

Avoiding the Blister Blues

Good Detection and Communication Techniques Critical to Avoiding Complaints

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Hull blistering is a problem that has been with us for a quarter-century. One might think that over a period of twenty-five years this problem would have long since been solved, and no longer be much of a problem for surveyors. Unfortunately, our research reveals that the blistering of boat bottoms continues to be a growing source of complaints and lawsuits against surveyors. It seems to be one of those pernicious problems that just won't go away. In fact, the number of lawsuits against surveyors has actually increased dramatically in the last several years.

One of the reasons for the increasing numbers of complaints is clearly the result of both yards and independent contractors having stepped up their efforts in marketing blister repair solutions. Blister repair has become a big business and repairers are roaming around boat yards looking for blistered boats, seeking repair work. That can mean that if the surveyor doesn't find the blisters on a hull, these people probably will.

A Problem With a Solution Despite the numerous studies, research reports and magazine articles on the subject, there is not much concordance on the cause and effect of blistering. Most of the literature seems directed at repair solutions rather than how to prevent blisters from occurring in the first place.

The simple fact is that hull blistering is caused by the use of inferior materials and shoddy layup. As Lee Dana, former head of engineering at Bertram Yachts told the audience at the annual conference of the National Association of Marine Surveyors in 1985, hulls built with high quality resins don't blister. If builders want to build hulls that don't blister, all they have to do is "spend another ten dollars per gallon for resin," he said

This fact is well known, but rarely considered by surveyors or the boating public. If boat builders wish to build hulls with inferior resins, then they, not surveyors, should be the ones who pay the price with warranty complaints and law suits. Unfortunately, most complaints and lawsuits against surveyors occur with older vessels which are either out of warranty or the builder is no longer in business. Moreover, most warranties only warrant the first vessel owner, leaving the next buyer in the lurch, which explains why the surveyor ends up in a particularly vulnerable position.

The good news is that there are a number of things that surveyors can do to protect themselves. And, if you're not already doing them, this article offers some highly effective methods for protecting yourself against problems that rightfully belong to the boat builder.

The Genesis of Trouble My review of nearly a dozen complaints against surveyors shows that nearly all of them got into trouble because they (1) failed to locate existing blisters, or (2) failed to give adequate advice to the client. Most allege that the surveyor either did not inform the client of the presence of blisters at all, or that he merely mentioned their existence, but downplayed their significance.

In at least three cases, the client maintained that blisters got substantially worse shortly after the survey was conducted, a claim which is dubious at best. In one case, a client claimed that blisters appeared on an older vessel a year after a survey revealed that there were no blisters, the so-called "mystery blister syndrome." In another, it was claimed that blisters appeared only a few months later.

Frankly, it is hard to put much stock in the mystery blister syndrome. Although it is well known that blisters will change their profile considerably as a result of changing environmental conditions such as temperature, humidity and drying out after being hauled for a period of time, I've yet to see a case of deflated blisters that wasn't readily observable under proper conditions. Nor have I heard of any documented cases where blisters developed rapidly (The lone exception to this was Hatteras yachts which was known at one time to have used a grossly inferior gelcoat because they painted their hulls). The minimum development time in new vessels seems to be around three years but usually much longer.



There are three blisters appearing in this photo of a boat bottom which is very clean and smooth. Two of them are easily revealed by the fluids that leaked out after the boat was sitting for many weeks. But the blister at lower center is barely visible. All of these blisters were highlighted by good artificial lighting used to take the photo. Without that lighting, and absent the weeping, it would have been very difficult to locate these blisters. After wetting down with water, they became much easier to see. If the bottom were dirty, it's not likely that they would have been located.

One way or another, unless they don't mind footing the bill for what should be a boat builder's problem, surveyors need to take some well defined steps to protect themselves from becoming convenient targets for recovery of repair costs.

Obligation to Inform The failure to properly advise or inform a client can certainly be construed as malfeasance or negligence. This means that the surveyor is charged with the responsibility of making every reasonable effort to determine the presence of blisters, be they inflated or deflated, and advise the client accordingly. This does not mean, however, that under the definition of a survey, surveyors are charged with making a technical analysis of cause and effect. It does mean that they have duty to report on conditions that are discoverable or apparent to any other surveyor or expert who would be likely to find such conditions.

Economic Impact Regardless of the prevailing wisdom of the effects of blisters, whether they cause structural damage or not, it is well known that blisters are likely to cause an economic loss to the client, for which the surveyor can be held liable in the event that he fails to detect and advise. Yet a client may exhibit no concern for the existence of blisters, nor be interested in repairing them. The problem usually arises when the client goes to sell the boat. The new buyer may demand that the your former client reduce his price by \$6,000 to allow for blister repair. Or he may be approached by a hungry yard manager or repair outfit and given a litany of horrors on how blisters are destroying his boat. Either way, this is how a formerly unconcerned client can suddenly become a hostile adversary.



Without the dark weephole to announce its presence, this blister is not visible under ordinary conditions. It has very little raised contour and is only slightly revealed by a strong light played across it at a low angle. Yet tapping it with a coin clearly reveals the separation of the gelcoat by sound.

The Working Environment Many surveyors get in trouble because they encounter conditions that inhibit their ability to perform their work. For the most part, surveyors get so conditioned to working under extremely poor conditions that they no longer are even aware of how badly their work is hampered by a poor work environment.

We should first understand that courts rarely award judgments to plaintiffs for conditions that are entirely beyond the control of the defendant. They award judgments simply because the defendant failed to properly advise the client about what he could, or could not do. It is not too much for the client to expect the surveyor to advise him of the limitations of his service, particularly when it involves dangerous or costly conditions. Therefore, the principle to be applied under all such limiting conditions is to make sure that the client is properly advised of any factor that adversely affects the surveyor's ability to perform his function as the client expects him to do.

Secondly, surveyors run into trouble as a result of a failure to fully and accurately inform the client of the full import of any negative condition, whether by omission or misconstruction of any material fact. An example would be to say that blisters on a boat bottom are of no significance when, in fact, they may cost thousands to repair.

Third, surveyors also fall victim to the failure to give *timely* advice. As we know so well, brokers are eager to close the sale as rapidly as possible and clients often close a sale long *before* the survey report is even written. It is not enough to merely advise him of defects or limitations only by means of the written report. Whenever serious and costly defects are discovered, or the surveyor is seriously hampered in performing his work, it is imperative that the client be advised as soon as possible. Unless the surveyor does this, the client may have a legitimate complaint that he suffered a loss as a result of the failure to give timely advice.

How Blisters are Concealed I have yet to see a case of blistering that could not be detected by nondestructive methods, which is not to say that there aren't conditions that disguise them. Two of the most common hindrances are heavy paint buildup and dirty bottoms.

Once blistering occurs, the outer skin or gel coat becomes stretched and will never fully return to its original contour. The "hump" may be very slight, but if you are looking for it, you will find it. But to do so, the bottom needs to be clean and smooth. A bottom that is dirty and rough is not capable of giving off enough reflected light to show up the changes in contours so that the blister is likely to be obscured. If the bottom is not cleaned, or is extremely rough, the surveyor cannot do his job and therefore he must make this situation clear to the client, verbally and in writing.

A heavy buildup of paint that has a lot of flaking yields a very rough surface that is ideal for hiding blisters. Even so, this does not mean that if blisters exist they cannot be found. It just means that the surveyor has to look very close. Wet bottoms reflect more light and will show up blisters much better than a dull, dry bottom. You can visually sight the bottom immediately after it is pressure washed to take best advantage of this. Since boats that have been out of the water for a while are reported as most likely to have deflated

blisters, get a hose and wet the bottom. If the bottom is clean, no matter how shallow they are, the blisters will show up if you sight it carefully.

A third factor is the positioning of the vessel at the time of the survey. If the vessel is sitting too close to the ground, it becomes very difficult to get a good look at it. Another problem is when boats are hauled out inside of covered buildings where there is an inadequate light source. When encountering these conditions, its time to be extra cautious. One way or another, the surveyor has to overcome these obstacles or risk the consequences.



This is an example of severe ply separation. The peeled away ply here measures about 3 feet across. In this case the skin out mat was so dry that there was little bonding to the inner structural laminates. The whiteness clearly indicates how dry it is. This allowed the interface between the two plies to fill with water. While this is an extreme example, incomplete bonding to lesser degrees is commonplace. To make matters worse, it was not detectable by sounding, although there was a bit of a warning sign in that the whole hull sounded somewhat "dead." These were not blisters but water filled ply separations that do not appear to have been initiated by osmotic pressure but rather enhanced by it. Scraping with a knife below the gelcoat easily revealed the dryness of the fibers.

Sighting Careful sighting is a must. To sight the bottom in such a way as to best locate blisters, it is necessary to view the hull from many angles. This is not difficult, but it may mean a lot of duck-walking around so that one can use the available light to best advantage. A casual look at the bottom just won't do.

Weepholes and Deposits Some gelcoats are so weak that they are unable to sustain the buildup of pressure and the blisters rupture either before, or after they reach a significant size. Under these conditions, styrene fluids usually weep out of the laminate, leaving a telltale stain or bubbling deposit as shown in the nearby photos. The important point to bear in mind here is that the breach in the gelcoat is also allowing water to penetrate the

laminate, so that blistering is likely to be progressive. Since these are actually ruptured blisters, these telltale signs should not be ignored but rather reported as broken blisters that are just as significant as unbroken blisters.

Sounding Sounding a hull is an audible technique that requires a high degree of skill and finesse. We've seen surveyors attack hulls with a plastic hammer as though they were driving nails. That may turn up a severe delamination, but its not likely to reveal a small blister. Our experimentation with plastic hammers have determined that these are far from the best instruments to use to detect smaller flaws. For one thing, the impact surface is too wide. For another, plastic against plastic is not a very good combination for getting the best audible result. Blisters are most responsive to a small piece of metal, preferably steel, about the size of a silver dollar. Very light tapping with an instrument of this sort will do a much better job of audibly revealing differences in laminate thickness, particularly blisters.



Notice on this hull how the blisters run along a band about one foot below the waterline. Also note how they appear in clusters lower down on the bottom, and that some areas between clusters are not affected. Examples like these prove once and for all that blistering is not merely a function of material, but also a matter of the quality of the layup. On this boat, the areas of blistering are not random but area-specific and directly related to permeability of the laminate due to imperfections. Once again, the skin out mat was found to be poorly saturated. Photo at right contrasts the dry mat against the fully wetted out structural laminate.

Destructive Probing Should the surveyor break open, probe or scrape blisters? Certainly its useful to determine whether the underlying plastic has dissolved or whether there are substantial ply separations. But doing this falls in the category of destructive testing. Complaints have been made against surveyors who have gone too far in doing this. Its best to get the owner's permission before proceeding.

Because secondary bonding failures have been identified with large blisters, the surveyor can take one of two approaches. If he does not, or cannot engage in destructive testing, he

can simply warn the client of the possible implications. However, if he breaks the surface at all, at that point he needs to go all the way. Sliding a short, very thin blade such as a cheap steak knife or pallet knife into the blister and probing the circumference for ply separation will usually do the trick. If you can continue to force the blade under the skin out mat beyond the circumference of the blister, there is definitely a bonding problem.

On the other hand, if you cannot force it, that does not necessarily mean that there is not a secondary bonding problem. It could not exist at one location but appear in others. And since this cannot be done for all the blisters, this test can only be used to confirm positive results.

Lamination Problems Boats that display extreme numbers of, or numerous and very large blisters may be suffering from more than just water permeation through the surface coating. My studies of hundreds of blistered boats reveals that many boats that display very large blisters are also suffering from secondary bonding failures. Bonding failures that result in blisters usually occur between the gelcoat and skinout mat, or the skinout mat and the first layer of structural fabric, usually roving. The failure to bond can be due to environmental conditions (temperature and humidity), contamination, or excessive delay in the layup process. Whatever the cause, the result is an incomplete bond that provides an ideal environment for very large blisters to develop. When a vessel has numerous large blisters, secondary bonding problems should be suspect. For a more complete discussion of bonding failures, see article titled *Blisters Again?* on this site.

If the bonding of laminate is weak, you may be able to separate the skinout mat for very long distances, in which case you've got a serious bonding problem that no commonly accepted method of blister repair will solve. To remedy the situation, all of the loose laminate will have to be stripped off.

Describing Blistering It is important that the general parameters of blistering be adequately described. One way to describe blistering is to again use a grid and literally measure and count the number of blisters. Using a tic-tac-toe grid of one foot squares will yield nine squares that make it quite easy to count the number of blisters per square foot.

Since blisters do not always show up evenly over the bottom surface, but can appear in clusters or bands, it is probably best not to attempt to give an exact count, but rather to determine the density and state the condition in terms of *maximum density*, but not attempt to indicate specific sizes or locations. Attempting to describe the size of the area and specific density can be difficult and dangerous. This way, if the blistering spreads rapidly to other areas, the surveyor won't get caught short. In other words, it's better to overstate than understate.

Use a Camera If you're not carrying a camera and using it, you're missing out on a better insurance policy that you could ever purchase. Good photographs will stop most misinformed complaints dead in their tracks. Using a piece of chalk, write the boat name and date on the area to be photographed, and then snap a couple shots from a variety of angles.

If you are not expert at using a camera, then you need to practice until you become so. Bad photos won't help you much. Take multiple shots using different angles and lighting and learn which techniques work best. Use a flash in virtually all conditions except direct sunlight, especially when a subject is half-in, half-out of direct sun. Make sure your flash is illuminating the subject. With good quality modern cameras, auto exposures will work perfectly; there's no need to play with timing and f-stops anymore. But I would suggest avoiding using autofocus which does not always work well. Get in the habit of focusing manually.

Photos won't do you any good when, several years later you can't find them. Storing them in a file is not a good idea because they often fall out and get lost. I store photos and negatives in the lab's original envelope and then file them chronologically in shoe boxes, which are then labeled with the year. This makes for a very convenient method of locating them quickly.

Reporting One good approach is to develop a more or less standard statement dealing with the issues of blisters for every report on fiberglass boats, one which is modified to fit individual circumstances. A good statement is one which first informs the client that reinforced plastics are known to be unstable. It should state that the surveyor is not able to determine the nature of the plastics and reinforcements of which the hull is made, and therefore he cannot guarantee the stability or the performance of the laminate.

To make assumptions about a laminate is to take risks that we ought not take. To look at a hull and say, "Ah, fiberglass," is making an assumption that is not based on anything we really know. In truth, we have no idea of what that hull is made of, and could be an endless array of materials. Nor can we give any assurance of the quality of those materials.

It should be clearly stated that warranties of the hull are provided by the builder only, and that if there are any questions about existing warranties, the manufacturer should be consulted. It should go on to state that the surveyor has made every effort to determine the presence of blisters short of destructive testing, and that blisters were, or were not found. This, however, does not mean that blisters won't develop at a later date. It should be made clear that changing conditions may result in the sudden appearance of blisters where previously there were none. Finally, one should point out that latent blisters, or blisters in the very early stages of formation, or blisters which are depressurized and deflated may also exist, and which are not detectable by any means available to the surveyor.

When sighting the bottom, be alert for evidence of prior blister repairs which are often done shortly before the boat is sold. The reason for this is that the surveyor has no idea of whether a proper repair has been made. Often as not, the owner has just ground out the blister and filled the void with epoxy. In this case the blistering is very likely to continue and may come back to haunt the surveyor. The best way to protect yourself is to report all evidence of prior repairs and disclaim any guarantee that the blistering will not continue.

Interpretation Unless a surveyor is going to engage in some serious destructive testing and analysis, he really doesn't have any way of knowing what the presence of blisters

means. And for clients, the significance of blisters is an entirely subjective judgment. We've seen sailboat buyers go ballistic at the mere mention of blisters, while others may not care in the least.

When clients question the surveyor about the significance of blisters, the wise surveyor is one who knows that he doesn't know, and resists the temptation to speak when he shouldn't. In my view, the best approach is to advise the client that only a technical analysis based on destructive testing can answer that question, and that this is not included in the survey service. It is best to advise the client that a prepurchase survey is a condition and not an engineering analysis. If you wish to get involved in destructive testing, separate this service from the survey and set it up as a consulting service. Start a separate file and issue a separate report and billing, even if you end up doing it generally at the same time. This will help protect the surveyor from claims of a negligent survey.

Communications Learning to communicate fully and effectively with the client is a very good form of insurance. But there is a fine line to be walked between communicating facts and engaging in idle speculation. Engaging in speculative conversation may lead the surveyor to say things he didn't intend to say. On the other hand, several complainants told us that they were particularly miffed by a surveyor's lack of communication. Doctors are notorious for this and we all know what its like to visit a doctor with lock jaw. We feel cheated because our desire for information wasn't fulfilled. Our opinion of the doctor drops dramatically. Its very easy for the surveyor to fall into the same trap because his work is strenuous and he's usually exhausted by the time he's finished, thereby diminishing the effectiveness of his communication.

Obviously, the best way to communicate a blistering problem is to physically show the client what is there. Even if he doesn't want to, make him look at it with his own eyes. Make it standard operating procedure to show him the entire hull bottom. There is nothing like direct client involvement in a problem to head off disputes.

Remember that a client who seems unconcerned about blisters at the time he is purchasing a boat that has them, may develop other ideas later on. If he decides to sell a short time later, and is faced with a \$6,000 repair bill, its pretty obvious what is likely to happen if the surveyor hasn't adequately covered himself.

Keep Good Records Any time a problem case ends up going to litigation, nearly all experienced surveyors will tell you that they often end up falling victim to a universal shortcoming - the failure to keep good notes. Litigation usually occurs years after the surveyor's initial involvement, and long after his memory has faded. Thus, when a subpoena is shoved under his nose, he retrieves his file only to find that there's not much there to help him.

Because hull blistering is such a universal problem, any surveyor whose been in the business long enough is eventually going to be hit with some sort of complaint. Every one has bad days and makes mistakes, often as a result of circumstances beyond the surveyors control, such as being rushed or hindered by bad weather. Sooner or later, the surveyor will find himself caught short.

A marine surveyor can get no better liability insurance policy than by training himself to keep good notes. Of course its very difficult to do that on the job when there are so many distractions and difficulties. He can't take good notes while standing in the rain or on the deck of a bouncing boat. But he can train himself at every instance to review his work once back at the office, and to fill in or expand on those notes he did take while on the job. This is why photography can be so useful. It only takes moments to snap a picture of a condition that might take ten minutes to attempt to write up on paper or, worse yet, can't be written up at all because of adverse conditions.

We should bear in mind how lame our excuses are likely to sound when sitting in front of a jury