Glossary of Terms

A plain-language reference for the non-technical reader

Roles, Documents & Credentials

Term	What It Means
Marine Survey	A formal, credentialed examination of a vessel by a certified marine surveyor - done for reasons like a pre-purchase check, insurance, valuation, or a legal dispute. It follows recognized standards and ends in a signed report that can hold up professionally and legally.
Marine Inspection	A broader, less formal examination of a vessel or its parts. It may be done by shipyard staff, technicians, manufacturers, or owners, and does not necessarily involve a credentialed surveyor or a signed report.
Pre-Purchase Survey	The most thorough type of survey, commissioned by a prospective buyer before purchase. It examines the vessel's overall condition, structure, systems, and safety equipment to uncover defects and needed repairs, helping the buyer make an informed decision and often used to negotiate price.
Condition & Value (C&V) Survey	Ordered by insurance companies or underwriters (and sometimes lenders) to confirm a vessel is safe, seaworthy, and worth insuring. It assesses the boat's condition and current market value and flags any safety deficiencies the owner must correct to obtain or keep coverage.
Valuation (Appraisal) Survey	A focused survey that establishes a vessel's fair market value for financing, estate settlement, donation, sale, or legal matters. It weighs the boat's condition, age, and equipment against comparable market sales rather than performing a full systems inspection.
Non-Destructive Testing (NDT)	Any method of examining a material or structure for hidden problems without cutting, drilling, or otherwise damaging it. Thermal imaging, percussion sounding, and moisture metering are all forms of NDT.

Standards, Regulations & Credentialing Bodies

Term	What It Means
SAMS (Society of Accredited Marine Surveyors)	A leading professional organization for marine surveyors in the United States. It sets standards of practice and a code of ethics, requires testing and continuing education, and awards the Accredited Marine Surveyor (AMS) and Surveyor Associate (SA) credentials that signal a surveyor's qualifications and accountability.

Term	What It Means
ABYC (American Boat & Yacht Council)	A nonprofit that develops the widely recognized voluntary safety standards for the design, construction, equipment, maintenance, and repair of recreational boats in the United States. Though the standards are not themselves law, they are treated as the industry's “standard of care” - the guideline manufacturers build to and the benchmark surveyors, insurers, and courts measure a boat against.
USCG 33 CFR (Navigation & Navigable Waters)	Federal law enforced by the U.S. Coast Guard that applies directly to recreational vessels. Part 183 (“Boats and Associated Equipment”) sets the mandatory construction and safety requirements manufacturers must meet - safe loading and flotation, fuel systems, and electrical systems - alongside rules for hull numbering, required safety equipment, and navigation lights.
USCG 46 CFR (Shipping)	Federal regulations governing commercial and Coast Guard-inspected vessels, vessel documentation, and certain equipment standards. For pleasure craft it mainly comes into play when a boat crosses into commercial use - larger yachts, charter boats, and uninspected passenger vessels carrying passengers for hire - and it often references the 33 CFR 183 construction standards as a baseline.
Holding Tanks & Sewage (MSDs)	Marine Sanitation Devices - the toilets, treatment units, and holding tanks that handle vessel sewage. For the yacht and small-craft surveyor the primary reference is USCG 33 CFR Part 159, which governs MSD design, construction, and Coast Guard certification and defines three types: Type I and Type II treat and disinfect sewage before discharge, while Type III is a holding tank that retains sewage on board for pumpout ashore - the most common recreational arrangement. On inspected commercial vessels, 46 CFR marine-engineering rules add installation requirements on top of Part 159; for recreational boats, 33 CFR Part 159 plus ABYC installation standards govern.

Boat Materials & Hidden Defects

Term	What It Means
FRP (Fiber-Reinforced Polymer / Plastic)	The technical name for fiberglass and similar composite materials used to build modern boat hulls - strong fibers set in a plastic resin.
Laminate / Composite	A material built up in bonded layers (like plywood, but with fiberglass and resin). Most of the defects in this paper are problems between or within these layers.
Gelcoat	The smooth, colored outer coating on a fiberglass hull. It reflects and absorbs heat differently than other surfaces, which matters for thermal imaging.

Term	What It Means
Nonskid	The textured, non-slip surface on decks. Because it is often dark and rough, it soaks up sunlight far faster than smooth white gelcoat.
Antifouling	The coating (often dark) applied to a hull below the waterline to discourage marine growth.
Core / Coring	A lightweight inner layer sandwiched between fiberglass skins to add stiffness without weight. “Kerfs” and termination lines are the cut edges of this core material.
Delamination (Interlaminar Separation)	When bonded layers of the laminate come apart. A common structural defect the inspection is trying to find.
Disbonding	When the laminate skin separates from the core underneath, or from other bonded parts.
Void	An empty air pocket or gap inside the laminate where solid material should be.
Resin-Starved Laminate	An area where too little resin was used, leaving the fiberglass weak and poorly bonded.
Moisture Intrusion	Water that has soaked into the laminate or core. Wet material holds and releases heat differently than dry material, making it detectable with a thermal camera and a moisture meter.

Fiberglass & Composite Materials

Term	What It Means
Fiberglass	A composite made of fine glass fibers embedded in a plastic resin. Strong, lightweight, and rot-proof, it is the most common material used to build modern boat hulls.
Composite	Any material made by combining two or more different materials - here, strong fibers plus a plastic resin - to get properties (strength, light weight) that neither material has on its own.
Reinforcement	The fibers that carry the structural load in a composite - the “bones” of the laminate. Glass, carbon, and Kevlar are all reinforcements.
Matrix (Resin)	The plastic that surrounds and bonds the fibers together, transfers loads between them, and protects them from water and wear - the “glue” of the composite.
E-Glass	The most common glass fiber (the “E” originally stood for electrical). It is economical with good all-round strength, and is the standard reinforcement for the majority of production boat hulls.
S-Glass (S-2 Glass)	A higher-performance glass fiber (the “S” for strength/structural). It is roughly 30% stronger and stiffer than E-glass and more heat-

Term	What It Means
	and impact-resistant, but costs more, so it is used where higher performance is needed.
Carbon Fiber	An extremely stiff, strong, and lightweight fiber used in high-performance hulls, masts, and components. It is expensive, relatively brittle, and electrically conductive.
Kevlar (Aramid Fiber)	A lightweight fiber prized for outstanding impact and abrasion resistance, used for tough, puncture-resistant hulls. It is weak under compression, absorbs moisture, and is difficult to cut and machine.
Polyester Resin	The most common and economical boatbuilding resin. Easy to use, but more prone than others to absorbing water and developing osmotic blisters over time.
Vinylester Resin	A tougher, more water-resistant resin that sits between polyester and epoxy in cost and performance; often used as a barrier layer against moisture.
Epoxy Resin	The strongest resin, with the best adhesion, lowest shrinkage, and highest water resistance. It is more expensive and is the resin of choice with carbon fiber and Kevlar and in high-end builds and repairs.
Chopped Strand Mat (CSM)	A reinforcement of short glass fibers laid down in random directions. Inexpensive and easy to saturate with resin, it provides moderate strength and bulk.
Woven Roving	A heavy woven glass cloth used to build up thickness and strength quickly in a laminate.
Laminate Schedule	The “recipe” for a laminate - the specific sequence, type, and orientation of fiber layers and resin used to build up the hull to its designed strength.
Sandwich (Cored) Construction	A laminate built with a lightweight core between two fiberglass skins, giving great stiffness for very little weight - like the two skins and foam of a surfboard.
Balsa Core	An end-grain balsa wood core that is stiff and light, but can rot and lose strength if water gets past the surrounding laminate.
Foam Core (PVC / SAN)	A closed-cell plastic foam core used as a rot-proof, lightweight alternative to balsa.
Tabbing	Strips of fiberglass that bond an internal part (such as a bulkhead) to the hull. “Disbonded tabbing,” noted in the paper, is a defect where that bond has failed.
Osmotic Blistering (Osmosis)	Blisters - sometimes called “boat pox” - that form when water seeps through the gelcoat and reacts inside the laminate. A common moisture-related defect in older fiberglass hulls.

Term	What It Means
Vacuum Infusion (VARTM)	A modern building method that draws resin through dry fiber layers under vacuum, producing a stronger, lighter, and more consistent laminate than traditional hand layup.

Thermal Imaging Methods

Term	What It Means
Infrared Thermography (Thermal Imaging)	Using a special camera to see and measure heat patterns across a surface. Warm areas and cool areas show up as different colors or brightness, revealing things the eye cannot see.
Thermogram	A single thermal image - the picture produced by the infrared camera.
Passive Thermal Imaging	Looking at an object "as-is," with no added heat, and reading its natural heat patterns. Works best when the structure is calm and evenly warmed (early morning or overcast).
Active Thermal Imaging (Active Thermography)	Deliberately applying a controlled heat source, then watching how the heat spreads. Defects interrupt the heat flow and show up clearly. This is the paper's preferred, most reliable method.
Thermal Stimulus / Excitation	The heat that is applied to the surface to make hidden defects reveal themselves. "Controlled" excitation (e.g., a propane heat tool) can be measured and repeated; sunlight cannot.
Solar Loading	Heat absorbed from the sun. The central problem of the paper: sunlight heats surfaces unevenly and unpredictably, masking real defects and making results unreliable.
Thermal Equilibrium	The state where an object has settled to an even, stable temperature with no leftover heating from the sun or another source. Passive inspections require this baseline.
Pulsed Thermography	An active method using a brief, intense flash of heat, then imaging as the surface cools. Good for thin layers and shallow defects.
Lock-In Thermography	An active method using a rhythmic, wave-like heat source to detect deeper hidden flaws.
Step Heating	An active method applying steady heat over a longer time, useful for thicker laminates.
Ultrasonic / Vibration Excitation	An active method that shakes the structure with sound or vibration, creating friction heat at cracks so they show up - useful for finding dry delamination.

The Physics Behind the Measurement

Term	What It Means
Emissivity	How efficiently a surface gives off heat as infrared energy, on a scale from 0 to 1. The thermographer must set this value correctly for accurate readings - but different surfaces (dark nonskid vs. white gelcoat) have different values, which sunlight makes even harder to pin down.
Blackbody	A theoretical perfect emitter of heat, used as the reference point for emissivity.
Reflected Temperature (T-Reflect)	A correction that accounts for heat bouncing off a surface rather than coming from within it. Under solar loading this correction breaks down, because the sun's reflected energy fools the camera into reading surfaces as hotter than they are.
Thermal Conductivity	How easily heat travels through a material. Defects conduct heat differently than sound material, which is what makes them visible.
Thermal Diffusivity	How quickly heat spreads through a material. Fiberglass spreads heat slowly, which limits how deep sun-driven heat can reach before the imaging window closes.
Thermal Gradient	A difference in temperature across a surface or through its depth. Sunlight creates false gradients unrelated to real defects.
Thermal Anomaly	A spot that reads hotter or cooler than its surroundings. It may signal a real defect - or, under sunlight, may be a false alarm caused by surface color, reflections, or shadows.
Confounding Variable	Any uncontrolled influence - sunlight above all - that corrupts the results and makes it hard to tell real defects from noise.
Signal-to-Noise Ratio	How strongly the real defect "signal" stands out against background "noise." Controlled active heating gives a strong, clear signal; solar loading buries it in noise.
Specular Reflection	A mirror-like glare bouncing off a shiny or curved surface, which can create fake hot spots that look just like defects.
Thermal Shadow	A cooler patch created where something blocks the sun, which can be mistaken for a defect.

Imaging, Reporting & Field-Verification Terms

Term	What It Means
Thermal Tuning	Adjusting the image's temperature range and settings so real detail is visible. A "poorly tuned" image hides useful information.
Color Palette	The color scheme used to display heat. The choice affects both detection and how believable a report looks.

Term	What It Means
Ironbow Palette	A warm orange-to-purple color scheme recommended for detecting defects in the field, because subtle heat differences are easy to see.
Grayscale (White Hot / Black Hot)	A black-and-white scheme recommended for formal reports, because it prints clearly and is free of misleading color bias. "Black Hot" (inverted) can make cool defects stand out.
Rainbow / Spectrum Palette	Colorful schemes that look dramatic but distort subtle heat differences. Discouraged for marine reports (though valid in fields like medical imaging).
Baseline	The reference thermal image, temperature, or moisture reading taken before testing, used for comparison. A dry-area baseline is essential when moisture metering.
Percussion Sounding	Tapping the hull in a systematic pattern and listening to the sound it returns. Solid laminate rings sharp and crisp; wet or delaminated areas sound dull or "dead." A simple, non-destructive check used to locate and confirm findings. (See the process description that follows.)
Phenolic Hammer	The small, hard plastic-resin hammer surveyors use for percussion sounding. Phenolic is hard enough to produce a clear, repeatable sound, yet soft enough not to chip or mar the gelcoat the way a steel hammer would.
Moisture Meter	A handheld device that gauges how much moisture is in the laminate, used to corroborate thermal and sounding results. The Tramex Skipper is the model most marine surveyors use.
Tramex Skipper	The marine moisture meter most surveyors reach for first. Made by Tramex, it is non-destructive - no pins or holes - and reads moisture right through the gelcoat. (See the process description that follows.)
Field of View (FOV)	How wide an area the camera lens can capture at once. A wide-angle lens covers more of the hull in a single image.
Civil Twilight	The low-light period just after sunset or before sunrise - a good time to image because the sun's heating has faded.

Field Technique: Phenolic Hammer Percussion Sounding

Percussion sounding is one of the oldest and most trusted hands-on methods a surveyor uses to judge the condition of a fiberglass hull bottom. The surveyor taps the surface with a phenolic hammer - a small mallet made of hard, dense plastic resin - and listens closely to the sound each tap returns. Phenolic is chosen deliberately: it is hard enough to produce a clean, consistent acoustic response, but softer than steel, so it will not chip, dent, or mar the gelcoat during the hundreds of taps a full hull survey requires. Some surveyors use a small coin or a plastic-faced hammer for the same reason.

The method works because sound travels differently through solid material than through flawed material. Where the laminate is dry, intact, and well bonded, the tap transmits cleanly through the full thickness of the hull and comes back as a sharp, bright, high-pitched “ring” or “click.” Where the laminate is delaminated, disbonded from its core, hollowed by a void, or saturated with moisture, the separated or water-logged layers no longer vibrate as one solid piece. That tap comes back dull, flat, and low - a “thud” or a “dead” sound. A trained surveyor’s ear picks up this change in tone instantly, even before any instrument is brought out.

In practice, the surveyor works methodically across the entire hull bottom in an overlapping grid, tapping every few inches so no area is missed. Suspect zones that ring dull or dead are marked - often with chalk, tape, or a grease pencil - to map the extent of the affected area. Because percussion sounding pinpoints where a problem is but not exactly what it is, the surveyor then cross-checks each flagged area with a calibrated moisture meter and with infrared thermography, and where warranted, with physical core sampling.

Field Technique: FRP Moisture Metering with the Tramex Skipper

The moisture meter marine surveyors most commonly use on fiberglass (also called GRP or FRP) hulls is the Tramex Skipper, made by Tramex Ltd. It is a non-destructive instrument - it reads through the gelcoat with no pins, no holes, and no damage to the hull. The surveyor simply presses the flat sensor plate on the base of the meter against the hull and takes a reading.

Rather than sensing water directly, the Skipper works by non-destructive impedance measurement. Coplanar electrodes on the base send a low-frequency signal a short distance into the laminate, and because water is far more electrically conductive than dry fiberglass, the meter reads the change in impedance the moisture causes. That reading is shown on a comparative scale (0 to 100 for GRP, plus a percentage scale for wood). Salt water conducts more electricity than fresh water, so the Skipper has selectable sensitivity ranges that let the surveyor test a hull correctly whether it has been lying in fresh or salt water.

A key strength of the Skipper is its dual-depth capability, provided by a three-electrode array. It reads at a shallow depth of about 3/8 inch (10 mm) and a deeper depth of about 1¼ inches (30 mm). Comparing the two tells the surveyor whether moisture is sitting just beneath the gelcoat or has penetrated deeper into the laminate or core - an important distinction on sandwich and cored structures, where trapped water can lead to core rot or disbonding.

Because the Skipper gives comparative (relative) readings rather than a true absolute percentage, surveyors use it by comparison. They first establish a baseline on an area known to be dry - typically higher on the topsides or a section long out of the water - then work a grid across the hull bottom, comparing each reading against that dry reference. Areas that read consistently and clearly higher are flagged as suspect for elevated moisture. Timing matters: readings are most meaningful soon after haul-out, before the surface begins to dry, since deeper moisture leaves the laminate far more slowly than the surface does.

As with percussion sounding, no single meter reading is conclusive on its own. Elevated Skipper readings are cross-checked against dull percussion sounds and thermal anomalies, and the most defensible conclusions come from all three methods agreeing - the layered, corroborated approach the paper recommends throughout.

Comparing the Three Verification Methods

No single method tells the whole story. Surveyors use these three together, letting the strengths of one cover the blind spots of another.

Method	What It Detects	Strengths	Limitations
Percussion Sounding (phenolic hammer)	Delamination, disbonding, voids, and large moisture-saturated areas - anything that changes how the hull rings.	Simple, fast, and free; needs no power; pinpoints the location of a flaw well and flags hollow or dead areas instantly.	Subjective - relies on the surveyor's trained ear. Tells you where a problem is, not exactly what it is or how deep, and can miss small or deep flaws.
Moisture Metering (Tramex Skipper)	Elevated moisture within the laminate and core, at both a shallow and a deeper level.	Non-destructive and quick; gives comparative readings plus a sense of depth; excellent for mapping the extent of wet zones.	Comparative, not an absolute percentage; affected by surface water, coatings, and fresh vs. salt water; best soon after haul-out; does not show structural separation directly.
Infrared Thermography	Moisture, delamination, disbonding, voids, and core damage that appear as heat-pattern anomalies across a broad area.	Covers large areas fast; produces a visual record for the report; with controlled active heating, can reveal subsurface detail the other methods miss.	Requires skill and the right conditions; ruined by solar loading; needs controlled heat for best results; poorly tuned images can mislead.

Marine Batteries

Surveyors also assess a vessel's batteries. The main types differ in what they are built to do and how safely and easily they are maintained.

Battery Type	Description
Cranking (Starting) Battery	Built to deliver a large, brief burst of power to start an engine. It uses many thin plates for high “cranking amps,” but is not designed to be run down deeply.
Deep Cycle Battery	Built with thicker plates so it can be discharged well down and recharged many times. It supplies steady power over long periods for “house” loads such as lights, electronics, and trolling motors.
Dual-Purpose Battery	A compromise design that can both start an engine and handle moderate deep-cycle use - convenient on smaller boats with a single battery, but not as good at either job as a dedicated one.

Battery Type	Description
Wet Cell (Flooded Lead-Acid)	The traditional, lowest-cost battery, filled with liquid electrolyte. It must be mounted upright in a ventilated space and topped up periodically with distilled water, and it can spill or release gas.
Maintenance-Free / VRLA (Valve-Regulated Lead-Acid)	A sealed lead-acid battery that never needs watering. A safety valve vents only if internal pressure builds up. AGM and Gel batteries are the two main VRLA types.
AGM (Absorbed Glass Mat)	A sealed lead-acid battery whose electrolyte is held in glass-fiber mats. It is spill-proof, highly vibration-resistant, safe in enclosed spaces, charges quickly, and self-discharges slowly - a popular, reliable marine choice at a higher price than flooded batteries.
Gel Battery	A sealed VRLA battery whose electrolyte is a thick gel. Spill-proof and durable, but fussier about charging - it needs a lower, well-regulated charge or it can be damaged.
Lithium Iron Phosphate (LiFePO4 / LFP)	The safest lithium chemistry for marine use. Compared with other lithium types it is far more stable and much less prone to overheating or fire. It is very light, lasts for thousands of charge cycles, can be discharged deeply, and recharges fast. It costs more up front and relies on a built-in Battery Management System (BMS) to keep each cell safe.

Battery Comparison Chart

Cranking, deep-cycle, and dual-purpose describe a battery's job; the rows below compare the four constructions those jobs come in - by how they are best used, maintained, and what they cost over their working life. Cycle-life figures are approximate.

Battery Type	Best Use	Maintenance	Relative Cost per Life Cycle
Flooded (Wet) Lead-Acid	Budget starting batteries and basic house banks that can sit upright in a ventilated space.	Highest - check and refill water regularly, keep terminals clean, and ensure good ventilation.	Cheapest to buy, but the shortest life (about 300-500 cycles), so only moderate value over time.
AGM (Absorbed Glass Mat)	Sealed starting and deep-cycle use, including enclosed spaces and high-vibration installations.	Very low - sealed and never needs watering; just keep it charged and terminals clean.	More than flooded up front, with a medium life (about 400-700 cycles) - a moderate cost per cycle.
Gel	Sealed deep-cycle use where slow, steady discharge and durability matter.	Very low - sealed and no watering, but it must be charged with a gel-compatible charger.	Priced at or above AGM; good deep-cycle life if charged correctly - moderate cost per cycle.

Battery Type	Best Use	Maintenance	Relative Cost per Life Cycle
Lithium Iron Phosphate (LiFePO4)	Premium deep-cycle house banks (and increasingly starting) where light weight, long runtime, and fast charging pay off.	Lowest - sealed, no watering, and an onboard BMS manages the cells; mainly avoid charging in freezing cold.	Highest to buy, but by far the longest life (often 2,000-5,000+ cycles), giving the lowest cost per cycle over its life.

Marine Corrosion

Metal fittings, fasteners, shafts, and hardware all corrode in the marine environment. Surveyors watch for several distinct types.

Corrosion Type	Description
Simple (General / Uniform) Corrosion	The slow, even breakdown of a metal as it reacts with air, moisture, and salt - for example, steel rusting or aluminum oxidizing evenly across a surface. It is the most predictable type and is managed with coatings and routine upkeep.
Galvanic Corrosion	When two different metals are electrically connected in seawater, they act like a battery: the more “active” (less noble) metal corrodes faster while the nobler metal is protected. A classic marine problem - for instance, an aluminum part wasting away next to bronze.
Dissimilar Metal Corrosion	Another name for galvanic corrosion, describing its root cause: two unlike metals in contact through seawater. Where each metal sits on the “galvanic series” decides which one sacrifices itself - the reason fasteners and fittings should be matched or isolated.
Electrolytic (Stray Current) Corrosion	Corrosion driven by stray electrical current - from wiring faults, shore power, or a neighboring boat - leaking through the water and forcing metal off a fitting. Unlike galvanic corrosion, it comes from an outside power source and can destroy metal alarmingly fast.
Pitting Corrosion	A localized attack that bores small, deep holes (pits) into an otherwise sound surface. It is common in stainless steel starved of oxygen, such as under fittings or in stagnant water, and is dangerous because the surface can look fine while damage runs deep.
Crevice Corrosion	Localized corrosion inside tight gaps - under washers, gaskets, or marine growth - where trapped, oxygen-starved water turns aggressive. Closely related to pitting and, like it, a frequent problem on stainless steel.
Sacrificial Anode (Zinc) / Cathodic Protection	Not a form of corrosion but the defense against it: a block of a more active metal (zinc, aluminum, or magnesium) bolted to the

Corrosion Type	Description
	hull or shaft that corrodes first, protecting the valuable metal. Surveyors always check anode condition - a wasted-away anode means the boat is next.

Determining a Vessel's Value

Establishing a vessel's fair market value is central to valuation and insurance (C&V) surveys. A surveyor rarely relies on a single number; instead they triangulate several independent market sources and then adjust for the actual condition found during the survey.

Valuation Source	What It Is & How It's Used
BUC Value (BUCValu / BUCValuPro)	A long-established used-boat price guide published by BUC International. “BUC” stands for Boat Underwriters Calculator, and the BUC guides have been an industry pricing standard since 1961. Using econometric models fed by dealer, broker, surveyor, and manufacturer reports, it produces baseline retail and wholesale value ranges for a given make, model, and year - a widely accepted professional starting point.
Soldboats.com	A subscription database (part of the YachtWorld system) of boats that have actually sold, showing the asking price, date sold, and the real selling price. Because it reflects what buyers truly paid - not just asking prices - it is strong evidence of real market value, though it only captures boats listed through that network.
Current For-Sale Listings	Active listings of the same or similar make and model on the open market (YachtWorld, Boat Trader, broker sites). These show current asking prices and how much comparable inventory is available, signaling market demand - bearing in mind that asking prices usually run higher than final selling prices.

No single source sets the value on its own. The surveyor gathers comparables from these sources to establish a market range, then positions the subject vessel within (or outside) that range based on the survey findings - its actual condition, equipment, upgrades, deficiencies, and needed repairs. A well-maintained, updated boat may sit at the top of the range, while one with deferred maintenance, corrosion, or moisture problems falls below it. The result is a defensible fair market value supported both by market data and by the documented condition of the specific vessel.