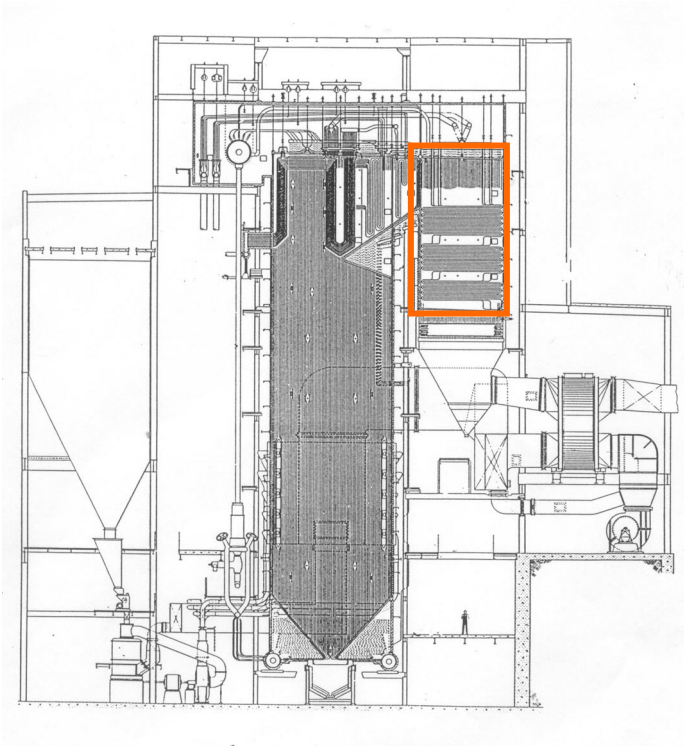
CHICAGO TUBE & IRON

# *PATENTED SUPPORT SYSTEM REDESIGN*

**July 19, 2004**



Duke Energy
Allen Generating Station - Unit No. 2
Belmont, NC

| | |
|---|---|
| Commercial Operation | 1957 |
| Electrical Generation | 165 MWe |
| Main Steam Flow lbs./hr. | 1,265,000 |
| SH Outlet Pressure | 2384 psig |
| SH/RH Steam Temp. | 1040/993 F |
| Type of Firing | Balanced Draft PC |
| Boiler Manufacturer | Comb. Eng. |

Chicago Tube & Iron has developed and implemented a unique solution to ongoing support-system failures, that have occurred on numerous horizontal convection superheaters and reheaters, originally supplied by Combustion Engineering.

Our improved design is shown in the photo below, which corrects the "ladder" support system in the horizontal down-pass of this CE boiler which has experienced severe failures. Those failures have resulted in a significant misalignment of the heating surface. Not only does this impact the efficiency of heat transfer, but the lack of proper support has ultimately led to major tube failures. This has been a systemic problem with numerous similar units supplied by Combustion Engineering.

Numerous steam generators have been designed by Combustion Engineering utilizing cast stainless steel supports, which were welded directly to the return bends of the horizontal heat transfer tubing of various Croloy (T1a, T11 & T22) alloys.

These austenitic support castings were then directly welded to the tube bends that form the transition between the horizontal heating surface and the vertical tube supports.

Even after only a few years of service, many of these dissimilar-metal welds are suspect with respect to their quality, including proper weld metal, and weld process.

These problems have now been observed and corrected on a number of steam generators operated by Duke Energy, Gulf Power, and Savannah Electric at their Allen, Lansing Smith, and Plant Kraft installations, to name a few.

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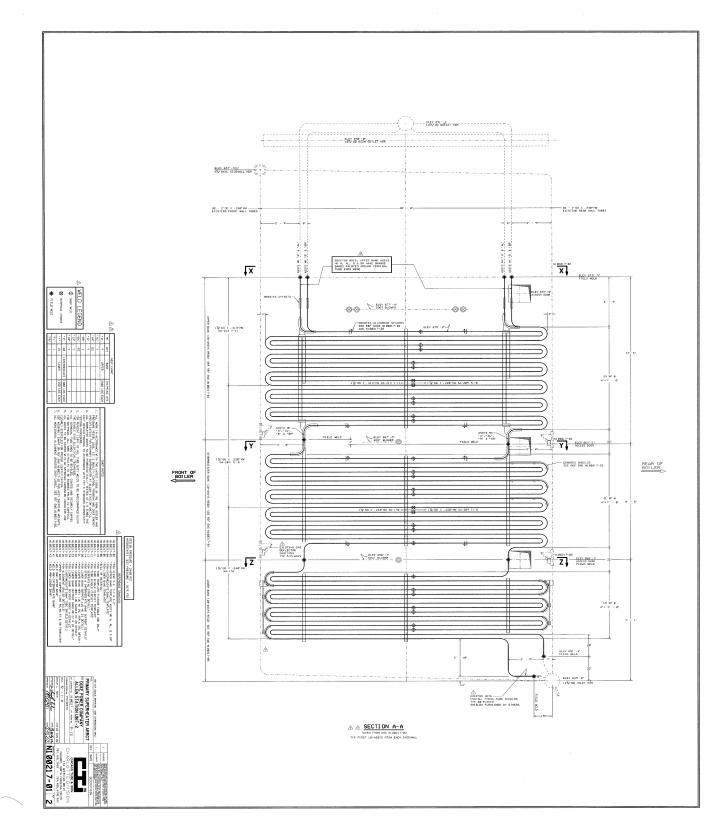
In each case, the engineers at CTI developed and applied a unique solution that completely eliminates dissimilar-metal welds for these critical supports thereby creating a significantly more reliable design. Patent applications for this design are being processed.

In the CTI design, we place a tight-fitting a stainless steel sleeve, at the location of each supporting tube bend, and then form the bend. This creates an integral joint, where the austenitic sleeve for attachment of horizontal heat transfer surfaces is external to the alloy code pressure tubing. A system of stainless ladder supports is then welded to the stainless sleeve, eliminating the dissimilar metal weld, and resulting failure potential.

As a consequence, there is no welding to the pressure parts, therefore alleviating any chance of weld crack propagation into the tube wall, any resulting leak, and the resulting unplanned outage. Also eliminated is the problem with "differential thermal expansion, caused by directly welding a support attachment to a tube.

While our design approach has been successful at correcting problems on CE boilers, similar design deficiencies have been observed on other OEM supplier's equipment.

What can we help you accomplish at your power plant?



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