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Corrosion Protection

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The Publisher's Statements on *page i* of this Owner's Manual apply to this chapter. Please read before proceeding.

This chapter describes the bonding system that protects components against corrosion.

Major Topics:

The Bonding System

Viking 61FY has a bonding system to protect the vessel as much as possible from severe electrolytic corrosion of propellers, shafts, rudders, fuel tanks, etc. caused by electrical currents and warm seawater. Essential to the cathodic protection system is an 8 gauge green and yellow common bonding wire connecting protected components to two sacrificial zinc anodes, port and starboard under the hull.

Note:- The bonding wire must NEVER be connected to a current carrying DC ground.

Metal graphite bonding brushes running on the prop shaft inside the vessel protect the propellers and shafts by connecting them to the bonding system. The brushes must always be in good firm contact with the shaft, and running on a clean and shiny part of the prop shaft. If seawater salt deposits are under the brush there is no protection.

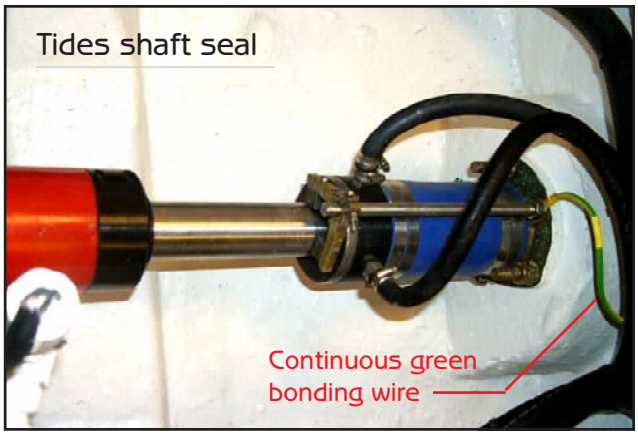
At some marinas metal in the docks and stray electrical currents in very warm seawater can cause severe corrosion and vessels normally docked there need special attention. Inspect zincs regularly and often (once a month may be necessary in electrically active waters). Shaft zincs are not recommended.

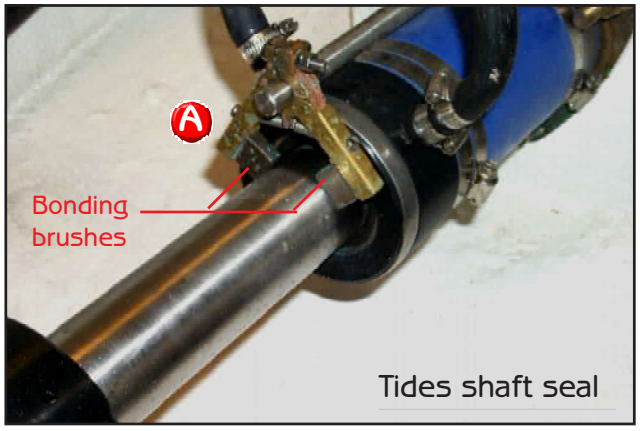
The vessel bonding system acts to reduce *both* galvanic and electrolytic corrosion. These processes, especially in warm seawater with elevated temperatures, quickly cause extensive corrosion to any of a vessel's unprotected metal fittings exposed to seawater.

Sacrificial zinc anodes

Zinc anodes must be replaced once they are half their original thickness. In Florida they have a short life, but it is essential they be replaced, or there is no bonding and the equipment they protect is at risk. Anodes are usually inspected and replaced by a diver unless the vessel is out of the water. Visual inspection should show signs of corrosion or pitting – if anode corrosion is not apparent the bonding system is likely not working and must be inspected without delay. A simple continuity test inside the vessel between the prop shaft and the two studs that hold the zinc to the hull will confirm whether there is continuity.

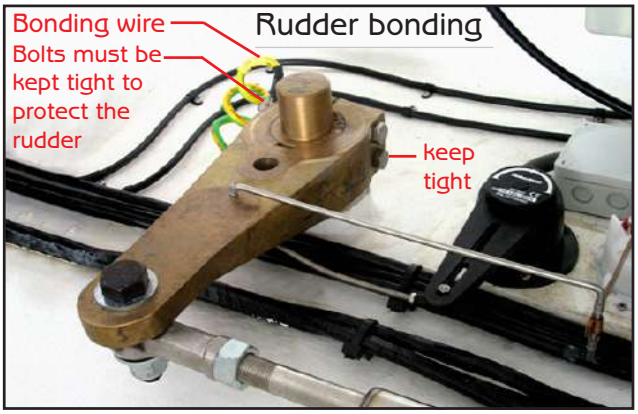
Whenever the vessel is out of the water for service check that anodes are not *excessively* corroded. If corroded, but not down to half-thickness, they can be somewhat rejuvenated: remove the zincs, clean them with a wire brush, clean off corrosion on the bolts, and reinstall. Never use anti-seize lubricants, sealants or pipe dope to install zincs. This would isolate them electrically from the metal they protect and corrosion would result. There must be a good electrical connection to the attaching bolts, which connect to the bonding wire inside the vessel.





To clean the shaft and brushes . . .

Gently lift the spring loaded brush arms A. The prop shaft MUST be clean and free of seawater deposits.



Running Gear Protection

Corrosion protection for the propellers, shafts and rudders starts with selection of the best components and materials to stand up to the severe warm salt water environment typical of Florida, where unprotected metal is quickly destroyed.

Prop shafts

Prop shafts are made by Teignbridge Propulsion Group in Devon, England. They are 60 mm (2.3 in) Temet boat shafting, precise to a tolerance of 0.003 inches out of round to reduce vibration when rotating at high speed.

Galvanic corrosion is minimized by use of a specially formulated metal that has a resistance to corrosion superior to stainless steel – ie., it is below stainless in the active and passive galvanic charts.

Propellers

Props are also by Teignbridge. They employ nickel-aluminium and bronze AB2, for high running speed and corrosion resistance. Props are 5-blade 30x42; shaft threads are 42x3.Struts attach to the hull with large bolts, with the nuts torqued down onto copper alloy backing plates B (also called "P brackets"). Attached to these are green bonding wires connected to the studs holding the zinc anodes on the outside of the hull. This affords corrosion protection to the running gear.

Zinc pencil rods

The MAN diesel engines and the Onan generator each have internal zincs which MUST be replaced as scheduled – refer to manufacturers' manuals for details. The ZF marine gear also has zinc anodes on the oil coolers, near the seawater inlet and outlet. Check annually or at 500 hours, or if seawater leakage occurs.

Tides Marine self-aligning shaft seals

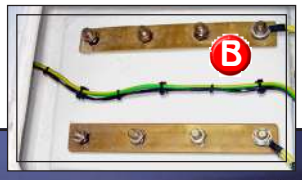
These comprise a simple nitrile lip seal on the shaft log that blocks seawater to keep it from entering the vessel. It is an important corrosion fighting strategy to prevent seawater entering the engine room as much as possible.

Bow thruster protection

The Side Power bow thruster has its own protection against electrolysis and corrosion. A zinc anode forms part of the attachment nut for the propeller. Check this for erosion whenever the vessel is out of the water, or have a diver inspect it when installing main zinc anodes on the hull. Do not ignore this anode, or corrosion will quickly attack the thruster and its propeller.

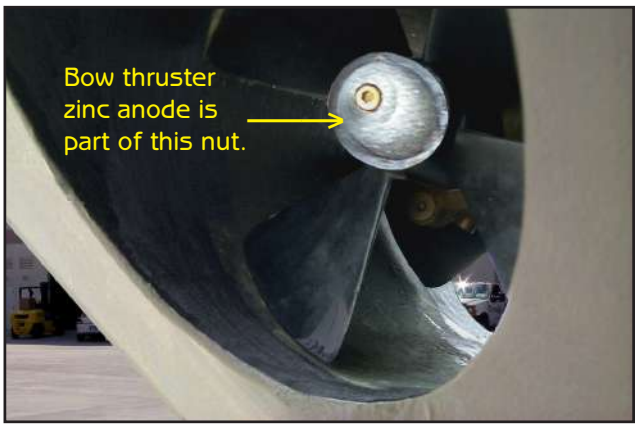
P brackets, B

Struts connect to bonding through these brackets



Teignbridge prop and shaft

Change internal zinc anodes on schedule



Bow thruster anode

Electrolytic corrosion

Stray currents are present at most marinas, and near other boats. A particularly strong source is shore power cords lying in the water – they cause severe corrosion, and are a safety hazard. At the docks themselves there are often metal reinforcing rods in concrete that lie in the water. These conduct stray currents that can cause a boat's zincs to erode quickly. Stray current corrosion is also caused by DC or AC current leaks from other boats around you. Aluminum is particularly susceptible to this – just look at some outdrives at a marina!

In the lazarette the two 15 kVA isolation transformers have a rated input of 100 amps @ 240 volts. Shore power coming aboard is isolated through the transformer windings from any direct contact with outside grounds. ONLY red, black and green are brought into the transformer. In effect, 240 volts AC ONLY goes into the primary winding of each transformer. 120 volt power is produced by the transformer. This isolation protects against stray currents and electrolytic corrosion that destroys underwater fittings.

In effect, the vessel has its own CLOSED CIRCUIT electrical system which also protects crew and passengers from potentially lethal electricity flowing through them to a shore ground.

The engines and generator have their own internal zinc anodes for protection of their metal parts, these MUST be maintained according to manufacturers' recommendations.

Stainless steel corrosion

All metals except gold, silver, titanium, and platinum corrode – some much more than others. Despite its name, stainless steel is also subject to corrosion because it is a ferrous alloy. 18/8 stainless, for example, is 67% iron, with 22% chromium and 11% of other metals added to make it more resistant to corrosion. The three types of stainless steels common in the marine industry are 302 or 18-8, used for screws; 304, used for stamped parts; and 316 or CF-8M, used for tubing, etc.

Though high up on the noble chart (-30 mV for resistance to corrosion), stainless steel WILL rust quickly in its natural state, particularly in the warm moist climate of Florida. For stainless to be corrosion RESISTANT it must be highly polished, plated, or electropolished in a number of ways during production. Unpolished stainless steel has iron or iron oxide sitting on the surface of the metal, but polishing brings the chromium to the surface. The more shine, the more resistance to corrosion.

If stainless is scratched, or cut and not polished at the edges, corrosion will result. Thus, if a screw driver bit slips on top of a screw, it will rust. And a hole drilled in stainless steel will corrode inside the hole unless protected by a watertight sealer.

When washing the vessel, never let water dry on the stainless. To avoid unsightly water spotting dry off stainless with a chamois.

Stanchions and rails must be kept clean, use a wax such as Collinites 850 cleaner/wax to further protect them.

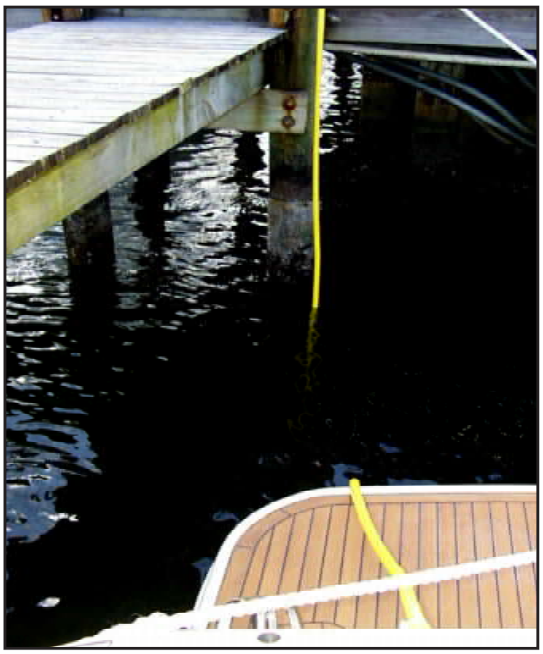
(optional model shown)

Isolation transformers

Isolation transformers effectively give the vessel a 'closed circuit" electrical system that is safe, and will not leak current and cause corrosion.

Onan generator

Internal zinc anodes must be changed on schedule.



A corrosion and safety hazard

A shore power cord in the water is a hazard to anyone in the water. The flow of AC current inside the cable will also make the vessel more susceptible to corrosion.

Components Attached to the Bonding System