United States Coast Guard
Marine Safety Alert
Assistant Commandant for Prevention
Department of Homeland Security

November 21, 2006 Alert 5-06
Washington, DC

Structural Integrity of Propulsion Boiler Casings

Recently a Great Lakes bulk cargo vessel suffered a boiler tube rupture resulting in a boiler casing failure which injured two crewmembers. The tube failure was not unique and the boiler casing should have contained and channeled the steam out the stack.

An investigation revealed that the structural integrity of the inboard boiler casing was compromised and the increase in internal casing pressure caused by the flashing of water into steam and its expansion caused a portion of the casing to separate, allowing the steam and a mixture of soot, refractory and other debris to be released in the vicinity of the operating station. (Attachment detail 1) Investigators discovered a number of areas where the strength of the inboard casing was compromised.

The aft inboard corner of the boiler casing is constructed of three inch angle iron which runs vertically to the top of the boiler. Attached to it are the studs which hold the dogs that secure the inboard most door of the aft side. The bottom of the vertical run should be welded to a similar piece of three inch angle iron which runs transversely across the boiler front. The transverse leg of the angle iron remained attached but the vertical leg had been cut away during a previous modification and not refastened. (Attachment detail 2)

The inboard boiler casing at the intersection of the steam drum is not permanently attached. (Attachment detail 3) The edge of the casing is fitted into a flanged expansion joint. An inner flange is welded perpendicular to the drum surface and the outer half is bolted to it. The two flanges form a slot and the outermost casing edge fits within. This arrangement allows for drum movement due to thermal expansion of boiler components without damaging the casing. It also prevents the casing from moving in any direction. For reasons unknown, about 20 inches of the aftermost edge of the casing which should have been recessed into the slot was cut away; weakening the strength of the casing. This modification combined with the fact that the corner at the upper casing between the inboard and aft casing had been cut away, left the after portion of the upper inboard casing substantially unsupported. (Attachment detail 4)

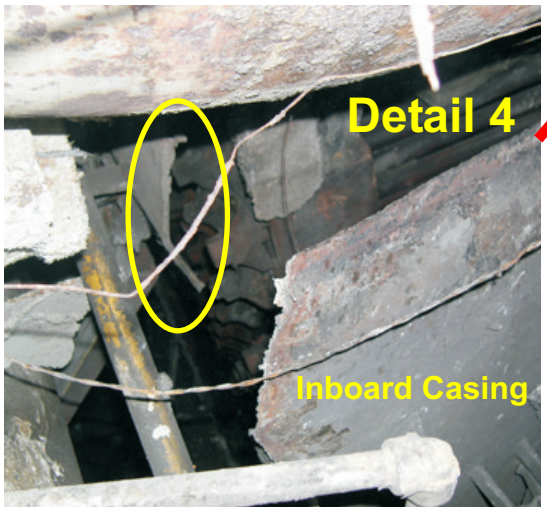
To prevent a similar casualty, the U.S. Coast Guard strongly recommends that owner operators of steam propelled vessels have their engineering staffs assess the structural integrity of their boiler casings; paying particular attention to support structure interfaces at the steam drum, front to side casing attachments and upper to lower casing transitions. It is also recommended that a thorough review of previous casing repairs be conducted to identify signs of diminished structural integrity. For U.S. flag vessels, any repairs necessitated by this assessment should be coordinated with the cognizant Officer in Charge Marine Inspection and Classification Society representatives to ensure that the equipment is reconstructed as originally designed and in accordance with good marine practice.

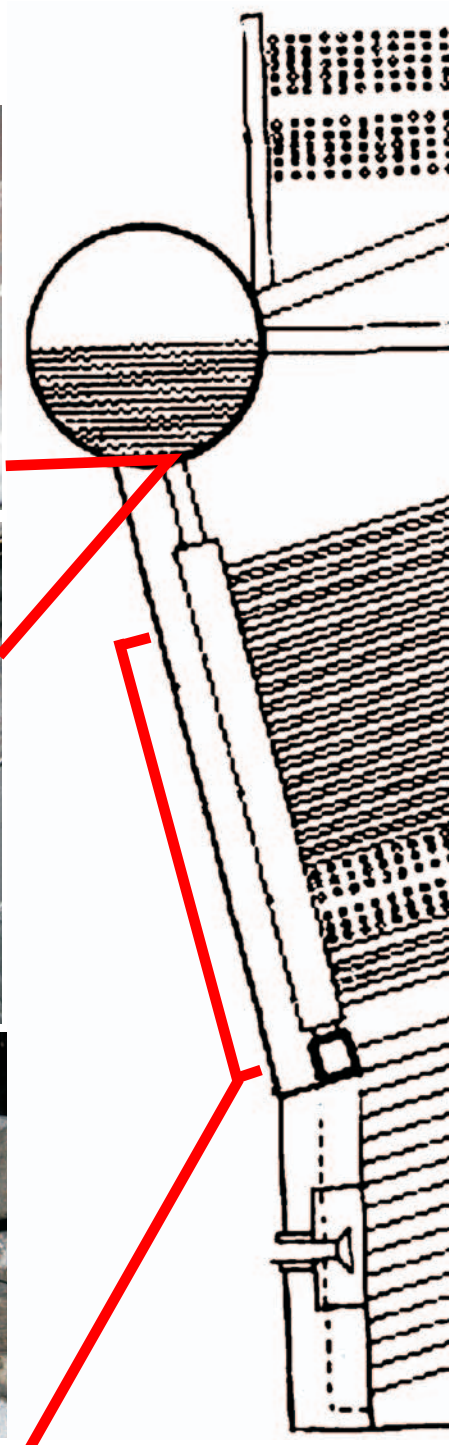
Questions pertaining to this safety alert may be addressed to CDR Brian Fisher of the USCG Quality Assurance Staff at brian.t.fisher@uscg.mil or Mr. Ken Olsen at kenneth.w.olsen@uscg.mil of the Office of Investigations and Analysis.

This information and the attached graphics are provided for informational purposes only and does not relieve any existing domestic or international safety requirement.

Attachment to Safety Alert 5-06

The drawing below is provided for informational purposes only and may not represent the exact boiler associated with the casualty.





Area of Detail 1.

Side View
(Inboard side of casing.)