



**Veterans Health Administration
W. G. Hefner Medical Center, Boiler #2
Refractory Replacement Recommendations
6/19/13**

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Executive Summary

ALSTOM was called in to review the plans for replacement of the refractory tile and block on Boiler 2. The existing refractory, which had previously been removed on the left, right, and rear sides of the boiler, was inspected to make recommendations on its replacement. Also in question was the availability of the same refractory tile and block originally supplied by Combustion Engineering. The use of the correctly sized refractory blocks will greatly reduce the amount of labor required to replace the removed material.

Refractory Baffles

The refractory baffles at the rear of the unit were inspected for damage. The 2" tile portion of the front baffle located between the Mud Drum and the Monolithic Baffles had been removed prior to the inspection.

Minor damage was found on the Monolithic Baffles. The front baffle is comprised of an upper monolithic section, a removable tile, and lower monolithic section. The lower monolithic section connects with the tile portion that had been removed. The upper section of the Monolithic Baffle is only clearly visible from the left and right sides of the boiler. A small section has broken off on the left side where the baffle meets the refractory sidewall. The right side was in good condition. All visible areas were secure and not damaged or crumbling.

The removable tiles between the upper and lower Monolithic Baffles were in good condition and appear to have been replaced more recently.



Damage on the left side of the front upper Monolithic Baffle.



Front baffle general layout. Center and lower section shown.

The front lower Monolithic Baffle is more accessible than the top and is damaged at multiple locations. Sections of refractory have fallen off and exposed the anchor wire at the center of the baffle. This likely occurred during the removal of the 2" tile section below. These damaged areas can be viewed and reached from a scaffold below inside the furnace. The sections of the baffle remaining all appeared secure with no cracks or crumbling that could allow them to fall.



Section of the front lower Monolithic Baffle that is damaged. The anchor wire has been exposed.



Damage on the left side of the front, lower Monolithic Baffle.

The rear baffle is comprised of a monolithic section that meets with the roof and a lower metal plate section. The Monolithic Baffle can currently only be viewed from the left and right sides of the boiler. It was in good condition. Access is also limited to the plate section, but no damage could be seen from the sides or rear of the unit.



Top side of the rear Monolithic Baffle where a roof panel has been removed.



Left side view of the rear Monolithic Baffle. Minor damage where it meets the sidewall.

Recommendation: The refractory baffles do not need to be removed and replaced. The sections in place are secure and in good condition. The sections at the sidewalls and on the bottom side of the front Monolithic Baffle that are missing material should be repaired with castable refractory. This will prevent hot combustion gases from bypassing the baffle and overheating the outlet and economizer of the boiler.

Refractory Material Availability

The writer has been in contact with our Parts Sales group and they are currently checking on availability of the originally supplied refractory tiles and block. This will include the curved tiles from the front wall and front baffle specifically requested. They will be providing you with an estimate as soon as possible. These are typically not a stocked item and will have to be cast to order. Your Parts Sales contact is Richard Broedel at richard.a.broedel@power.alstom.com.

Boiler Refractory Sidewalls

The left and right sidewall refractory consists of 3.5" tile on the bottom of the furnace and 2" tile above. This is encased with 4" refractory block. The question was asked if 2" tile could be used in the place of the 3.5" lower tile.

Recommendation: It is not recommended to use 2" tile for the full height of the sidewalls. To do this in confidence would require an engineering study of why 3.5" tile was used on the lower section in the original design. This thicker tile provides more insulation to the hottest portion of the combustion furnace. Without this additional insulation, hot spots may occur on the sidewall casing and cause damage or burnout. There may also be structural reasons for the thicker tile at the lower portion of the sidewalls. It is also not recommended to replace this tile with sections of tile that are significantly smaller than the original design. The tiles are supported on the outside by the casing panels and on the inside by the cold side of the tubes. A smaller tile that does not reach from tube to tube could fall inward over time.

Foundation Masonry and Refractory

When the boiler was converted to wall firing from stoker firing, the stoker was removed which included concrete piers that lined the inside of the brick boiler foundation. This was replaced with masonry brick that was crudely installed on the inside of the existing brick foundation. Refractory brick was set against the inside section of the steel I-beams that support the lower waterwall headers. However, the I-beams are still exposed to the combustion fireball and temperatures.

Recommendation: Remove the crudely installed masonry brick on the inside of the furnace foundation. Replace it with refractory brick filled in with castable refractory as needed that will properly insulate. The steel I-beams supporting the headers should not be visible from inside the furnace when complete.



View of added masonry brick at the front left corner of the furnace.



View of the added masonry brick at the rear right corner of the furnace. This support beam was left exposed.