



# U.S. Coast Guard

## Marine Safety Office, Portland, Maine



# SAFETY ALERT '01-03

## Steel Repair Considerations on Fishing Vessels



This safety alert is a reminder to follow proper procedures when repairing steel vessel structures.

Welding and cold working develops stresses within steel. If not properly relieved these stresses may cause the steel to distort or even crack. Like a small crack eventually extends across the windshield of your car, a crack that starts in a part of your vessel may propagate across the hull. Such a catastrophic failure may result in the loss of the vessel or worse, in the loss of life.

**Preheating:** Preheating a surface immediately before welding decreases the temperature difference between the base steel and the weld, and therefore reduces stress and distortion. This is especially important when working in colder temperatures during the winter. Preheating also creates a much slower cooling rate after the weld is deposited and reduces the amount of martensite (hardened steel) that forms near the heat-affected zone. Martensite steel is very hard and brittle and therefore has a tendency to crack.

**Preparation for Welding:** Before welding ensure that the surfaces are clean from water, paint, and any other foreign material and that any surface abnormalities such as nicks, and cracks, are removed. Failure to prepare the surface may result in a faulty weld. Joint surfaces should be beveled to ensure good weld penetration. Select the proper electrode with its parameters for use. Ensure that you wear appropriate personal protective equipment such as welding shades and leathers.

**Welding:** The welding techniques that you use may also affect the stress level and likelihood of post weld cracking. For example, intermittent welds cause less expansion and stress than continuous welds. Alternating intermittent welds on opposing sides of the work area has an even greater positive affect.

When a continuous bead is required try back welding. Back welding is laying short, successive beads moving from right to left, while the direction of the weld proceeds from left to right.

Before starting consult with a welding engineer to determine the most appropriate techniques to use.

**Postheating:** Regardless of the techniques used in welding, residual stresses are likely to remain. Re-heating or tempering the metal should relieve these stresses. Re-heating times and temperatures are based on the carbon content and thickness of the materials used.

Specific guidelines for welding can be found in *The American Bureau of Shipping Rules*, and in *The Metals Handbook* by the American Society for Metals. Additional repair considerations for steel hulls are identified in Coast Guard Navigation and Vessel Inspection Circular (NVIC) # 7-68. Other NVICs of interest to fishermen considering repairing their own vessels are #8-87 Repair of Fiber Reinforced Vessels, and #7-95 Repair & Maintenance of Wooden Hulls. These and other NVICs can be obtained on the Coast Guard's website <http://www.uscg.mil/hq/g-m/nvic> or by calling your local Marine Safety Office.

**For more information please contact:**

Commercial Fishing Vessel Safety, (207) 780-3256 / 3079  
USCG Marine Safety Office, 103 Commercial Street, Portland Maine, 04101  
<http://www.uscg.mil/d1/units/msoport/>