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PSEUDOCORES

Waterline Yachts



How a small Canadian company carved out a market niche for performance cruisers—in lightweight steel construction.

by Sven Donaldson

By even the modest standards of the boatbuilding industry, Waterline Yachts is a low-profile business, tucked away in a small industrial park behind the regional airport in Sidney, British Columbia. No signs point the way to the two-room portable structure that serves as an office, or to the nondescript construction buildings that flank it. One wing of the portable is a design office where Ed Rutherford—company founder, president, and in-house designer—meets clients and drafts the distinctive steel

sailboats that have become the yard's specialty. Next door, Rutherford's wife and business partner, Marilyn Lowry, handles everything from ordering and payroll to preparing exhaustive quotations on new projects.

In some respects, this is your typical "ma and pa" shop, with the two principals completely immersed in every aspect of the operation, including hands-on boatbuilding. What's not so typical is Waterline's consistent and growing profitability while remaining a small custom yard with fewer than

10 employees. In a nutshell, the key to the yard's success has been a combination of technical and business expertise that has resulted in an enviable reputation for excellence in a narrowly defined market. As the years go by, the projects have gotten larger and more sophisticated, yet the yard has not. Rutherford and Lowry maintain close ties with their past customers, who, virtually without exception, have remained enthusiastic about their boats. New customers most often find the yard via word-of-mouth, and



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used Waterlines generally sell for close to their original prices—another indication that this builder is perceived as delivering fair value.

The Steel Phenomenon

Rutherford and Wally Horniak, who was to become Rutherford's first business partner, learned boatbuilding through a two-year yacht technology program at Humber College in Toronto. After graduating, the two headed west, hoping to establish a market for high-quality radiused-chine steel sailboats. They founded Waterline Yachts in 1982. Rutherford had a talent for design work, and he drafted a handsome 33-footer (10m). The partners spent three years building four boats (including one 33 for each of them).

At that time, steel boatbuilding was gaining popularity in much the same way that ferrocement had briefly thrived about a decade earlier. The dream of the leak-proof, virtually indestructible steel cruiser was fed by enthusiastic articles and by books such as LeCain Smith and Sheila Moir's *Steel Away* (based on outfitting a 42' [12.8m] hull from Waterline).

After three years of boatbuilding, Horniak set sail for the South Pacific, but Rutherford stuck it out, and was rewarded with several orders for progressively larger yachts. Before long, Lowry suspended her career in physiotherapy to administer the boatyard full time.

No question, the steel boat revival of the '80s established a market for Waterline's specialty. "Nearly all the

clients who come to us have already decided on a steel boat," Rutherford notes. "The rigidity and strength are what draw people." On the other hand, a perception that there's money to be made in steel boats has periodically encouraged inexperienced builders, who've been known to hang around Waterline's yard in an effort to uncover tricks of the trade. Rutherford believes that, in fact, there really aren't a lot of secrets in the business, and has been forthright in sharing with *Professional BoatBuilder* his 20-plus years of experience.

In North America, the majority of professionally built metal small craft are aluminum rather than steel, but Rutherford steers clear of aluminum projects. Interestingly, his hesitation is due not so much to often-cited alu-



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Facing page—Mettle, the personal yacht of Waterline owners Ed Rutherford and Marilyn Lowry, is a 50' (15m) pilot-house sloop designed by Rutherford. Waterline's steelwork is lighter than average, thanks to structurally efficient framing and relatively thin plating with high-strength steels. **Left**—The radiused-chine hulls are built bottom-up over a grid of permanent bent-steel mold frames, overlaid by longitudinal stringers. Here, a Waterline 46 (14m) is in the final stages of plating.

Below—Star Tracker, a Waterline 333 (33'/10m), was one of the yard's earliest projects. Sold as a painted hull kit in 1985, it was finished by the owner and launched in 1987.

minum problems such as diminished weld strength and susceptibility to electrolysis, but to the difficulties he perceives in achieving a long-lasting paint job. Offshore cruising boats lead a rough-and-tumble existence, and he believes that aluminum's susceptibility to creeping oxidation beneath the coating makes it prone to paint-shedding when the integrity of the paint is breached. While unpainted aluminum has become quite popular in the European cruising fraternity, Waterline's customers have always wanted something a bit more "yachty."

By specializing in top-quality steel yachts, Waterline has in some respects limited its potential customer base, but also its potential competition. As Rutherford notes, "If customers are looking for steel, there aren't a lot of builders, because to build in steel, you need both a woodworking operation and a metalworking operation—each with entirely different tools and procedures." The finished yacht is essentially a custom wooden boat cocooned inside an insulated steel shell, and each demands unique skills—and, preferably, its own dedicated work space. But as Lowry points out, steel kit boats are no way to make money, because the bulk of the labor hours and margin opportunities accrue during the fit-out phase.

Waterline's steelwork building represents about half the total shop space. The lion's share of the build hours goes into woodwork, systems installations, and exterior finishing—all of which take place in the second

building, where there are two bays 80' (24m) long, and individual shops for the various other trades. This second building is always busy, and at times, the lightly used space next door must look quite tempting. Waterline's principals don't begrudge the overhead of maintaining the separate metal shop, though, and prefer not to contaminate finishing areas with grime and metal particles from the steel yard. A small work force helps make this approach feasible. As Lowry explains, "We can control our costs relative to larger yards because of the small number of people. They all have their own role, and their own space."

Construction Details

Over the years, Rutherford has refined a hull-fabricating technique that minimizes structural weight without compromising strength or fairness. Waterline's radiused-chine hulls are built bottom-up over a grid of permanent bent-steel mold frames, overlaid by longitudinal stringers. In most cases the primary framing is a combination of 1½" (32mm) angle stock and T-bar. Once welded to the outer plating or to one another, these framing members become the structural equivalent of channels or I-beams, producing a stiff but relatively lightweight structure. The plating contacts only the longitudinal stringers (spaced 12"-18" [31cm-46cm] apart), which improves exterior fairness. And to ensure that the array of stringers stays fair and accurate until the plating has been applied, the underlying mold frames are supported by extensive temporary bracing.

As is normal in radiused-chine construction, the turn of the bilge is plated first. Waterline's steel suppliers pre-roll stock to the desired radius, but before plating, Rutherford's crew bends it longitudinally using a three-roller bending machine or, in some cases, an English wheel to coax the required compound curvature. This refinement makes it feasible to cover the bilge areas with a minimum number of plates per side, producing a substantially fairer result than the more common approach using numerous short segments.

Another way that Waterline trims the weight of its boats is to specify high-strength steels where appropriate. Most Waterline hulls incorporate

A-36 mild steel (36,000 psi [248 N/mm²]) only for the radiused-chine plating, where its greater malleability makes roller-forming feasible. A higher-strength 44,000 psi (303 N/mm²) steel is specified for the topsides and bottom panels, allowing these panels to be 25-30% thinner and lighter than would otherwise be the case. Recent Waterlines in the 50' to 55' (15m to 17m) range have ⅜"

(4.8mm) plating for the bottom and bilge round with 10-gauge and ⅜" (4.8mm) for the topsides. Decking can be as light as 11 gauge (slightly under ⅜" [3mm]), while steel up to 1" (25mm) goes into parts of the keel structures. As is sound practice in any welded boat construction, the plating is installed methodically, using stitch-welding to attach plating to frames, and working alternately port and star-

Putting Pace into Steel

Conventional wisdom would suggest that steel, at 585 lbs per cu ft (9,371 kg/m³), is too heavy for a performance-oriented sailboat. Ed Rutherford, co-owner of Waterline Yachts in Sidney, British Columbia, has done a creditable job of demonstrating otherwise in his later designs.

Rutherford's 50-footer (15m) *Mettle* (pictured on page 72), which he owns with his wife and business partner Marilyn Lowry, is a case in point. Derived from the Waterline 46 (14m)—which Lowry describes as "our signature, raised-deck pilothouse design"—the 50 adds a broader, more powerful stern to accommodate dual-wheel steering and walk-through stern boarding, along with a generous workshop/storage space aft. Speed comes from a combination of long sailing length (LWL = 47'6" [14.48m]), a deep semi-bulb keel that delivers maximum stability for a given ballast weight, and lighter-than-average steelwork thanks to structurally efficient framing and thinner plating with high-strength steels. (See the main text for more on the yard's construction methods.) The happy result is a steel yacht with an exceptionally low CG that can easily stand up to its sizable rig in a stiff breeze.

As in most other Waterlines, *Mettle's* galley and nav station occupy the raised pilothouse area with the saloon forward and down. Engine, generator, tankage, and batteries are centralized under the pilothouse, keeping the ends of the boat relatively light to minimize pitching.

On the other hand, this is a luxury cruising yacht with an elaborate interior and plenty of comforts: everything from a washer/dryer and heavy-duty refrigeration, to hot-water heating and heavy impact-resistant windows. And as any experienced yacht designer is well aware, it's the weight of the fit-out that really adds up—regardless of the hull material selected.

Proof of the pudding came during a three-hour sailing and photo session that brought variable winds from near nothing up to about 12 knots. Each time the breeze topped 6, *Mettle* displayed impressive speed, at one point topping 8 knots on a close reach. Close hauled, this 25-ton (22.7 tonne) yacht still managed nearly 7 knots in 12 knots true wind, and tacked through just

Mettle Particulars:	
LOD	50' 6" (15.4m)
LWL	47' 6" (14.5)
Beam	14' 0" (4.3m)
Draft	7' 3" (2.2m)
Ballast	13,000 lbs (4,852 kg)
Displ.	50,000 lbs (18,662 kg)
Std. Sail Area	1,240 sq ft (115m ²)
SA/D	14.6
D/L	208
Fuel (in keel bin)	355 gal (1,344 l)
Water	237 gal (897)

under 90°. The feathering Max-prop obviously helped, as did a nicely cut Ulmer-Kolius Diamond-Drive cruising genoa.

Mettle also proved a joy to helm, thanks in large part to a Whitlock Mamba direct mechanical steering system instead of the "no-feedback" hydraulic steering commonly found on steel cruisers. The boat was no slouch under power, either. The Yanmar 4JH diesel (100 hp) delivered 8.3 knots at 2,900 rpm, and a full-throttle 9.2 knots at 3,200 rpm.

—Sven Donaldson

Housing for the ballast bulb is built separately from the hull and filled with lead, then put aside until shortly before launching, when it's welded to the keel fin. That way, the boat can sit closer to the shop floor during construction, making it easier to work on during the lengthy fit-out phase.

board to minimize heat distortion.

Waterline's customers have always tended toward the performance-cruising persuasion, so Rutherford routinely drafts long, rather voluminous fins. In recent years he's been positioning the ballast lower by housing all the lead in a flat-bottomed bulb that is fabricated separately, and welded into place shortly before launching. That way, the unfinished boat sits some 18" (46cm) closer to the shop floor, making it considerably easier to work on during the lengthy fit-out phase. The sealed space in the keel fin above the ballast becomes the main diesel tank.

A frequently mentioned benefit of all-metal construction is the elimina-



SVEN DONALDSON

tion of deck leaks, and Waterline goes to great lengths to ensure its yachts will live up to this billing. For example, the stanchion tubes slide over stainless stanchion posts—short lengths of round bar stock that pass through holes in the deck. Each post is welded to the inner hull surface at the bottom, and all around at the plane of the deck. Similarly, deck gear such as cheek blocks or winches is

bolted into acorn nuts, each individually welded all around to the underside of the deck. Other than hatches and windows, the entire boat is essentially a continuous all-metal capsule.

Gilchrist Glass Bending in Victoria, British Columbia, supplies Waterline's 1/2" (12.7mm) laminated safety windows, which incorporate heat-strengthened glass and a thick .090"



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polyvinyl butyral interply layer. Window glass often wraps around corners. Most recent Waterline owners have also opted for reflective coatings on the glass to reduce solar heating and improve daytime privacy.

Since the glazing is bonded directly into recesses in the steelwork, the integrity of the windows is only as reliable as the adhesive. Waterline's current practice is to pre-fit and mark

the inner panes prior to lamination, and then have Gilchrist fuse on a black silica frit around the margin of each window where adhesive will later be applied. The adhesive—Simson Fast Tack—is a silyl modified polymer formulated for glass. [For information on sourcing this and other products mentioned in the text, please see page 83—Ed.] The roughness of the frit further improves adhe-

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sion, and its opacity helps prevent UV light from degrading the bondline.

Corrosion Stymied

Rust is an obvious concern with steel boats, and Waterline goes to great lengths to curtail it. Fortunately, steel boat builders have benefited from the huge demand for effective coating systems to protect commercial vessels, offshore structures, and bridges.

Waterline hulls receive various treatments to protect the topsides, underbody, and inner surfaces. After sandblasting, the topsides are, in most cases, flame-sprayed with molten zinc; then, within 24 hours, coated with the first of five or six spray applications (15–20 mil) of Amercoat 235—a two-part reinforced epoxy paint. This is followed by an AwlGrip linear-polyurethane paint system (high-build

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Left—Steelwork complete, a Waterline 46 is moved from the metal shop to the finishing shop. **Right**—Rutherford's sailboat designs favor semi-balanced rudders supported by a partial skeg.

primer and topcoat—most recently at Waterline—AwlGrip II). Thanks to extremely accurate steelwork, the hulls need surprisingly little fairing. After painting, the results are virtually indistinguishable from a well-finished

composite boat.

Below the waterline, Rutherford favors a slightly different approach: applying Ameron's Dimetecote 302—an epoxy primer containing inorganic zinc silicate—immediately to the

sand-blasted steel. (He stresses the importance of never leaving freshly sand-blasted steel uncoated overnight.) Next comes 15–20 mils of Amercoat 235, followed by antifouling paint.

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He avoids using flame-sprayed zinc below the waterline because he's seen the zinc layer get eaten away beneath the adjoining paint film after a small area was exposed by abrasion. "It becomes more of an issue to repair if there's a wide patch of steel with no zinc left," he explains. That problem occurs because the flame-sprayed zinc layer achieves full electrical connectivity with the steel. So, if the zinc layer is exposed, it typically becomes the anode in an electrolytic reaction—much like a bolted-on sacrificial zinc, but far less easily replaced. By contrast, zinc particles in the Dimetcote primer are suspended in a non-conductive matrix. Experience has shown that this primer, together with attached sacrificial zincs, provide ample below-the-waterline protection.

Above the waterline it's a different matter, with the flame-sprayed zinc offering excellent protection. "Some of our owners have cruised for a year without doing touch-ups on the topsides," Rutherford comments, noting that when bare steel is exposed

by minor chips and scratches there's been no problem with spreading rust.

Inner surfaces of hull/deck assemblies are sandblasted and given two coats of Dimetcote 302—sprayed, but also brushed behind the angles to ensure complete coverage. This is followed by two coats of DP 40 and 48 strontium-chromate epoxy primer from PPG. These particular primers provide an effective tie coat for the sprayed urethane insulation, which is normally not applied until days or weeks later.

Rutherford considers coatings a critical determinant of quality in steel boat building. "All our paint jobs are documented: products, batch numbers, mils, temperature, and humidity," he notes. "We've also hired an independent lab to come and do adhesion testing on our coating systems." He explains that repainting steel boats can be challenging, and it's much better to get it right the first time. "Sandblasting can drive salt into the steel," he observes, which can cause severe problems during recoating.

Waterline is unusual among steel

builders in that it incorporates substantial amounts of stainless steel to reduce the risk of rust spotting in high-abrasion areas. Applications include chainplates, bow platforms, and a company trademark—toerails made of rectangular tubing and buffed to a high polish.

Interior and Equipment

Although Waterline Yachts does superb woodwork and installations, its practices conform in most respects to those of other good custom builders, and won't be described in detail here. That said, one interesting innovation is Waterline's use of a Hilti powder-actuated gun to nail plywood cleating to the steel frames, so the stick-built interior can later be attached with Sikaflex adhesive and screws (or, in the case of overhead panels, Velcro strips). The Hilti fires chrome-nickel stainless nails that embed so firmly they're nearly impossible to remove. Because Waterline's longitudinal steel framing lies outside the transverse framing, two different thicknesses of cleating are needed to



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Left—Carpenter Kaj Jakobsen preparing to install overheads in a Waterline 55. Sprayed urethane foam is first ground back to eliminate high spots. Plywood cleating is then anchored to the framing with chrome-nickel nails fired by a Hilti powder-actuated gun. Here, Jakobsen tacks an extra layer of thin plywood over the main cleating to secure lamp wiring. Overhead panels will then be attached with Velcro. **Right**—Waterline's electrical and mechanical installations are done in-house.

create a uniform supporting gridwork for the 1/4" (6mm) interior panels. To maintain an uncontaminated surface suitable for Sikaflex, the plywood

cleating must be masked off twice: once before the urethane foam is sprayed; and again after the foam surface has been ground off level, so a

fire retardant can be sprayed.

As a low-volume custom builder, Waterline relies on a handful of veteran craftsmen to achieve the high

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Waterline's interiors are fit out to a high standard. **Left**—Mettle's galley, located under the pilothouse. Steel construction allows the support structure for the windows to be relatively light. **Right**—A maple sunburst-pattern table with inlaid cherry border.

finishing standards its clients expect. One advantage of building quite slowly—typically one large boat every 18 months—is that Waterline never outstripped its market, and has thus

been able to offer steady employment to its most experienced shipwrights. As Marilyn Lowry wryly observes, "If you're just doing custom boats, it helps not to get too big."

Lead woodworker Frank Jakobsen has played a major role in building the reputation of the yard, not only for his craftsmanship, but because he has a knack for creating cabinetry styles that mesh with each client's particular tastes in décor. For example, Rutherford and Lowry's own boat, *Mettle*, has a crisp, modern interior in figured maple veneer with maple trim. By contrast, the most recent launching—the 55' (17m) *Delphina*, built for Brad and Lynne



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ED RUTHERFORD

Left—The ½" (13mm) laminated safety glass has a reflective coating to reduce solar heating. Note the metalwork details on deck: hidden conduits for the lines, and polished stainless steel toerails. **Right**—The yard has so far built two motoryachts. Shown here is Ted K, designed by Steve Seaton. The concave topsides and bulbous bow involved some of Waterline's most difficult steelwork to date. The art on the bulb is by David Tolman, an employee at the yard.

the ergonomics. A comparable effort goes into the boats' systems, which are tailored to the needs and desires of each client. Installing the auxiliary equipment, the wiring, and the plumbing often occupies systems specialist John Norwood for the entire fit-out period. Still, the man-hours involved are not out of line. As Rutherford explains, "It really helps not to have a lot of people always getting in each other's way."

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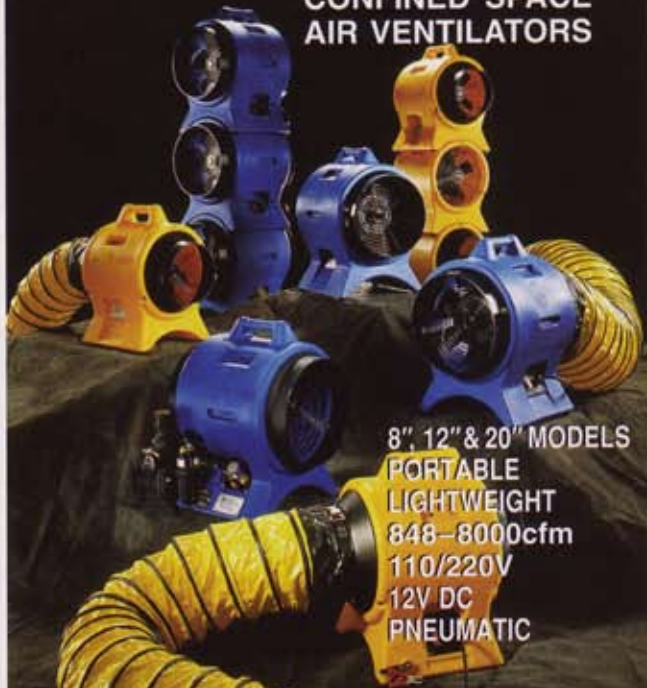
There is, of course, a downside to deliberately staying small—a greater risk of one day confronting a prolonged gap in the build schedule. Rutherford

Cooley of Portland, Oregon—features a traditional solid teak interior complete with crown moldings and bull-nosed paneling. Like many Waterline

clients, the Cooleys played an ongoing role during the build. They even created complex CAD models of various interior options to fine-tune

and Lowry routinely show boats—either clients' or their own—at two major Northwest boat shows each season. Combined with word-of-

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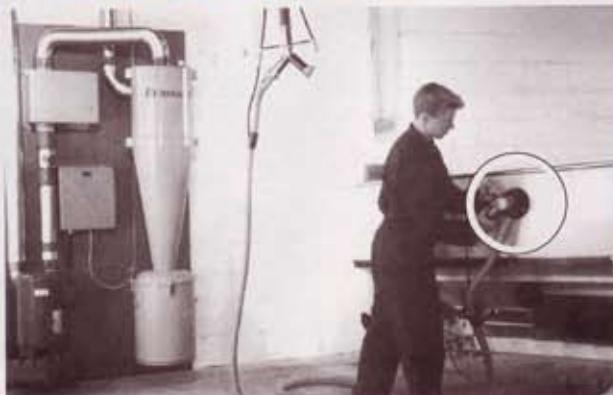
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mouth (and the occasional magazine article), this has so far done the trick, but there may come a time when additional measures are required.

Well aware of the demographics currently driving a shift from sail to displacement power, the couple has been eyeing the so-called trawler-yacht market. Already, Waterline has built two such vessels: *Askov*, a classic-

looking design from Bill Garden (Sidney, British Columbia), and *Ted K*, a magnificent trawler drawn by Steve Seaton (Fort Lauderdale, Florida).

As long as there are valued employees who want keep working at Waterline, Rutherford and Lowry will be drumming up projects to keep them working. On the other hand, should the day come when everyone

wants to retire, it's just as likely that *Mettle* (or its replacement) will be heading for the South Pacific. **PBB**

About the Author: *Sven Donaldson is the technical editor of Pacific Yachting magazine, and makes his home in Vancouver, British Columbia. Over the years he's contributed numerous articles to Professional BoatBuilder on a variety of subjects.*

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