

Riser and Tube Attachment Fatigue and Corrosion: Location and Evaluation Experience

**SAFETY ALERT
WARNING**

Technical Service Bulletin

Purpose

This Technical Service Bulletin provides customers with information and recommendations concerning experience with fatigue and corrosion damage locations in original risers and tube attachments on older, two drum recovery boilers that have generally been in operation for more than 15 years. While the potential for stress corrosion is not isolated to recovery boilers or to a specific boiler manufacturer, examination of recovery boilers should have priority over other types of boilers because of the potential for catastrophic damage from tube failure in recovery boilers.

Problem

Both fatigue and corrosion cracks have been experienced at specific tube attachments, riser bends and relief risers in the penthouse area of older, two drum recovery boilers. The affected areas in the refractory sealed

penthouse are not easily accessible. In some cases the damage is inside diameter (ID) initiated stress-assisted corrosion and only detectable by remote internal inspection or radiographic testing. Other drum-type power boilers with similar construction could also potentially develop this condition.

The sidewall outlet header nearest the steam drum has a small, 2 in. diameter relief riser off the end of the header which runs horizontally to the steam drum. The purpose of this connection is to ensure circulation flow in that circuit during transient (startup and shutdown) conditions, recognizing that relatively less heat input to that panel is observed because it passes alongside the nose arch. See Figure 1 plan view, Item 1.

In some cases, the risers bend out of the upper furnace panel headers and

are routed to the steam drum within the penthouse above any screen or superheater headers. A few of the risers bend out of the outlet headers and travel to the steam drum just outside the penthouse enclosure and enter the ends of the steam drum. See Figure 1, Item 2. Other risers are routed inside the penthouse but bend toward the drum within a short distance of the outlet header. See Figure 2 side view, Item 3.

Lugs support the wall panels furthest from the drum as the panel tubes bend to form the roof. See Figure 2, Item 4. Penthouse casing also attaches to the wall/roof tubes in this vicinity.

All of these areas can develop stress-assisted corrosion due to waterside fatigue conditions combined with cumulative fatigue cycles.

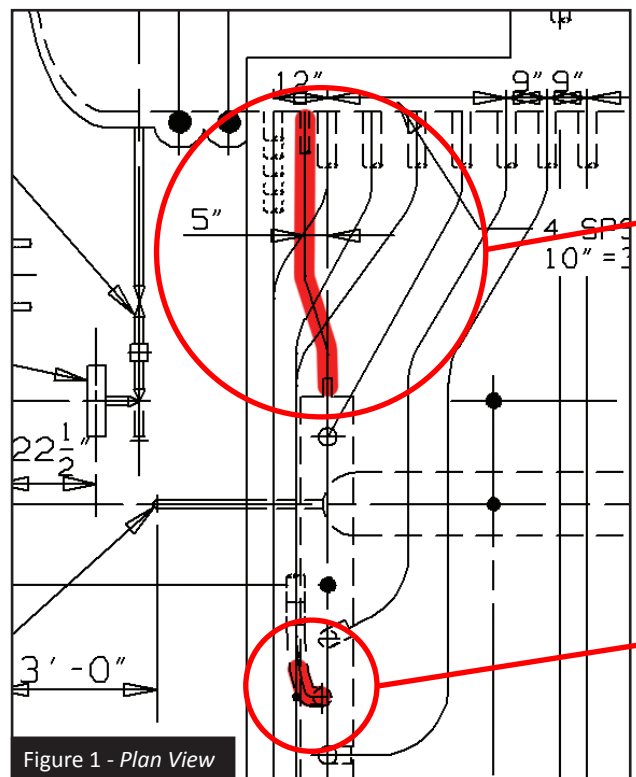


Figure 1 - Plan View



Item 1

Item 2

(Continued on reverse side)

Experience has shown that the various riser tubing and attachment locations are areas that may develop stress-assisted corrosion or fatigue damage after many years of operation. The waterside environment combined with the stress concentrations related to flexibility and discontinuities, such as bends and attachments, are reasons why this cracking can develop over time.

Inspection

To date, radiographic testing is the only proven non-destructive technique that provides positive detection of corrosion damage. Other non-destructive examination methods are under investigation for characterizing the extent and depth of corrosion damage.



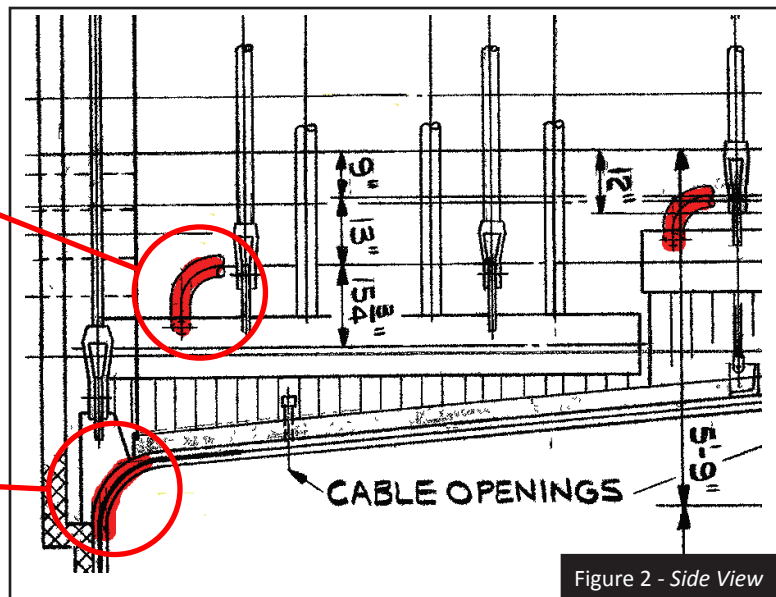
Recommendations

1. Review waterside operating history to determine if oxygen, pH and/or chemical cleaning excursions have occurred. Such excursions would increase the probability of corrosion.
2. Review pressure part failure history that may indicate through-wall corrosion. Possible suspected failure locations include panel support attachments, penthouse casing attachments, and the relief riser tubes off the ends of the upper wall headers or those with bends close to the outlet headers, both inside and outside the penthouse enclosure.

3. During the next scheduled outage, perform radiographic testing of riser bends, relief risers and attachment weld locations in the penthouse.
4. Visually inspect any tubing removed from the suspected locations for damage.

Support

Contact The Babcock & Wilcox Company (B&W) Field Engineering Services group through your local district service office to coordinate your research and inspection efforts and to identify and locate potential corrosion damage. B&W is continuing the investigation of this problem and will keep customers informed of further developments.



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