



Engineered Pumps and Services
25 Williamsville Road
Barre, MA 01005
Tel 978-355-2911
Fax 978-355-2917

CIRCULATING WATER PUMP FIELD REPAIR CASE NO AP-022

Chas G Allen received an emergency request to repair an I-R Model 60APMA-1, rated 140,000GPM @ 26'TDH. The unit provides cooling water to a 650Mw base loaded coal fired station. This is a non-pullout style design in which the outer column was constructed in carbon steel and had deteriorated to near catastrophic failure in the saltwater. Several years prior the customer installed a carbon steel column from the OEM as the unit was schedule to be replaced within a few years of the last repair. Scheduling changes move the replacement project out another eight years from the original plan.

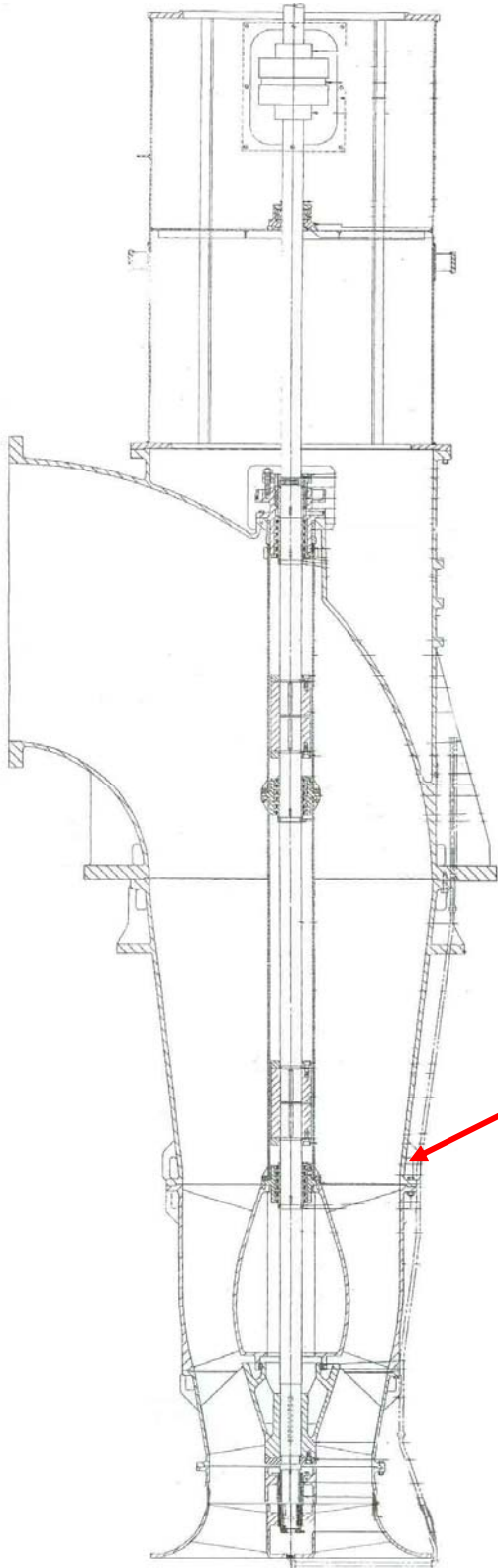
The station was in the 2nd week of a schedule 4 week outage when it was discovered during routine cleaning of the intake pit that the outer column had numerous holes 6" in diameter with serious erosion at the lower flange to the casing.

CGA evaluated the damage and devise a corrective action plan until a new column could be fabricated. Fabrication of the new column had minimum of 6-8 week lead-time in 316SS. Due to the severe erosion and unknown actual thickness of the column, removing the unit would probably have due more damage to the other stainless components (shafting, inner columns, casing) and in-place repair was the only option.

The column was dimensional recorded and new carbon column was fabricated in sections. A new lower flange was also constructed in sections. Prior to installation these components were prepared by blasting to near white metal and utilizing special primers.

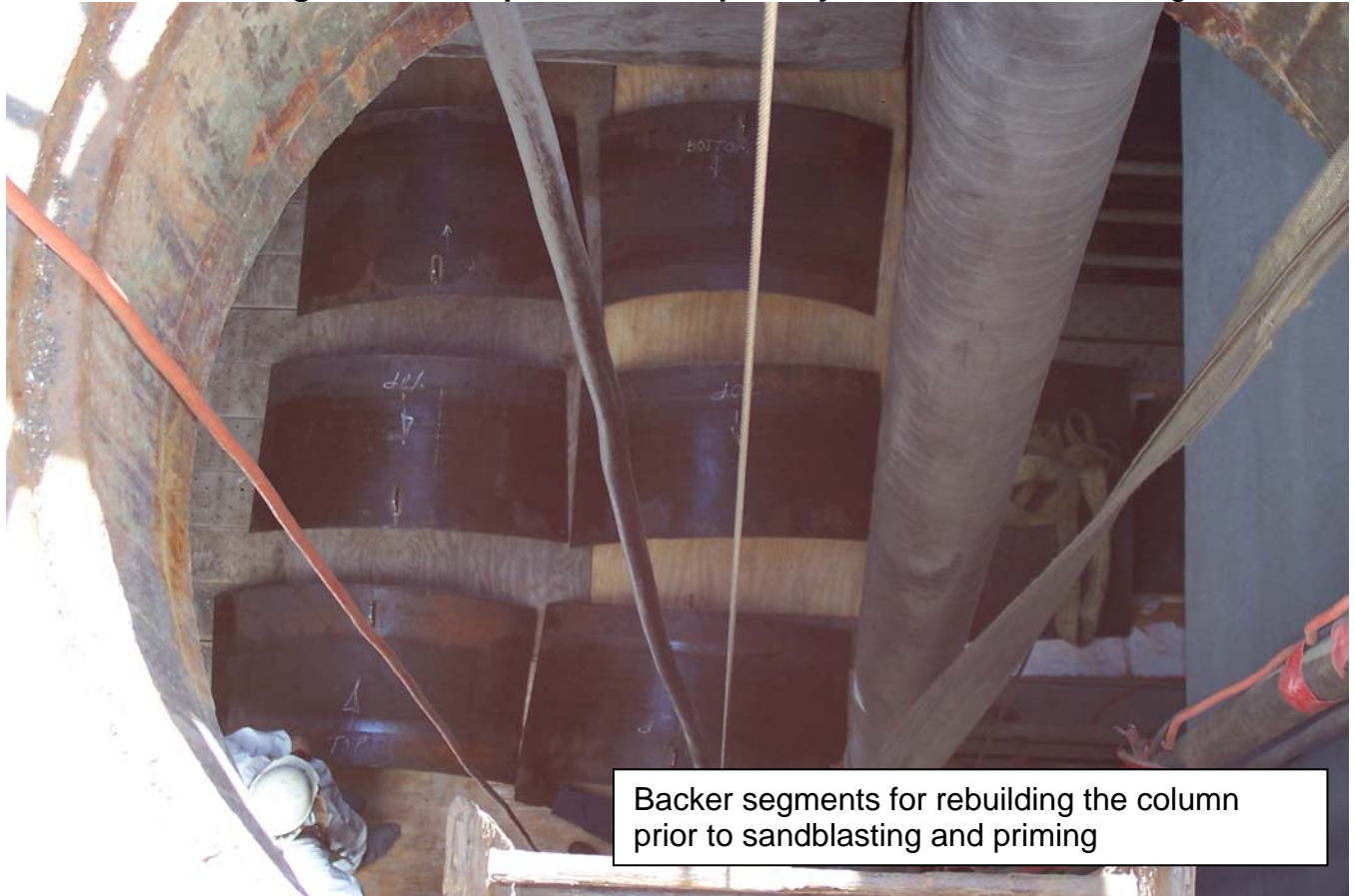
Extreme caution was taken to record the suction bell position prior to installing the components and monitored closely during the repair to correct any distortion causing misalignment of the centerline.

The following outline the repair, which is now several years old in good condition and is monitored at each outage. CGA furnished a new spare 316SS column as a spare for replacement.



Typical of the corrosion/erosion damage to the upper column at the flange to the casing, note the major damage is closest to the 316SS casing.





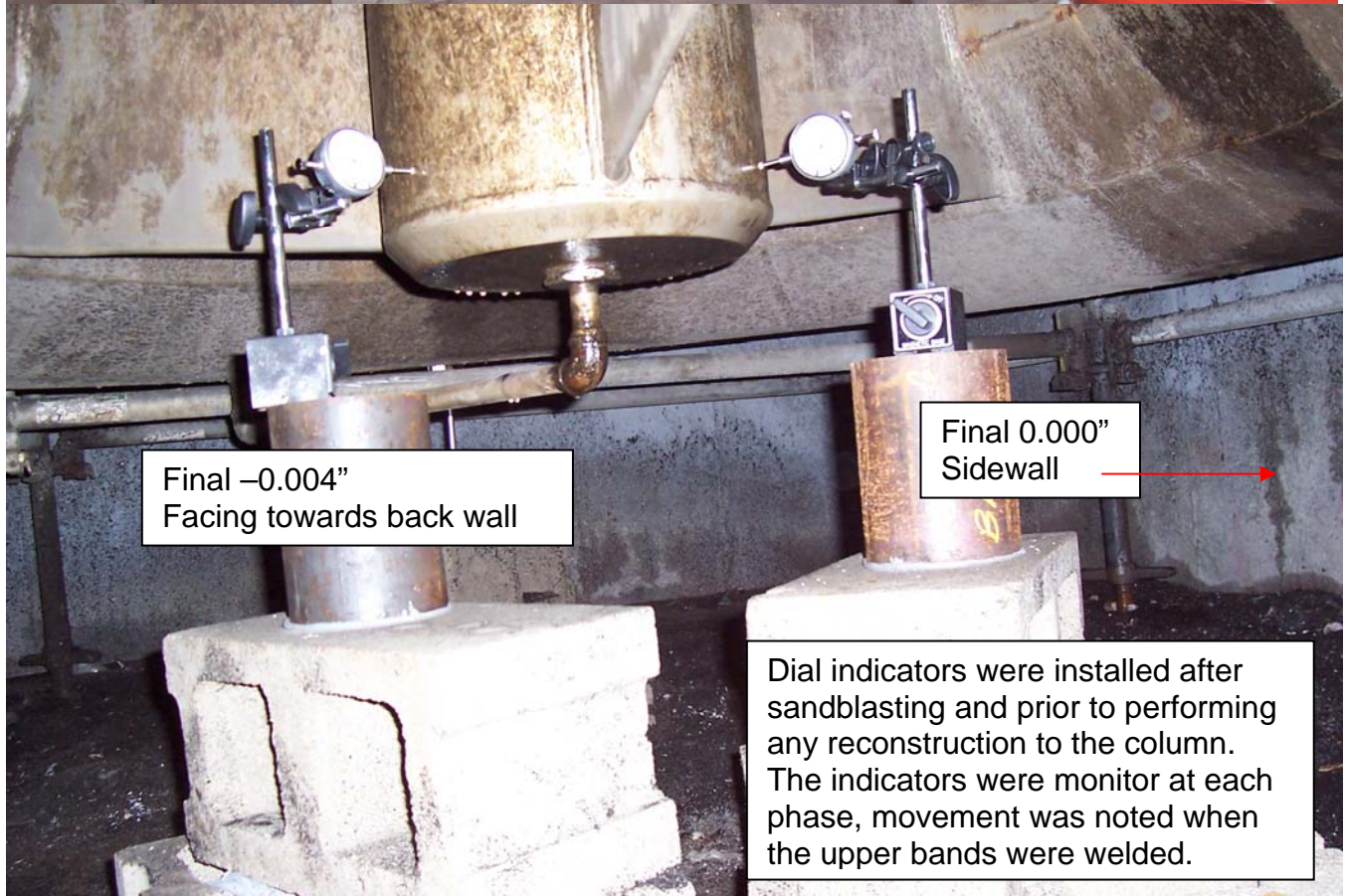
Backer segments for rebuilding the column prior to sandblasting and priming



Upper column after sandblasting for preparation of Belzona 6111 primer.



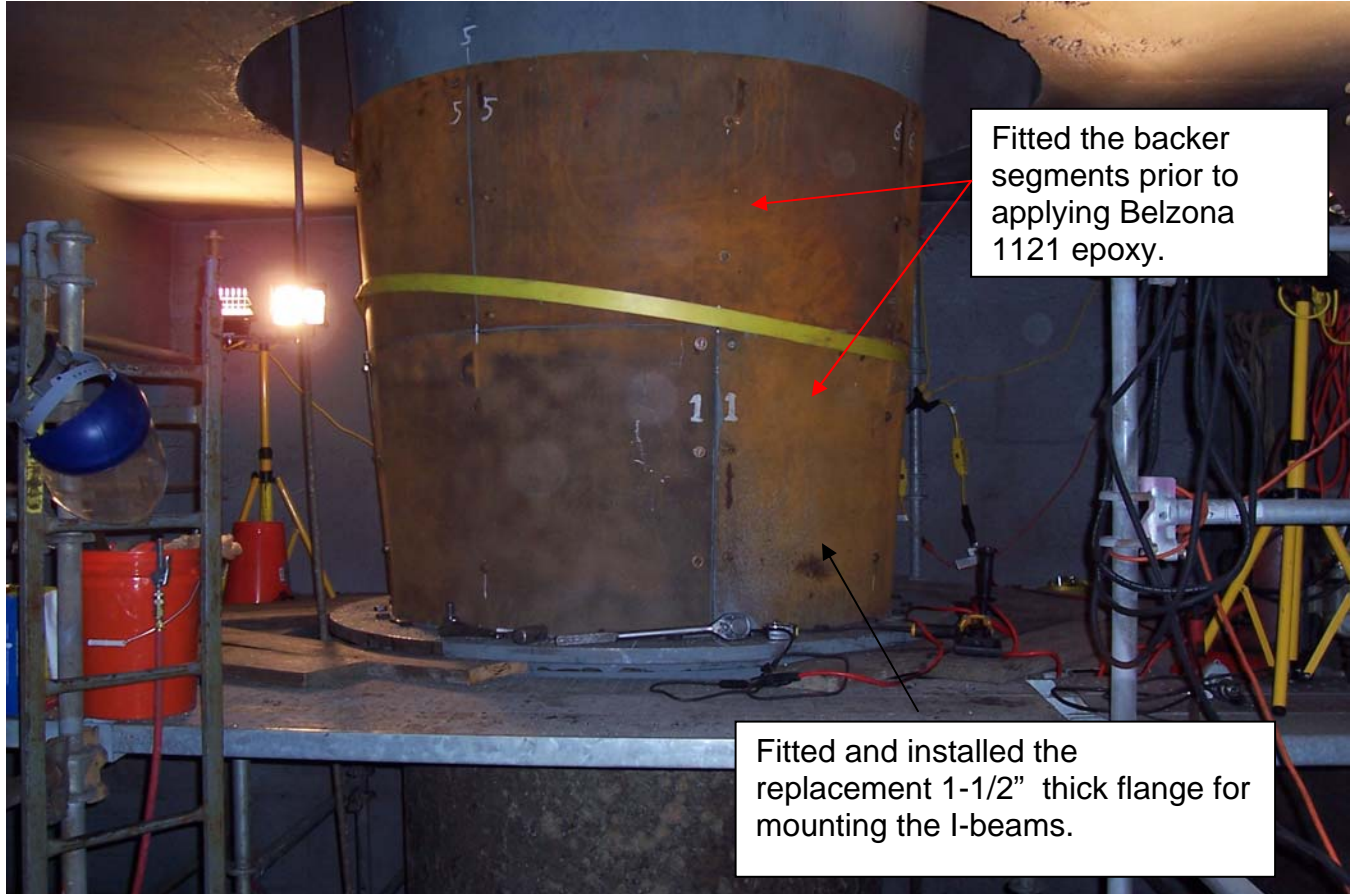
Backer segments after sand blasting, prior to priming.



Final -0.004"
Facing towards back wall

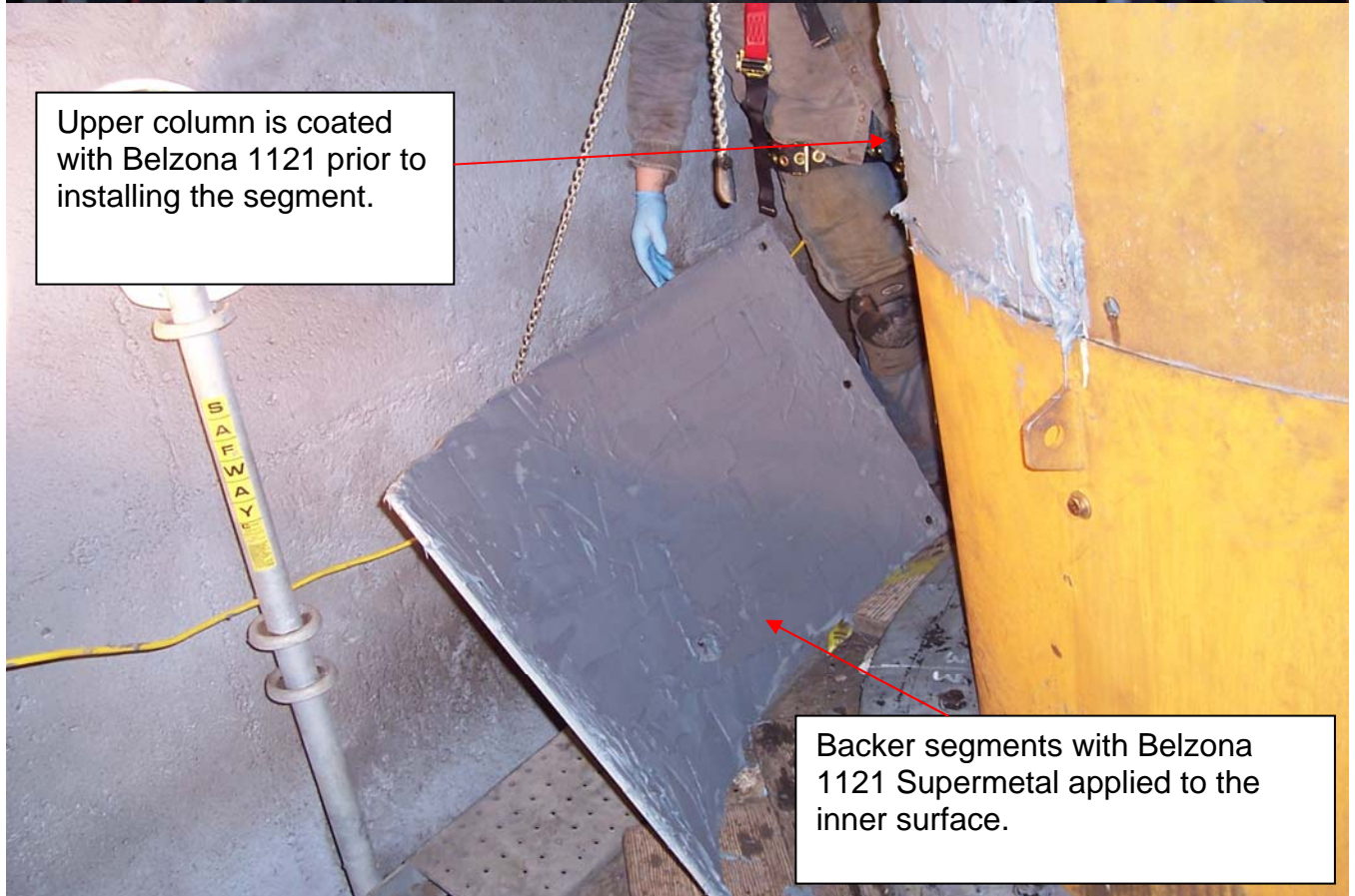
Final 0.000"
Sidewall →

Dial indicators were installed after sandblasting and prior to performing any reconstruction to the column. The indicators were monitor at each phase, movement was noted when the upper bands were welded.



Fitted the backer segments prior to applying Belzona 1121 epoxy.

Fitted and installed the replacement 1-1/2" thick flange for mounting the I-beams.



Upper column is coated with Belzona 1121 prior to installing the segment.

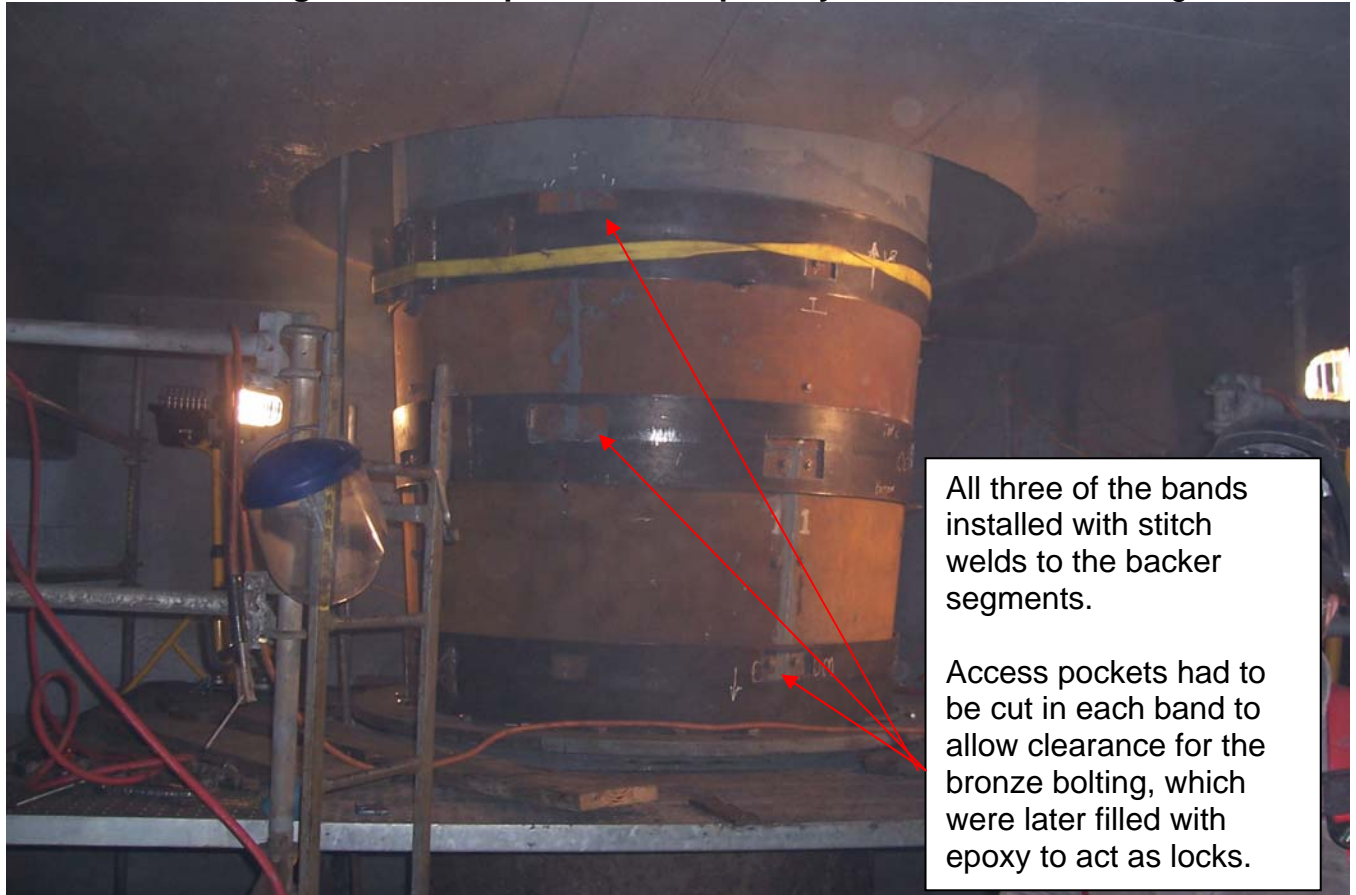
Backer segments with Belzona 1121 Supermetal applied to the inner surface.



Note excessive 1121 epoxy material, being extruded when bolted to the column.



Cutting and fitting the middle band, lower installed.



All three of the bands installed with stitch welds to the backer segments.

Access pockets had to be cut in each band to allow clearance for the bronze bolting, which were later filled with epoxy to act as locks.



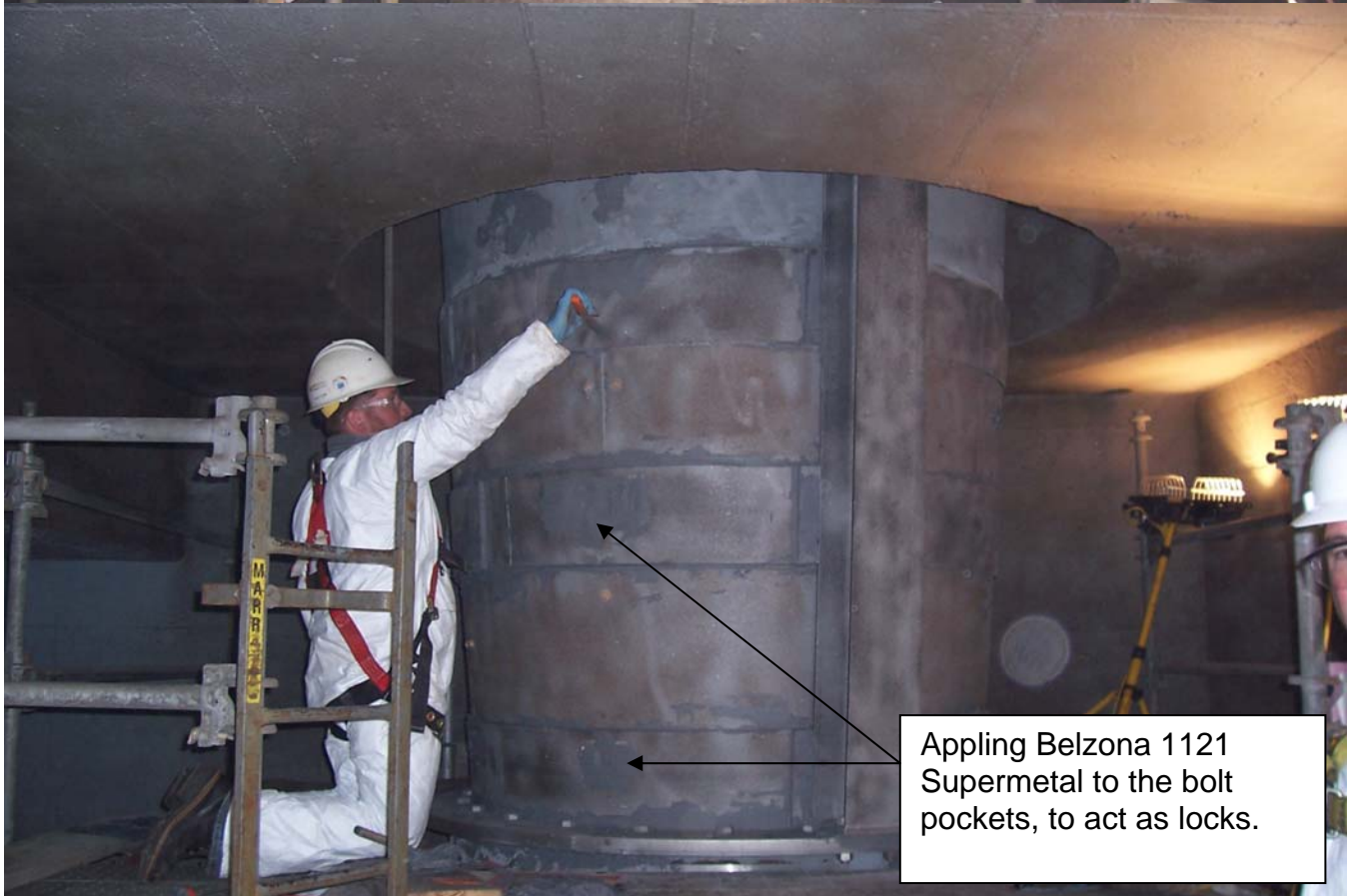
I-beams installed, which were welded at the top support disassembly flange and bolted at the bottom with shims.



Welding of beams to the upper bands.



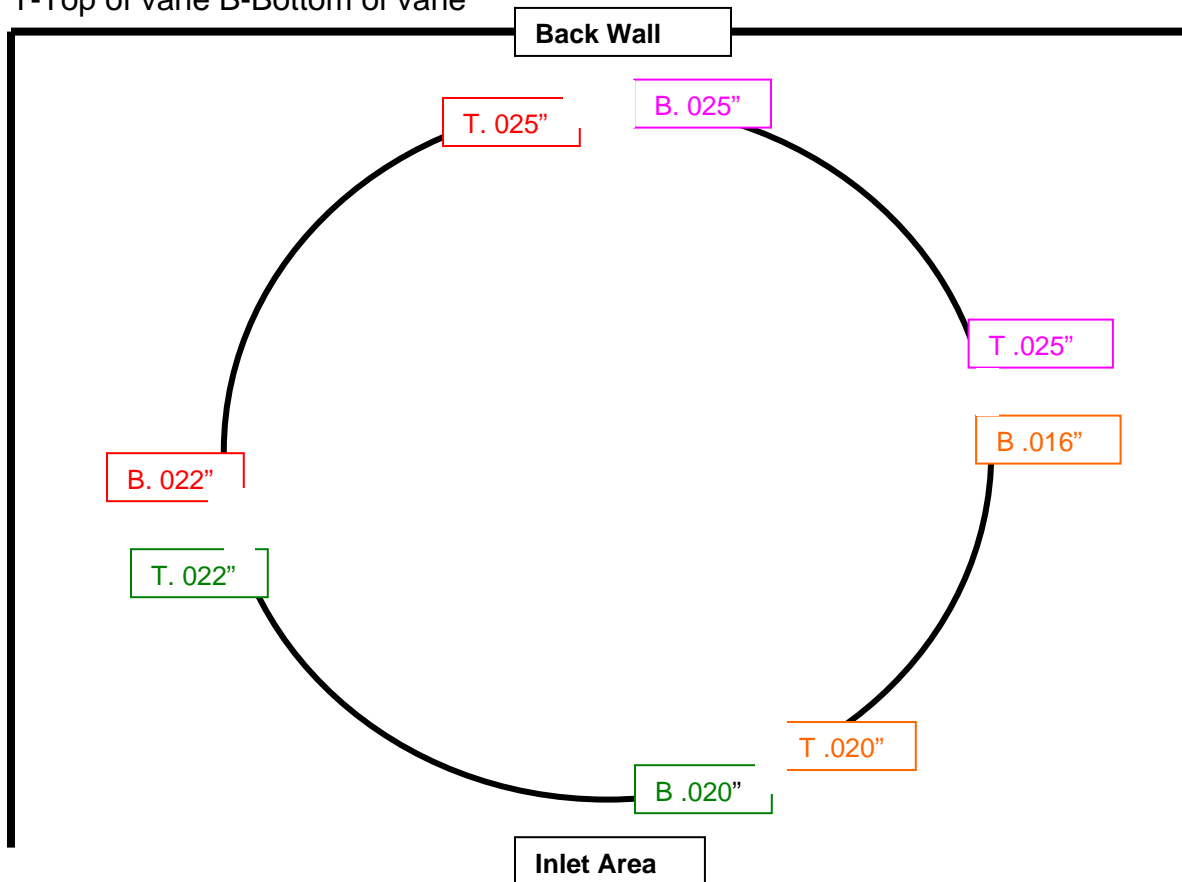
Two zinc anodes installed one on each beam.







Recorded impeller vane tip clearances suction bell with the pump lifted 0.130"
T-Top of vane B-Bottom of vane



Inspection of repair almost one year later still in good condition. Subsequent yearly inspections have not revealed any deterioration over than the marine growth shown





Both zinc's have expended 30% of their original mass. Recommend adding two more zinc's on the opposite sides of the I-Beams.

01/15/2007



New Outer Column supplied by CGA in 316SS

