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PassageMaker

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THE ABCs OF ABYC

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While on an extended cruise aboard your vessel, we'll call her *Cherokee*, you notice that the engine's coolant temperature gauge has stopped registering. Being a prudent skipper and knowing that an inoperative engine instrument is an invitation to disaster, you point *Cherokee's* bow toward the nearest boatyard to have it repaired. Fortunately, an experienced marine technician is on hand, and he quickly discovers that the problem is nothing more than a loose wire. The bill is small and your detour short.

The story, however, does not end here. The technician working at the away yard, we'll call him Dick, reveals that, while investigating the failed temperature gauge, he noticed that *Cherokee's* AC electrical panel is not "ABYC compliant."

"How could that be?" you say. "My boatyard back home has taken care of *Cherokee* for years, and they never noticed anything wrong with this panel. In fact, Harry, the yard's top electrician, rewired much



The range of publications produced by ABYC is broad, indeed, including everything from the all-inclusive *Standards and Recommended Practices for Small Craft*, shown here in CD form, to study guides for certification exams.

of it just last winter."

With the increased implementation of American Boat and Yacht Council standards, this scenario is no longer as uncommon as it once was. If this happens to you, you may, no doubt, be as chagrined as *Cherokee's* skipper was when he learned about his vessel's deficiencies. You might even wonder if, under the circumstances, the away yard is trying to take advantage of you. How do you know Dick is right and Harry back home is wrong, and what is ABYC anyway? The answers to these questions are

relatively simple, and, once you've finished reading this article, you'll be better equipped to evaluate Dick, Harry and others like them before they repair, service or build your trawler.

If Dick's yard is a member of ABYC and he has evaluated *Cherokee's* electrical system based on ABYC guidelines, then chances are good he is correct in his assessment. If the manager at *Cherokee's* home yard stares at her skipper blankly when asked, "Are you a member of ABYC, and is

Harry familiar with the organization's standards?" then chances are excellent that Dick is indeed correct and Harry, well—we'll come back to Harry and what his options are later.

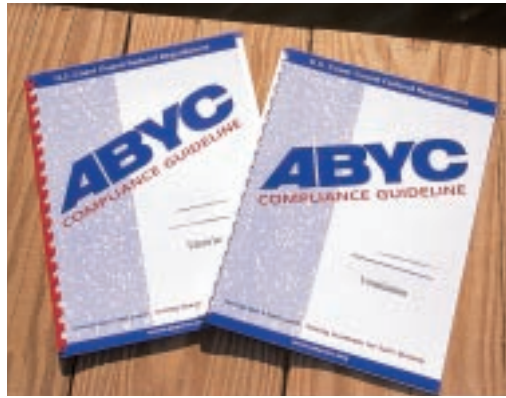
WHAT IS ABYC?

You've seen the letters "ABYC" mentioned in the pages of *PMM* on many occasions. Perhaps you've even seen the ABYC logo on a marine product you've purchased or, if you're fortunate, a proudly displayed membership placard on the front door of your boatyard or marina service office. ABYC is an organization whose members include boatbuilders, repair yards, marine equipment manufacturers, surveyors, insurance industry representatives and average boat owners.

Civilians aren't the only ones who look to ABYC for guidance and assistance with small vessel design and construction. When the Department of Homeland Security and the Coast Guard's Office of Boat Forces needed to design and engineer a Homeland Security Response Boat, Small (RB-HS), they turned to the ABYC standards to ensure the resultant craft was safe and reliable.

ABYC was formed during the recreational boating industry's exponential growth of the 1950s. Fiberglass was a revolutionary product in this day; most boats were still built using timber, caulk and enamel paint. In 1950, members of the Motorboat and Yacht Advisory Panel of the U.S. Coast Guard's Merchant Marine Council were tasked with creating an organization that would provide boatbuilders, equipment manufacturers and repair yards with critical safety related information. With this mandate, the American Boat and Yacht Council was born, convening its first meeting at New York City's Lexington Hotel in April 1954. Forty-three members were in attendance—the founding fathers of ABYC, as they were, led by the organization's first president, Phelps Ingersol of Wilcox Crittenden Corp., a well known manufacturer of marine sanitation devices, seacocks and other shipboard gear.

The newly formed organization, working from its



ABYC offers several reprints of Coast Guard requirements on topics from electrical and fuel systems to ventilation and floatation requirements.

first office—a rented house in Amityville, Long Island—wasted little time in churning out data and information useful to the marine industry. ABYC's first standards, "AC Rectifiers (E-6)" and "Life Saving Equipment (H-9)" (all ABYC standards are classified by a letter-number identification system), were issued in 1956.

The first edition of what was then titled *Safety Standards and Recommended Practices for Small Craft* was published in 1965, compiling all of the nine standards written up to that

date. The title of the bantam-weight volume remained unchanged until July 2001, when convention dictated an update more accurately reflecting ABYC's and the standards' contemporary mission. The title of the current tome, *Standards and Technical Information Reports for Small Craft*, is indicative of ABYC's larger mission, which encompasses a great deal more than just "recommended practices." It is available either in book format (a large one—think Manhattan telephone directory) or as a CD-ROM.

Today, ABYC's main thrust is evident in the organization's mission statement, which declares, "The council shall develop technical practices and engineering standards for the design, construction, equipage, maintenance and repair of small craft with reference to their safety. The council also shall disseminate these standards and be the principal source of education, training and technician certification for the marine industry." As a marine industry insider (the boatyard I manage has been an ABYC member for nearly two decades), I can assure the reader that little doubt remains as to whether ABYC lives up to this proclamation. This organization is the acknowledged authority, the last word in enhancing marine manufacturing, maintenance and hardware reliability and safety.

IN THEORY

Returning, once again, to the trawler *Cherokee* scenario, how did Dick the technician determine that the vessel's electrical panel was in need



ABYC standards address many facets of boatbuilding and repair. Proper security and insulation of batteries is clearly addressed in standard E-10, "Storage Batteries."



Liquefied petroleum gas, or LPG, has become commonplace aboard even the smallest of today's recreational vessels. This gas must, however, be accorded considerable respect during design, installation and use of systems that use it for cooking and heating. ABYC's section A-1 addresses these concerns, prohibiting, for example, the use of unions or valves within a vessel's cabin space, as is shown here. This system does not comply.



LPG is heavier than air and thus will accumulate in a vessel's bilges if allowed to leak. Standard A-1 addresses these concerns. In this photo, the gas line leading through the wall of an LP tank locker is anything but gas-tight and thus is noncompliant.

of attention, and what did he mean when he said it was "noncompliant"? Dick used two resources to arrive at this determination. First, being a responsible marine technician, while troubleshooting the problem at hand, Dick performed a cursory inspection of *Cherokee's* electrical system. Using knowledge he acquired at an ABYC marine electrical systems certification course, he searched for potential fire or electrocution hazards. Second, after inspecting *Cherokee's* electrical system, Dick consulted his yard's copy of the aforementioned *Standards and Technical Information Reports for Small Craft*, otherwise known as "the standards." Here, he confirmed his suspicions about the electrical panel deficiencies. Section E-11 clearly states, "Simultaneous trip circuit breakers shall be provided in power feeder conductors..." "reverse polarity indicating devices providing a continuous visible or audible signal shall be installed in 120VAC shorepower systems..." and "... the panel shall be designed so that when the panel is open there is no access to energized parts without the use of tools." None of these components or features was present in *Cherokee's* electrical panel, and all present a potential electrocution and/or fire hazard.

Why and how did *Cherokee's* home yard allow this grievous error to go unnoticed and uncorrected? The answer in this and many cases like it is often one of ignorance rather than negligence. Residential and commercial shorebound electrical panels require none of the above-mentioned features, and, thus, even an experienced terrestrial electrician may be unaware of the special requirements for marine electrical systems. Herein lies one of the greatest dangers where electricity afloat is concerned—boats are not homes, and their electrical requirements differ in several critical respects. As a result of these distinctions, any lack of understanding on the part of the technician may lead to costly, even life-threatening, mistakes. ABYC electrical guidelines specifically address the peculiarities of marine electrical systems, providing an invaluable resource to those designing and working on these systems.

The necessary details for properly and safely wiring *Cherokee's* AC electrical system are clearly spelled out (and diagrammed in the form of

example schematics) in the ABYC standards. If Harry had been familiar with these guidelines and consulted the book when carrying out repairs or upgrades to *Cherokee's* electrical system, he would have avoided the mistakes Dick discovered while repairing the malfunctioning temperature gauge.

THE BOOK

There's more to the *Standards and Technical Information Reports for Small Craft* than the aforementioned electrical system recommendations. This book comprises a comprehensive, *voluntary* guideline for boatbuilders, repair yards, surveyors and others detailing approved methods for building and installing everything from steering systems, lightning protection, bilge pumps and fuel tanks to seacocks, inverters and LP gas systems. The book's more esoteric chapters include guidelines for determining the necessary field of vision from the helm, horsepower limitations, glazing materials and floatation requirements, to name just a few. All told, the ABYC standards are made up of 66 documents.

The Code of Federal Regulations, or CFR, section 33 applies to recreational small craft. These guidelines, which are federal law, specify, among other things, the requirements for fire extinguishers, life jackets or PFDs, over-current protection (fuses and circuit breaker requirements), navigation lights, sound signals, etc. However, it comes as a surprise to many boaters that these requirements are virtually mute where actual vessel construction is concerned. Local laws may apply to AC electrical systems, much as they would for residential or commercial construction; however, as previously mentioned, marine AC electrical systems differ considerably from their land-based brethren, and, therefore, these regulations may be inapplicable or inconsistent with afloat electrical requirements.

Thus, the ABYC standards fill a necessary, albeit voluntary, gap between federally mandated recreational marine regulations and laissez-faire boatbuilding and repair practices.

The standards are clear, concise guidelines, written in textbook form, that guide the builder and technician, utilizing a "here's how it should be" rather than a "step-by-step, how-to" approach. It is important to note that the standards do not supplant experience or technical expertise. When used for new construction or repair, ABYC

AC shorepower systems present considerable risk of electrocution and fire, particularly if they are installed improperly. ABYC standard E-11, "AC and DC Electrical Systems," clearly distinguishes right from wrong. Here, a clear violation is shown: use of a household distribution box that lacks a main two-pole circuit breaker.



Reverse polarity in 120-volt AC shorepower systems could spell disaster. A properly installed, ABYC-compliant reverse polarity alarm will alert the user to a potential problem before energizing onboard equipment.

"A seacock shall be securely mounted so that the system will withstand a 500-pound static force applied for 30 seconds to the inboard end of its connecting fitting," states *ABYC Standards and Recommended Practices*, section H-27.7.1. Do your seacocks meet this requirement?





guidelines are written for users who are experienced in their marine mechanical, electrical or design trade. To reiterate, it's not a "how-to" book. The assumption of those who write the text of each standard is that, in the hands of an experienced professional, it will achieve its end.

THE BIRTH OF A STANDARD

Each standard, from "AC and DC Electrical Systems (E-11)" to "Exterior Hatches, Doors and Port Lights (H-3)," takes a lengthy and circuitous path before reaching the eyes of a technician, surveyor or boatbuilder. The first step on the route toward establishment of a standard is a review by the ABYC Technical Board. After receiving information from the marine industry—one of ABYC's 13 staffers or one of its members—that details or reveals a particular safety or technical problem, the ABYC Technical Board tasks an ABYC Project Technical Committee, or PTC, with direction to begin work. Seventeen PTCs exist within ABYC, and their ranks consist of more than 300 individuals from within the marine industry, boat and equipment manufacturers, insurance companies, surveyors, USCG, other government agencies, and the boating public. The initial mission of a PTC is to create a draft of a new or revised standard (every existing standard is automatically reviewed and revised every five years), which is then made available for review by ABYC members and the general public. Comments are collated, considered and worked into the draft until a final standard is created. The process, from primary investigation of the proposed need for a standard to the final published product, may take as long as two years.

While the entire collection of standards, *Standards and Technical Information Reports for Small Craft*, is available only to ABYC members (the cost of individual membership for nonmarine professionals, i.e., the average boater, is \$95 annually, while the standards publication in either book or CD format is \$219), individual standards are available for purchase by nonmembers via ABYC's website, abycinc.org, or by calling 410.956.1050. The cost for these individual publications ranges from \$40 to \$120, again, for nonmembers. The average trawler owner would find little practical use for the entire standard; however, in my experience, individual standards such as electrical (E-11), gasoline and diesel fuel (H-24 and H-33,

respectively), LP gas (A-1), and through-hull fittings (H-27), as well as several others, prove to be particularly enlightening to boat owners and are often a worthwhile investment.

MORE THAN JUST A BOOK

Lest the reader draw the conclusion that ABYC is little more than a publisher of boatbuilding and repair guidelines, professional education is a large part of this organization and an essential part of fulfillment of its mission.

The ABYC standards work harmoniously within an extensive, dynamic and ever growing program of continuing education. Instructional seminars, from as brief as a day to as extensive as a week and covering everything from electrical standards to air conditioning and refrigeration, complement and teach, among many other facets of boatbuilding, repair and maintenance, the most relevant and safety related chapters of the *Standards and Technical Information Reports*.

Additionally, ABYC organizes and supervises a host of seminars, including ones that offer certification, around the country and in several foreign locales. The Council also conducts on-site training and instruction in standards compliance for organizations such as boatbuilders and repair facilities. The current breadth of educational programs includes accident investigation, corrosion prevention, air conditioning and refrigeration, basic marine engines, electrical systems and trouble-shooting, fiberglass lamination, and stability and floatation, among others.

In addition to straightforward instruction, ABYC educational programs also include certification. Currently, members, marine industry professionals and technicians have the choice of attaining ABYC "certified" status by either attending one of the weeklong certification preparatory programs and then completing a lengthy examination (between 100 and 200 multiple choice questions, depending on the subject) or by studying on their own and then taking and passing the exam. Current certification categories include AC/DC electrical, air conditioning and refrigeration, gas or diesel engine and support systems, corrosion control, composite boatbuilder, and general standards accreditation. The final category of standards accreditation is a general overview of the most important standards

and is especially popular with boatyard and service managers as well as boatbuilding supervisors and surveyors.

The most popular of these certification exams is that of AC/DC electrical systems. The exam has been described by many of those who have taken it as nothing less than demanding. It is anything but a rubber-stamp process of attending the class and then sitting for a perfunctory regurgitation of course material. The attrition rate is high; only 46 percent of those not attending the prep class pass, and 86 percent of those who do attend the weeklong class pass. As of December 2003, approximately 1,100 individuals had successfully completed one or more of the ABYC certification exams. In 2003 alone, nearly 1,000 people attended an ABYC-sponsored educational seminar or exam preparatory course.

It is important to note that certification in one or more of the aforementioned boatbuilding or repair-related categories is not necessarily a guarantee of competency. As mentioned earlier, the ABYC guidelines and their companion certifications do not teach basic mechanical or electrical practice in vocational or trade school style. Examinations are not hands-on practicals; they simply test an individual's understanding of the applicable ABYC standards, and his or her ability to utilize the *Standards and Technical Information Reports* publication. In order to be most useful, implementation of ABYC guidelines and practices, whether by certified or noncertified individuals, must be carried out by those who are experienced in basic marine mechanical and electrical practices. Understanding the written material and being able to demonstrate this understanding during an examination is a critical, albeit incomplete, component of the overall ABYC-certified technician's experience.

As a boat owner, a working knowledge of the guidelines will assist you in either completing do-it-yourself tasks in a compliant fashion (provided you possess the requisite technical skills) or enabling you to ensure that others do the work according to these standards.

IN PRACTICE

Ideally, the production builder who builds your next boat will be a participant in a recently announced program that has been jointly introduced by ABYC and the National Marine



LP gas lockers "shall minimize the likelihood of use as a gear storage locker," according to ABYC standard A-1.



The most commonly requested individual ABYC standard is section E-11, "AC and DC Electrical Systems." This guideline provides a wealth of information about the safe installation of onboard electrical equipment and systems. This image shows an ABYC-compliant placard, which guides the user through safe connection of shorepower cables.



ABYC standards are not a "how-to" to manual. While installations such as this fuel manifold are sloppy and undesirable, the ABYC standards do not specifically prohibit such practices.



Manufacturer's Association, or NMMA. This program will evaluate boat models for compliance with 31 of the most critical ABYC guidelines. (This number will be increased within the next three years to 40.) A decal will identify such boats as having been "NMMA Certified Using ABYC Standards."

At the introduction of this program in October 2003, ABYC President Skip Burdon said, "Broad scale use of ABYC standards in the manufacture of boats and boating accessories is key to ABYC's mission of providing a safe and enjoyable boating experience for the boating public." Look for or ask about this inspection during your next boat purchase, as it will provide a measurable degree of assurance and value to the would-be boat buyer, particularly where quality and safe construction practices are concerned.

The program is geared primarily toward production boatbuilders. In order to receive the certification, a builder must submit a representative model for inspection by an NMMA-designated third-party inspector. Since only a model is inspected, the program is no substitute for a factory's quality assurance program or skilled boatbuilding techniques.

In order to remain compliant with the program, manufacturers must submit new models for certification, and all vessels that will carry the NMMA-ABYC certification placard must undergo recertification annually. Roughly 140 builders currently participate in the program. For an up-to-date list, visit NMMA's website: nmma.org/certification/programs/boats/boatlinks.asp.

Because of the model type-certification process, few custom or semicustom built vessels will participate in this program. In this case, buyers must hold builders responsible for meeting individually agreed upon ABYC standards, which may actually parallel those set forth in the NMMA-ABYC program, and a surveyor may act as the buyer's third party inspector. You won't, however, get the coveted NMMA-ABYC certification decal unless your vessel and its builder participate in the program.

Beware of the claim "This boat is ABYC compliant," for either new or used production or custom built vessels. In fact, no boat fully complies

with all ABYC standards, as full compliance is simply impractical and not the aim of the standard. Additionally, the guidelines address several categories that are directed toward service and repair rather than new boat construction, once again making full compliance unachievable in most cases. If a boatbuilder or broker makes the compliance proclamation, inquire as to which standards he or she is referring.

For those of us more concerned with how ABYC affects service and repair rather than new construction, the news is encouraging. More and more boatyards, marinas and service providers are joining ABYC every day. Currently, ABYC's ranks include approximately 4,400 members, ranging from students enrolled in ABYC and other marine educational programs to individuals; employees of boatbuilders, repair yards and marine equipment manufacturers; and corporations and businesses. Additionally, ABYC is truly an international organization, with members hailing from more than 40 countries.

How does all of this bode for *Cherokee* and her crew, and what could they have done differently? Initially, her skipper should have inquired, when the electrical system was first being upgraded, as to whether the work would conform to ABYC standards. Many reputable service yards and other facilities belong to ABYC, and thus their technicians and supervisors have access to a copy of the book, as well as unlimited technical advice and problem solving assistance from ABYC's technical division.

It is worth noting, however, that membership in this organization neither compels nor ensures that a service facility will complete work that meets or exceeds these voluntary requirements. (The ABYC guidelines are billed as a "minimum" standard; the work may exceed this threshold.) It's up to *Cherokee's* skipper to inquire and ensure that the work meets the relevant guidelines, particularly those in the critical categories of electrical, fuel, seacocks, LP gas, CO detectors, etc.

Additionally, by the time you read this, it may already be possible to log on to ABYC's website to determine what yards and marinas along your proposed cruising routes are members of ABYC and who among their staff is certified. Preplanning is best; however, if you find yourself in service




extremis, this information may be only a few keystrokes away.

Finally, the ABYC guidelines also serve to level the playing field for consumers and service facilities alike when comparing quoted work or simple value for one's money. In the absence of ABYC standards, it is difficult for a trawler skipper to compare the work, and resultant expense, from one yard to another. Now, however, provided the work is of high quality *and ABYC compliant*, comparisons are more valid and meaningful.

What could Harry, the technician who worked on *Cherokee* in her home yard, and his employer do differently, and how could he have prevented the mistakes he made while working on this vessel's electrical system? First, Harry's employer should join ABYC and obtain a copy of the standards. This will give him and his employees access to world-class safety and technical guidelines for future repairs aboard *Cherokee* and other boats like her. Then, Harry would benefit from attending one or more of ABYC's educational seminars. Once he's done this, he can begin preparing for exams in one or more of the categories offering certification. With the proper experience under his belt and an ABYC electrical certification, there's little doubt that he will avoid future mistakes like those he made aboard *Cherokee*.

As previously mentioned, boatbuilders and service facilities aren't the only ones who belong to ABYC. As a boat owner or buyer, one of your greatest advocates is a reputable, experienced surveyor. If you are in a position to employ such a professional who will either assess damage in preparation for repairs or inspect a boat you intend to purchase, insist that he or she do so to ABYC standards. Many surveyors belong to ABYC and have access to the standards through professional organizations. A survey that does not use the standards, particularly those in the aforementioned critical categories, is of considerably less value than one that does. Once again, it's up to you, the boat owner or owner-to-be, to insist on this standard.

The American Boat and Yacht Council has been serving the marine industry, boatbuilders, repair yards and surveyors for over 50 years. If you fail to take advantage of the service this organization provides—not insisting on new construction, repairs and surveys that meet its standards—you're simply missing the boat. 

Proper grounding of fuel system components for both gasoline and diesel installations is important. In this example, a fuel fill is properly grounded using a ring terminal and screw, rather than clamping the wire beneath the hose or hose clamp. ABYC standards clearly prohibit the latter case.



In the event of a leak, the exhaust system of any internal combustion engine presents some risk to the user. ABYC standard P-1 defines in great detail the dos and don'ts of these systems. In this image, a noncompliant diesel exhaust system is shown. Get the standard, and you'll find out why.

Section P-6, "Propeller Shafting Systems," provides information regarding propeller shaft diameter calculations, struts, shaft seals, logs, shaft bearing spacing requirements and more.

