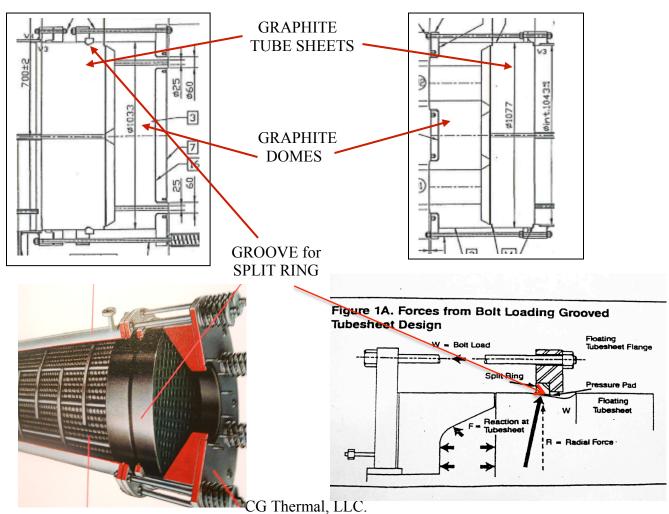
EXPOSED GRAPHITE, GROOVED TUBE SHEET DESIGN

In this design, the graphite tubesheets and domes are NOT contained in metal. Prior to 2010, the manufacturer was not able to apply a full ASME SEC VIII Div 1 code stamp on the unit because of the exposed graphite. In 2010, AMSE incorporated the IUG standards to govern use of graphite in heat exchangers. New heat exchangers with exposed graphite requiring code must carry the G-mark in addition to the ASME U-stamp.

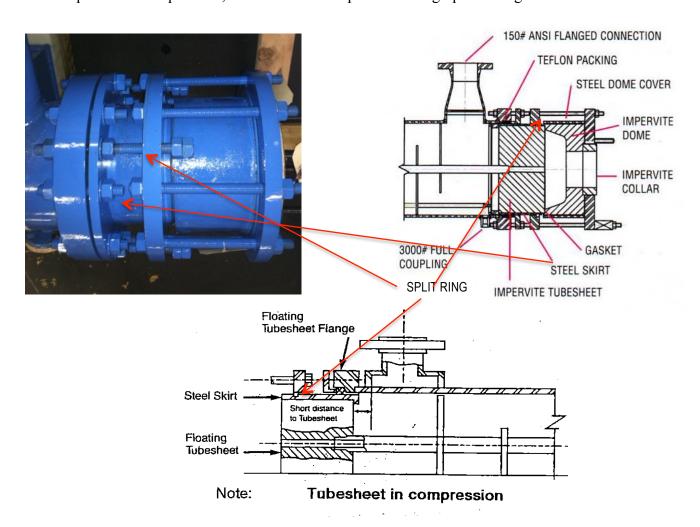
There are inherent disadvantages to the "grooved" floating tube sheet design due to dangerous tensile loads on the floating tube sheet. This design has a pressure pad between the groove in the graphite tubesheet and the steel split ring, which produces a radial load on the graphite. The full load on the groove is a result of the bolt load and the tubeside pressure (hydraulic end force) acting on the head and tubesheet. These loads are transmitted to the graphite area that has been weakened by as much as 40% due to the groove. This frequently results in a radial break in the tubesheet.



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FULLY METAL ENCASED TUBE SIDE CONSTRUCTION

CG Thermal fully encases all exposed graphite components in ASME SEC VIII code stamped metal covers and skirts, protecting the graphite from external damage and eliminating dangerous tensile loads on the floating tube sheet. The design includes a high precision machined floating tube sheet "skirt" which transfers the floating head mechanical and hydraulic forces on to the back side of the floating tube sheet, putting this graphite component in compression, which is the "best practice" for graphite design.



GENERAL

- Units will be designed and stamped with a full ASME SEC VIII Div 1 code stamp, without need of G-mark.
- All metal components will be designed and constructed per ASME code requirements.
- All graphite is contained within ASME code material and unit is tested on both service and process side, treated as a single chamber pressure vessel.

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