and prevent a fire starting due to unintentionally contained heat. Sinks should be big enough to handle the number of dishes appropriate to the boat's normal use, and have vertical walls to help minimize or keep water from sloshing out. Bowl-shaped sinks are the worst offenders, as they naturally slop water with very little encouragement from the boat itself.

There should be a toe kick at the counter, so you can stand close to it without losing your balance.

Few people, I believe, want to stand at the sink or stove for any length of time—staring directly at cabinets. There's no substitute for having a window close to eye level to look through, to cheer up the cook.

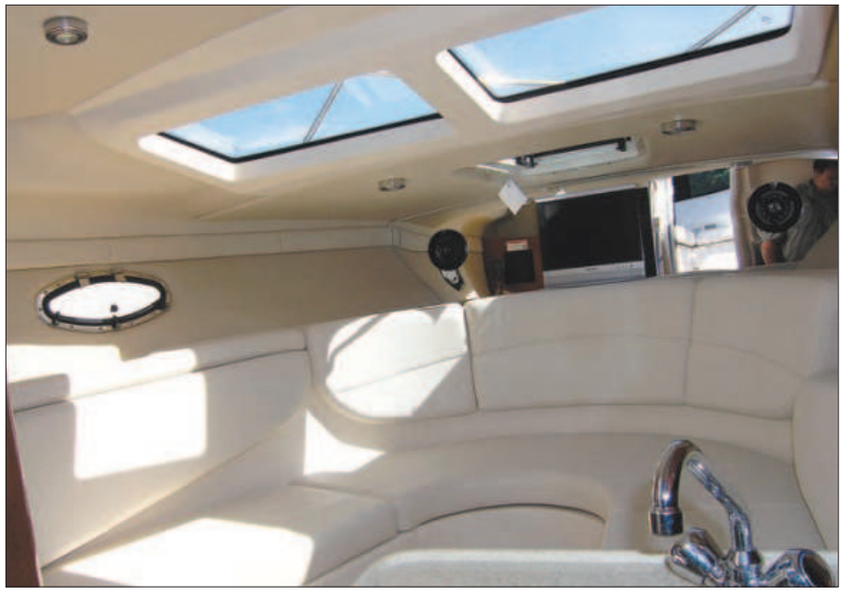
The amount of galley storage space required depends on the size and range of the boat. The owners of a 30′ (9.1m) express fishing boat expect a lot less cabinetry than the owners of a 50′ (15.2m) pilothouse motoryacht. The same size- and use-driven limitations apply to counter space. For smaller boats in particular, having a flush cover for the stove increases usable countertop surface when the stove isn't in use.

Hatches and Windows

Hatches are often thought of as being there primarily to let in air and sunlight to make things brighter and fresher belowdeck. However, they must also serve as exits during an emergency such as a fire or sinking. One constraint to that critical role is the fact that ABYC's standards haven't kept pace with the average American's girth. Section H-3.4.2: "Enclosed accommodation spaces shall have a second readily accessible means of exit if one exit can be blocked by a fire in a galley or machinery area. Exits shall provide for minimum clear opening dimensions of: 14½ x 18½ inches (rectangular), or 270 square inches, with a minimum dimension of 14½ inches (oval), or 18½ inches in diameter (circular)."

Those are rather scanty dimensions, in my opinion. I recommend a hatch that's a minimum of 20 sq in (129cm^2)—so that most people can get through it in an emergency. Any smaller, and it's an awfully tight fit for a lot of adults. On a yacht like an Eastbay or Alden, *24″* (61cm) hatches are the norm.

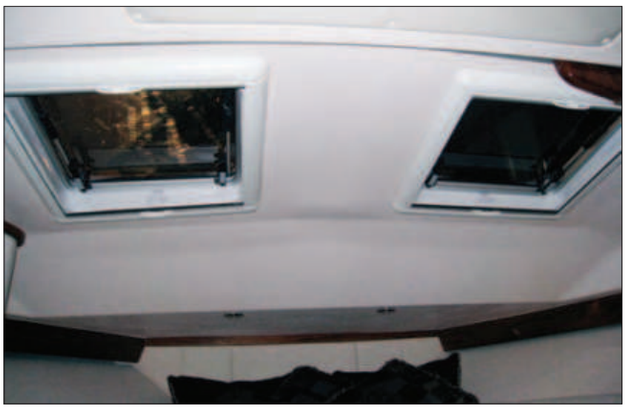
Apart from the matter of dimensions, the hatch has to be readily accessible so that a person of less-than-average upper-body strength can climb through it. If the hatch is located close enough above a berth to allow you to hoist yourself up and through, you're all set. Any boat not so equipped should provide a ladder that swings down, so you can climb up and out.



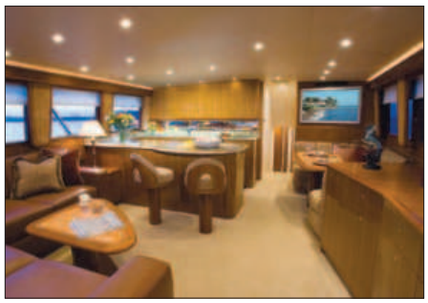
Left—*The relatively small interior of a Regal 2860 (8.9m) appears bright and spacious thanks to windows, hatches, ports, and a mirror.* ***Above—****This 17" (51cm) hatch on a 37' (11.2m) sportfisherman meets ABYC standards but will be difficult for many owners and guests of normal girth to squeeze through in an emergency.*

Too often I encounter cave-like cabins, with no side windows and only one or two small hatches forward. Thankfully, the trend now is to let in more light and fresh air from more and bigger windows. It used to be that windows meant leaks, and the demise of the window on production boats is due in part to boatbuilders' frustration in this regard. But relatively new, frameless technology bonds the glass to the hull or deckhouse and eliminates leaks (and the corrosion associated with aluminum window frames) while adding stiffness and strength to the surrounding structure. So the only reasons now not to add frameless glass are the extra time and materials needed to install them, and the loss of coveted storage space in front of the windows.

Take pilothouses, for example. They used to have leaky, full-glass windshields across the front. But in



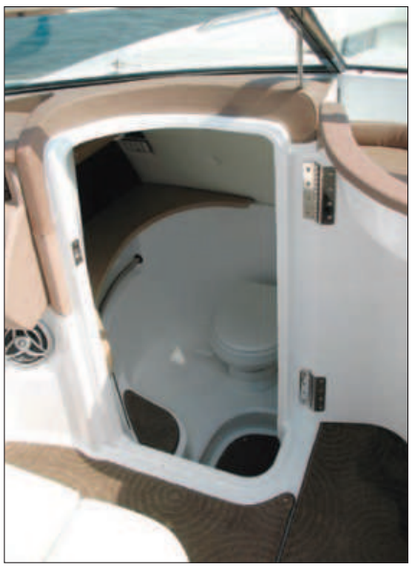
Above left—*Ready and sized for an emergency, a pair of easily accessible 20" (51cm) hatches on this Grady-White are directly over the forward berth.* ***Above right—****Production high-end express sportfisherman interiors have good electric lighting and lots of cabinet space. But no windows.* ***Right—****A typical convertible saloon contains galley, pantry, a television where the windshield would traditionally be, and large windows in the cabin sides and aft.*

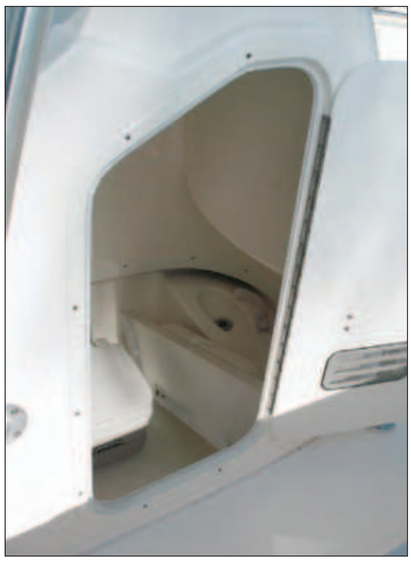


the late 1960s, convertible builders took out the windshields, and soon filled the space forward of the bulkhead with residential-size refrigerators, televisions, and storage cabinets. Today, it would be difficult to wean many owners of those boats off such amenities. Given the running angle of large numbers of modern convertibles, it would also be impractical to reinstall lower helm stations anyway.

Heads

We come at last to a critical interior element where too little room can



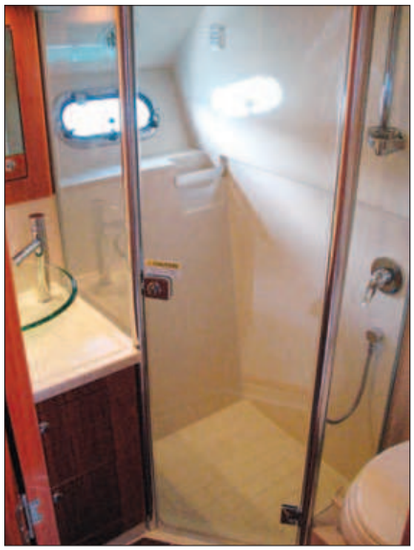


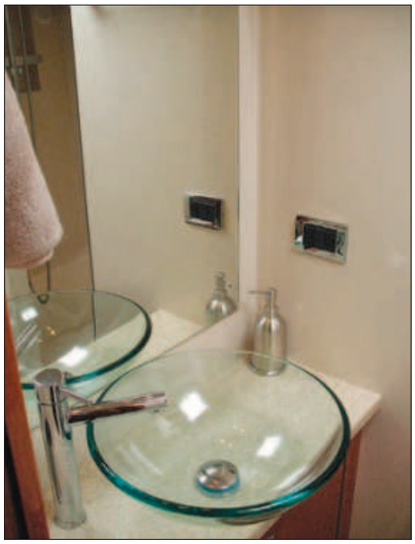
Right—*The wide molded door to the step-down head on a Cobalt dual console incorporates a small hatch for ventilation. The door's complex curve facilitates plenty of headroom for ingress and egress.*
Far right—*By contrast, the head door aboard this 24' (7.3m) center console is just 37" (94cm) high—too short for comfort.*

make boating miserable. Good head-design satisfies a short list of reasonable criteria, namely: being able to sit comfortably on the toilet without having one's knees jammed against a door or bulkhead; having enough headroom to stand up tolerably well, right at the toilet; having enough natural and mechanical ventilation; and being able to take a shower without feeling like a sardine in a can, or spilling water onto the cabin sole on the other side of the door.

Add one more ergonomic head requirement specific to center- and dual-console boats: a door that's tall enough (45″–50″/114cm–127cm) and wide enough (18″–22″/46cm–56cm) to pass through without doing a bad imitation of a contortionist.

I'm convinced that a successful strategy for customer satisfaction and loyalty includes building a practical boat to live with and on. Rather than trying to fit too much into a small space, design around actual human needs and dimensions. Make that 28-footer (8.5m) sleep four, not six, and advertise that those are true adult-sized berths. If you choose to include





Far left—*Large boats like a Riviera 4700 (14.3m) can afford the space for a dedicated shower enclosure that keeps the rest of the head dry.*
Left—*That shallow glass sink may work well enough dockside in a marina, but will launch its contents across the head once the boat hits a wave.*

six berths anyway, point out the ones that are for the kids.

Make accommodation proportions generous: 20″-to-24″-wide (51cm-to-61cm) companionways; 76″ (193cm) minimum headroom; 48″ (122cm) center-console head doors; 20″ overhead hatches; and 78″ to 80″ (198cm to 203cm) berths, or 76″ at the very least. These larger dimensions ensure a more enjoyable boating experience. Likewise, the light and ventilation from good windows and generous overhead hatches will make any boat more livable and attractive to a potential buyer or repeat buyer.

In the real world, getting the interior details right can make your products more attractive, usable, and, ultimately—more competitive in a crowded powerboat marketplace. PBB

About the Author: *Eric Sorensen has been driving commercial, recreational, and military vessels for four decades. He was the first director of the marine division of J.D. Power and Associates (the customer-satisfaction survey organization), and is the author of* Sorensen's Guide to Powerboats, now in its second edition. *Currently a consultant, he specializes in powerboat design, construction, safety, and performance at his Plattsburgh, New York–based firm (same name as the book).*