

15 Things you never want to see on a yacht

Boat surveys can reveal all sorts of horrors. Ali Wood learns about some of the worst from marine surveyor Ben Sutcliffe-Davies

Leisure boats don't need to pass an MOT. You can buy one tomorrow, sail it away, and if it sinks because a skin fitting shears off, or if it explodes because of a gas leak, then that's your bad luck.

Caveat emptor – buyer beware – applies when it comes to buying a boat, as the RYA explained in last month's PBO. There are unscrupulous sellers out there who



Marine surveyor Ben Sutcliffe-Davies

think nothing of slapping a bit of filler and paint over a serious fault. Marine surveyor Ben Sutcliffe-Davies has seen it all.

What you can – and should – do, is commission a marine survey. Even if the boat's asking price is less than the cost of a survey, you could save yourself a hefty boat disposal fee, injury or worse.

Ben has spent more than 30 years surveying boats, and discovering faults that 'push ignorance to new levels'.

"My old dad was a suspicious man," he says. "He always used to take a magnet with him when buying a car to see if they used filler. Well, I do the same with boats – only it's a thermal imaging camera."

So, what kind of problems does a marine surveyor uncover when checking over a boat?

Ben pierces an osmotic blister



1. Osmosis

"You are less likely to see osmosis on modern production boats because of the types of resins used," says Ben. "Older boats use basic polyester resin and the chopped strand mat, that has end-filaments, soak up water for years".

Ben recently surveyed a 1980s motorboat with osmotic blisters. When he

Ben's motley assortment of boat bit failures he's collected over the years



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'The hull sagged when the full weight of the boat was lowered back down onto the keel'

You can see the hull sagging over the keel in this image from Ben's YouTube video



Fracturing and corroded keel studs



Water coming from the hull to keel joint

put his Gerber knife into one of the really deep blisters, over 5-6mm deep, the glycol could be seen coming out. The blisters were so severe that the only solution would be to have the boat fully peeled, hot-vacced, and given at least two or three coats of laminate, at a cost of £30,000... plus months of drying time.

"The boat was only worth £30,000. What's sad is it looked lovely too," says Ben.

Although a blistered hull might not seem all that bad at first, the high moisture will make the laminate softer, which could result in the boat sinking. Ben has seen hulls that are so soggy they slump over the strops when lifted out and the keel flexes easily.

2. Keel movement

When you park your boat on a rock or sandbank, the keel can be forced upwards, causing delamination. A bad sign is when the boat is lifted and water escapes from corrosion in the keel-to-hull joint.

Ben surveyed a yacht in the Ionian, and found the lead keel had suffered 'a hell of a whack!' from hitting rocks. The lead at the bottom was damaged and the glassfibre (woven rovings) delaminated at the joint. Another telltale sign of keel movement is the shape of the hull, which you can sometimes see sagging where it overhangs the back of the keel.

In an extreme case, which Ben filmed for his YouTube channel (The Marine Surveyor Notebook) he could see daylight where the keel detached slightly during lift-out. The hull then sagged when the




The floor of this yacht has buckled due to pressure from the keel during grounding

full weight of the boat was lowered back down onto the keel. Gaps like this will undoubtedly lead to crevice corrosion in the fastenings, so it's important that new keel fastenings are fitted before the boat goes back in the water.

Surveyors will often remove the antifouling fore and aft of the keel to take a better look at the stress points, especially as owners have been known to try to hide faults. Ben attended a survey once where the owner had suffered a bad grounding. He had attempted to hide it by forcing lead into the keel joint and then used copious amounts of Sikaflex to mask the problem.

3. Internal matrix damage

Grounding damage can also be spotted inside the boat. In the previous example, an inspection of the internal keel matrix revealed all sorts of red flags such as corroded keel studs, gel coat crazing and fracturing on the foot of the compression post. Ben also noted signs of buckling and hogging - where the front and aft of the boat are lower in the water than the middle. The impact was so severe that it separated the internal pan moulding away from the hull which was obvious around the seacock fittings.

Not only will the keel need to be removed and repaired but the internal 



LEFT Water ingress to a balsa core deck. Not a good sign if you can flex it easily with your hand!



LEFT When changing deck fittings on a balsa core deck, preferably an internal plywood patch should be glassed in

'Gas safety isn't just about ensuring bottles and pipes are secure and the gas is turned off'

This narrowboat locker is far too corroded to carry gas bottles

matrix will also require reconstruction.

"You can see fracturing on the gel coat where a boat has been flexed and you might see it inside where it's torn from the matrix. Some people paint the bilges to try and hide it!" warns Ben.

As well as removal and repair of the keel, the whole matrix will need to be cut out, repaired and glassed back in, depending on severity.

"If your boat's grounded, replace the keel bolts too," advises Ben. "Don't re-use them, even if they look OK. Roll them across the table and you'll soon see they're not!"

4. Soggy decks

Are the decks springy? Sandwiching balsa in between glassfibre layers creates a stiff, high-strength composite without adding a lot of weight. However, once water gets in – often through a leaky fitting – the deck can be ruined.

"Balsa core is lightweight but it has to be properly fitted and bonded in," says Ben. "When people drill holes in it for skin fittings, discharges, gas lockers, etc it absorbs water beautifully!"

Sometimes the deck is so springy that Ben can flex it simply by pushing down on it.

"I'm not a great fan of balsa core decks," he says. "When you get water into the decks the whole deck pumps up and down. So how can we solve this? Remove the balsa core from the internals and reinforce with suitable pads from the underside glassed in."

Ben surveyed a Westery last year, and although the owner had tried to keep up with maintenance – having just replaced the keel bolts – he failed to notice the poor state of the hull.

"The laminate was so soft that it just absorbed the keel bolts and the keel fell off when it was on the mooring. The boat just started leaning over and sank!"

Always check your deck fittings are properly sealed, as this is a common way for water to enter the boat.

5. Peeling teak decks

Teak also has its problems. "The best way to survey teak decks is to throw water over them," says Ben.

Ben then uses a hammer to tap the decks, listening for a change in the sound to indicate water ingress.

Sometimes the water will squirt right out, and in extreme cases, Ben can lift the entire deck, as has happened in this case when the sealant came loose and the owner neglected to rectify it.

"It probably started as just a small corner, but because it wasn't resealed straight away it's now lifting quite spectacularly," says Ben.

Sometimes teak decks are laid over balsa core. Ben recalls surveying one 45ft GRP yacht – worth £25,000 – where the quote for replacement balsa was £25,000 and the teak £30,000.



The seal has come loose here and the teak decking has detached from the substrate

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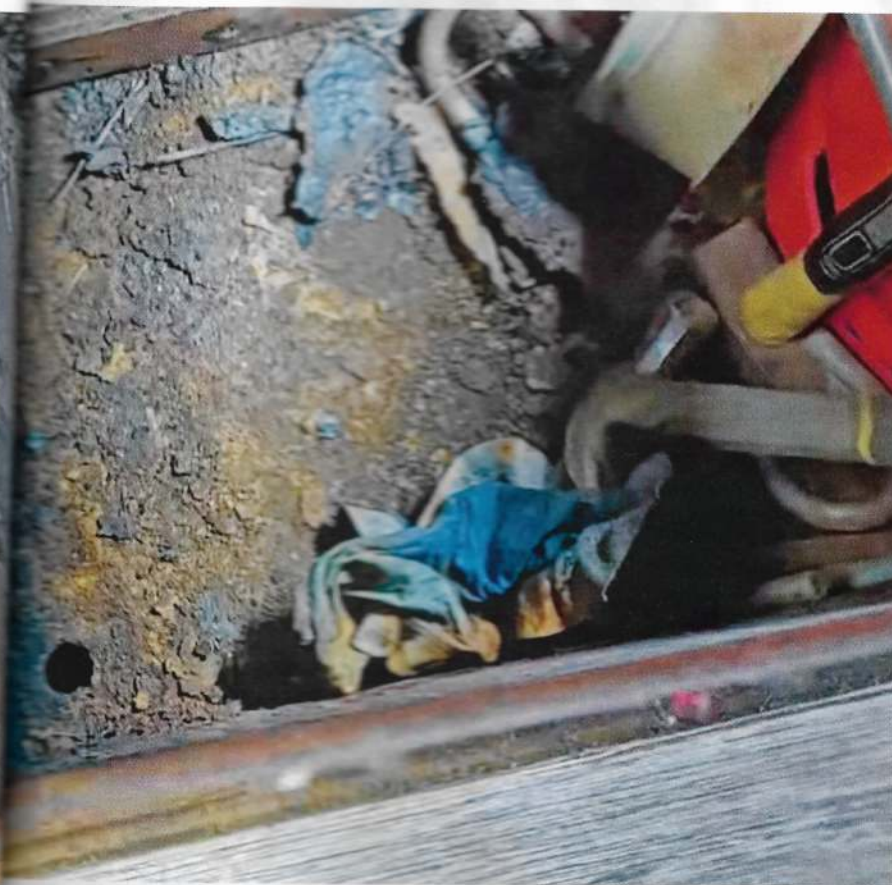
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BELOW RIGHT The top of this engine mount had detached from the bottom

"Quite often I find engine mounts that are 20-30 years old."

During surveys, he'll stick a pry bar under the mount to see if it moves. While a little movement is to be expected, anything more could spell disaster.

"When you open the throttle, all the load pushing the hull along goes through the mount," he says.

"Mounts are susceptible to diesel and water leaks. Diesel can damage the joint with the rubber, and water can lead to corrosion."

So do check your mounts, especially after catching a rope around the prop, which exerts extra force on the mount.




9. Rudder issues

The best time to check your rudder is when the boat comes out of the water. Rudders, like keels, are prone to get a knock now and then, but be careful, because damage can lead to water ingress.

Ben will give the rudder a wiggle and pump the blade fore and aft, often resulting in water oozing out of the blade, where the stock is passed into it. He can also check the moisture content with a moisture meter.

A rudder can appear reasonably intact even when it has a very high level of moisture. It's a common problem on yachts and often the solution is to drop the blade, split and replace the wet core, using an epoxy film filler.

During a survey, Ben will also tap the rudder with a ball-pein hammer. If he hears something a bit suspect the next step is to use his thermal imaging camera. He recalls an incident where visually there was nothing wrong with the rudder. He took photographs and found evidence of a split under the epoxy coating. It was 

6. Rusty gas locker

Gas safety isn't just about ensuring the bottles and the pipes are secure and the gas is turned off. A watertight gas locker is essential. If you don't know if yours is watertight, throw a bucket of water inside and let the water fully drain overboard, making sure that the drain pipe doesn't hold water. If it leaks out into the bilges, so will any escaped gas and that's bad news (you can see an example of Ben doing the bucket test at pbo.co.uk/bucket).

"It doesn't matter what type or age of boat you've got, this is something you can always do with any gas locker," he says.

In steel gas lockers, be aware of corrosion which you can test by a small knock with a hammer. In one particular boat, the gas safety certificate was obtained just months earlier but the base plate was badly rusted over and crumbling.

"If I hit that with a hammer it would go straight through," says Ben. "The gas compartment is over the engine, where you've got an alternator, a starter motor... if the gas leaks you'll have an inland waterway bomb. Please check your gas locker. It's simple!"

7. Faulty gas regulator

Ben has removed the gas oven from his own boat and switched to using a diesel cooker. However, he recalls a narrow escape for a nearby boat in Corfu.

"There was an almighty bang. The gas regulator had failed," he says. "The 10-year-old fitting was surging high-pressure butane out of the Campingaz

bottle and into the cockpit. I ran over, whizzed the gas bottle off, chucked it in the water, jumped below and switched off the electrics. I then got the owner to hand-pump the bilges with a Whale pump."

On inspection, the gas hose looked to be out-of-date and there was a kink in it. The bottle's seal had jammed from the regular pin stuck inside the ball bearing seal.

"The guys on board the vessel were very lucky!" says Ben. "Always check gas regulators and change them at least every 10 years."

8. Worn engine mounts

"None of us really appreciate the importance of an engine mount," says Ben.



This pressed alloy gas regulator fractured, causing high pressure gas to escape from the bottle; this could have caused an explosion

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denser than the laminate, which was why it showed up.

"It's like when you get an x-ray of a tooth done at the dentist," says Ben.

"A thermal imaging camera is really good for showing up all sorts of things, such as where repairs have got filler under the paintwork"

10. Corroded seacocks

Corroded skin fittings and seacocks are a notorious cause of sinking and fierce debate among boat owners, many of whom insist their old brass or DZR (dezincification-resistant brass) ones are fine. Ben begs to differ.

"I have seen a number of boats over the years that have sunk due to skin fitting failures, especially in sub-zero temperatures where the water is frozen in them," says Ben. "DZR – I absolutely hate the stuff!"

Historically, seacocks were made of bronze, but in the 1980s European boatbuilders switched to DZR or brass fittings to save money. The RCD (Recreational Craft Directive), introduced in 1998, stated that seacocks and skin fittings need only last five years! DZR contains around 30% zinc and was developed for the domestic plumbing market. If you have DZR fittings, especially in a marina where there are a lot of stray currents from shore power, there is a risk of corrosion, especially if they are bonded.

Ben has even had skin fittings snap off in his hands. While bronze is a good – albeit expensive – option, Ben recommends composite fittings such as those made by TruDesign and Marelon, which require less maintenance.

Naturally, a seacock means there's a hole in your boat, so if you don't need that hole, glass it up, says Ben.

"Also, why on boats do you find every seacock open, especially through winter?" he adds. "You're playing Russian roulette."

Other common issues linked with skin fittings are not enough hose being pushed onto their tails, unclamped hoses or unsupported hoses which are prone to flex and then split.

11. Dodgy diesel heater

Cheap, Chinese-made diesel heaters are a well known danger that we've reported on a lot

in *PBO*. Last year Ben dealt with four fires caused by diesel heater failure.

"The exhaust is a big part of the problem," he says. "There's a press metal fitting which isn't airtight and a hole at the bottom for when it's fitted to a truck so that any water vapour can simply drop out the hole. In a yacht, any vapour that drops out is going to be carbon monoxide or exhaust gases which gather in the bilges."

On his YouTube channel, Ben demonstrates just how bad the unit is by sealing it with a bung and pouring water in

Water coming out of the top of the rudder stock



LEFT A corroded DZR seacock

RIGHT Dodgy diesel heater exhaust. This diesel heater exhaust is deadly. Don't ever fit one on your boat!



through the other side. The water drips everywhere!

"If you buy a boat, look at the exhaust system and make sure you don't have one of these fitted," he says, referring to a part he sourced from China. "Get rid of it, buy yourself a proper one that is suitable for marine use."

Ideally, this should be fitted by a professional. If not, make sure everything from the heater to the discharge is insulated (on top of that there's an aluminium conduit which needs to be double-insulated), it's not near anything flammable, is at least 2in away from the turn of a deck, and is fitted on a non-flammable flame system.

"Ensure the fuel line is either copper or ISO marked (740). There's a stop-tap at the tank, and where it's taking the air from, make sure there's no petrol or anything else flammable," adds Ben.

"Every cheap diesel heater kit you buy from the web is pitiful. They're not designed for marine use. People die from these – from fires and carbon monoxide poisoning – it's an absolute killer."

Ben recounts one incident where the boat owner fitted a diesel heater but it had no pick up for the diesel. He therefore drilled a hole in the fuel tank breather pipe and stuffed a hose in there. Every time he filled his diesel tank, diesel was going into his bilges! Diesel heaters need a separate feed to your fuel.

"I've seen people use a plastic jerry and plastic hose to feed a diesel heater," says Ben. "One boat I surveyed had the diesel heater installed in the cockpit locker next to the gas bottles and polyurethane ropes. You could see the scorch marks!"

12. Diesel bug

Diesel bug blocks filters and can cause engine failure. It grows at the interface of fuel and water, and if your fuel's been sitting in a tank for over six months, it could well be contaminated.

"Thirty five years ago, we never talked about diesel bug," says Ben. "However, since the introduction of bio-fuel, fuel management is essential."

He points out that fuel filler caps can be problematic. After a wet winter, Ben found a leaky deck filler on his own boat, which has led to diesel bug.

"The problem with the cap is that the



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Ben of props. The blade has high-pitch in good bonded dead can and hold even br



The frame that the saildrive sits on has come completely free of the hull

shoulders and O-rings don't seal very well, and even though we greased it this year, the O-ring has broken down, letting water into the tank."

Ben changed his cap for one that covers the whole of the deck fitting and has a completely watertight double-seal.

Note, also, that if your deck is balsa core, like Ben's, and you need to cut a recess for a new deck fitting, be sure to seal the edge with epoxy resin, glassfibre paste or a good sealant mastic to avoid water getting into the deck.

If water has made its way into your tank then you need to check and replace fuel filters and try to remove the water, either through a drain plug if there is one, or fit a pump such as the Marine 16 Diesel Dipper. If you can't get it out, a mobile tank cleaning company should be able to help.

13. Propeller damage

Propeller damage caused by dezincification is a common problem on yachts and powerboats. Poor—or no bonding—of the anode means that the prop itself corrodes when in contact with another metal, or its own alloy makeup.

Ben cites a 5-year-old powerboat he surveyed with twin engines and propellers. One propeller was correctly bonded to the anode, which had all but disappeared, but on the other side the anode had been painted over with antifoul so wasn't doing its job.

Ben used his ball-pein hammer on both props. The correctly bonded propeller blade had a nice ring to it—it sounded high-pitched and tuneful and looked to be in good shape. The one that wasn't properly bonded was, in Ben's words, "As dead as dead can be." The hammer sounded dull and hollow and the tips of the blade had even broken away where he hit them.

"That's total proof that this propeller has suffered completely from dezincification" he says. "I could even see the alloy pinking in the metal."

14. Out-of-date saildrive seal

Out-of-date saildrive seals are a common find in Ben's surveys.

People spend a lot of time debating when the O-rings, shaft seals and rubber boot should be changed.

Ben has a simple answer for this: "Change it when the manufacturer says you should! Some say five years, some say seven years. OK, so some people say they take it out later and it's perfect. But if your boat is worth £40,000 is it really a big deal to spend £1,000 when needed to prevent a disaster?"

In the past, Ben has found the saildrive frame has failed, where the sail drive leg sits. "What's concerning is that the saildrive ring wasn't bedded in on anything other than paste," he says.

15. Loose fuel lines and missing nuts

Far too often, Ben finds fuel lines that are not clipped on properly, allowing them to rub against sharp edges, or clips missing

LEFT A pitted and corroded propeller



on the gearbox. He regularly sees gearboxes that don't have a lock nut on the Teleflex or Morse controls. This can cause accidents where the owner thinks the boat is in neutral but it is actually still going forwards. In one incident, the owner ran into lock gates, causing £32,000 worth of damage.

Believe it or not, these are just a handful of the issues Ben encounters when he does a marine survey.

From white plastic fittings to split hoses, fractured engine manifolds and badly fitted rigging, there's plenty more to see on his YouTube channel the Marine Surveyor's Notebook.

Watch the videos of these ghastly survey findings at www.pbo.co.uk/15things