

Architects Clayton&Little

/Field Report

Seaholm Power Plant Rehabilitation

Report on Methods of Selection of Cleaning Process for Exterior Concrete

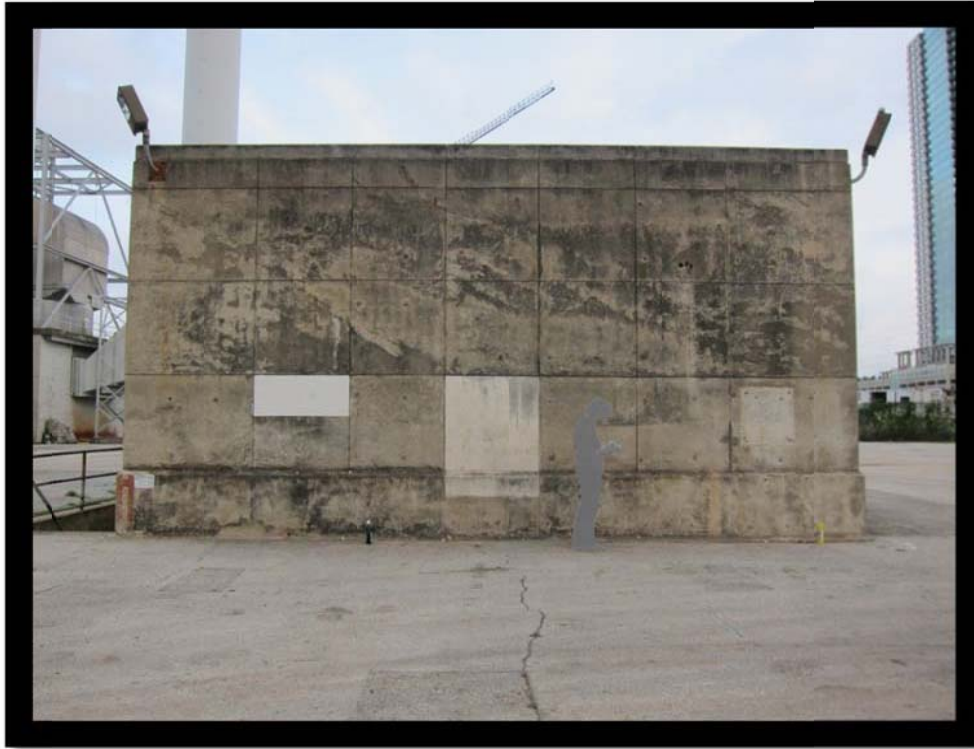
Issued: 9.4.12

Action Item 1. 6.15.12 7:30 am

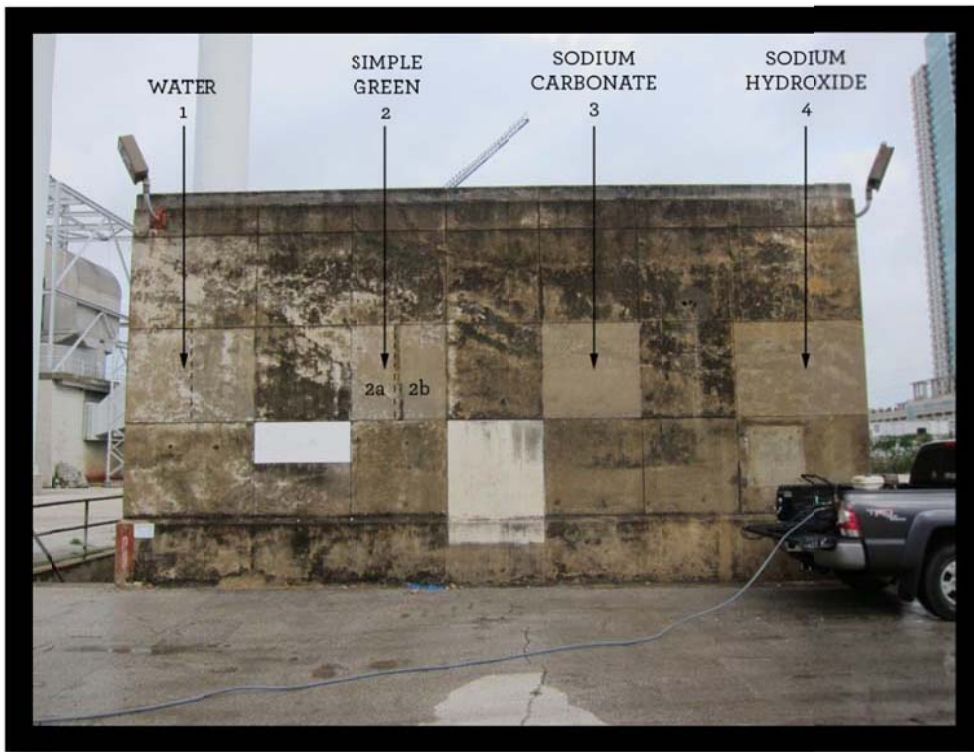
Attended by: Elizabeth Brummett (EB) - Texas Historical Commission; Dave Stauch (DS) & Bill McCann (BM) - HS&A; Emily Little (EL) & George Wilcox (GW) - Clayton&Little Architects

1. After a visual inspection of all four facades of the Fuel Oil Building, the eastern façade was selected for test cleaning as being representative of the overall project. Reference Photograph A for a photo of the eastern façade before any cleaning work was done.
2. Four cleaning methods were decided upon (per specifications provided by Pat Sparks, PE, Principal at Sparks Engineering), and test “panels” identified; reference Photograph B. These panels will be referred to as 1, 2 (a & b), 3 & 4. GW applied cleaning solutions, BM operated the pressure washer. Test cleaning methods were as follows, with the pressure washer equipped with a 15 degree fan tip that was held approximately 10” to 12” off of the wall:
 - a. Panel 1 - Water only, no cleaning chemical applied, panel cleaned with 2,500 psi ambient temperature water only. Horizontal spray pattern was used on the entire panel and on the right half of the panel a second pass with vertical spray pattern was used. Horizontal spray pattern took approximately 3.5 minutes and the subsequent vertical spray pattern on right half took approximately 2 minutes.
 - b. Panel 2 - “Simple Green” spray detergent (non-ionic neutral pH detergent) applied at 50% concentration on left half of panel, labeled 2a. “Simple Green” spray detergent applied at full strength on right half of panel, labeled 2b. After an approximate 10 minute delay, the overall panel was then cleaned with 2,500 psi ambient temperature water. Horizontal spray pattern was used on the entire panel and on the bottom half of the panel, a second pass with a vertical spray pattern was used. Horizontal spray pattern took approximately 3.5 minutes and the subsequent vertical spray pattern on the bottom half took approximately 2 minutes.
 - c. Panel 3 - “Concrobium Mold Control” product spray applied at full strength on panel; this product is a 0.95% concentration of sodium carbonate. After an approximate 15 minute delay, the overall panel was then cleaned with 2,500 psi ambient temperature water. Horizontal spray pattern was used on the entire panel and on the bottom half of the panel a subsequent vertical spray pattern was used. Horizontal spray pattern took approximately 3.5 minutes and the subsequent vertical spray pattern took approximately 2 minutes.
 - d. Panel 4 - “Easy Off Heavy Duty Oven & Grill Cleaner” product spray applied at full strength on panel; this product is a 2.5% to 10% concentration of sodium hydroxide (per MSDS). After an approximate 20 minute delay, the overall panel was then cleaned with 2,500 psi ambient temperature water. Horizontal spray pattern was used on the entire panel and on the bottom half of the panel, a subsequent vertical spray pattern was used. Horizontal spray pattern took approximately 3.5 minutes and the subsequent vertical spray pattern took approximately 2 minutes.
3. Test areas were wet. It was decided to meet on site again on 6.19.12 (weather permitting) at 8:00 am to review the test areas. Reference Photograph B, test areas after pressure washing (note that wall is wet). Areas of “striping,” probably due to the pressure washing wand not being perpendicular to the wall, were noted with the naked eye, but not apparent in photographs taken. For this reason we will recommend dual coverage with both horizontal and vertical cleaning patterns.
4. Ferrous staining (rust spots apparently due to corroding reinforcing steel or embedded steel anchors) were more apparent after cleaning. Ferrous stain removal is to be addressed when paint stripping takes place.

Photographs from 6.15.12:



Photograph A - Eastern facade of Fuel Oil Heating Building - Before Cleaning Work - 6.15.12, 7:30 am



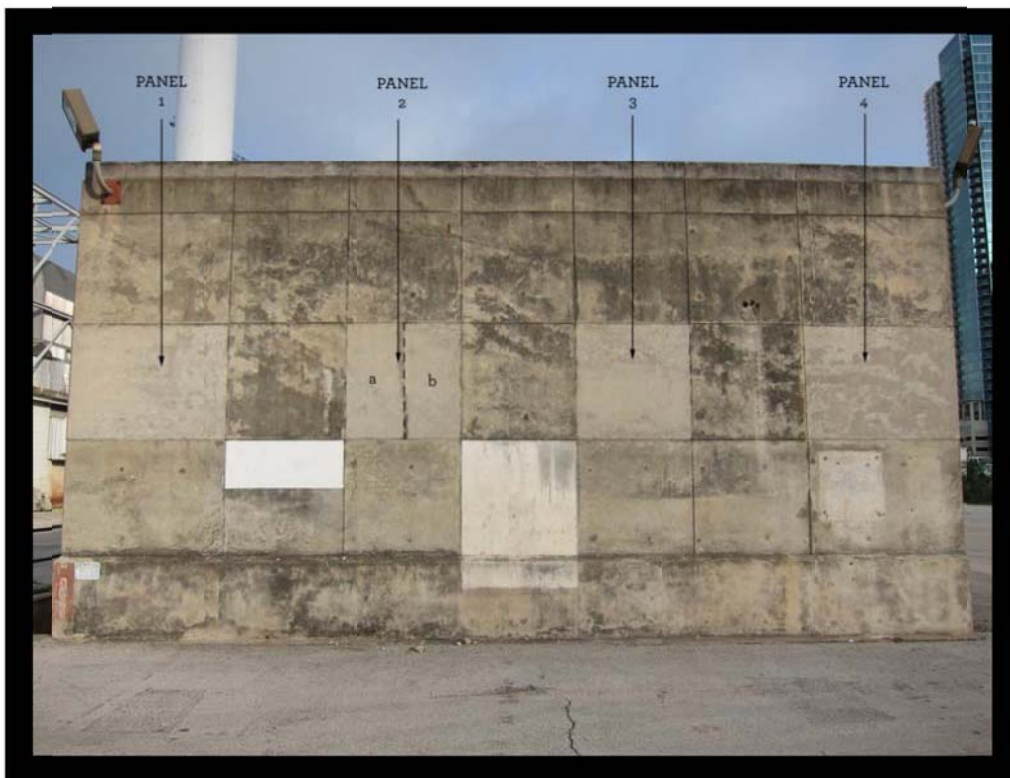
Photograph B - Test Panel Legend & Eastern facade of Fuel Oil Heating Building - After Cleaning Work - 6.15.12, 8:30 am

Action Item 2. 6.19.12 7:30 am

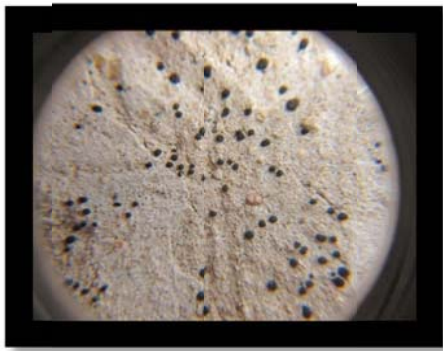
Attended by: Elizabeth Brummett (EB) - Texas Historical Commission; Dave Stauch (DS) & Bill McCann (BM) - HS&A; Jim Susman, Jack Tisdale, Tim Pellowski, Kelly Henson, Lina Murillo - STG Design; Emily Little (EL) & George Wilcox (GW) - Clayton&Little Architects

1. Test panels were visually inspected by Elizabeth Brummett, Emily Little and George Wilcox, with no magnification and with a 10x magnifying lens. No erosion of the existing concrete surface was noted on any of the test panels.
 - a. Panel 1 - Organic nodules and staining (mold/mildew) were apparent on the surface of the concrete. Reference Photographs D and E.
 - b. Panels 2a & 2b - No evidence of organic nodules or staining was seen on either panels 2a or 2b. Reference Photographs F and G.
 - c. Panel 3 - No evidence of organic nodules or staining was seen on panel 3. Reference Photographs H and J.
 - d. Panel 4 - No evidence of organic nodules or staining was seen on panel 4. Reference Photographs K and L.
2. A follow-up meeting was scheduled for 7.24.12, which occurred approximately three weeks after soaking rains, to see if any organic regrowth could be visually detected. Reference action item 3, below.

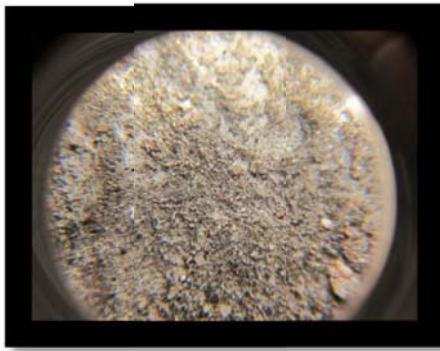
Photographs from 6.19.12:



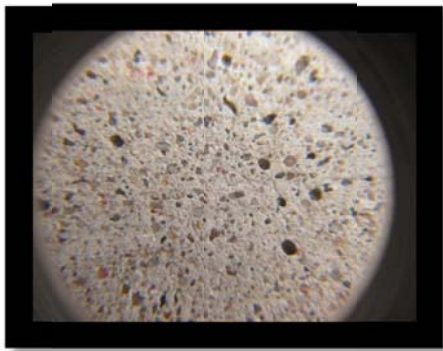
Photograph C - Eastern facade Fuel Oil Heating Building - After Cleaning Work - 6.19.12, 8:00 am



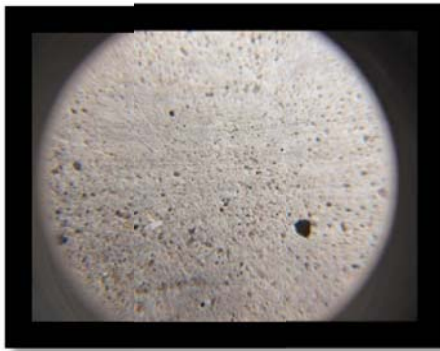
Photograph D - Panel 1; Organic Nodules Present - 10x - 6.19.12



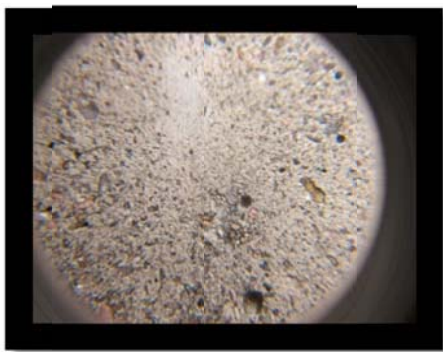
Photograph E - Panel 1; Organic Staining Present - 10x - 6.19.12



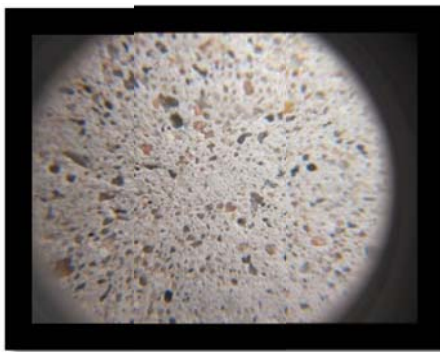
Photograph F - Panel 2a; No Organic Nodules or Staining Present - 10x - 6.19.12



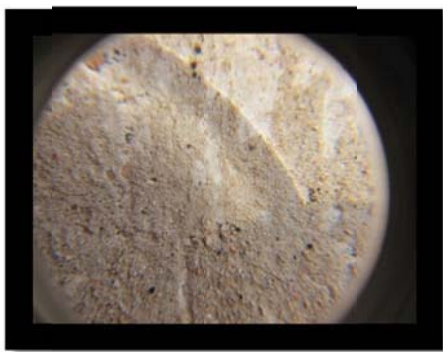
Photograph G - Panel 2b; No Organic Nodules or Staining Present - 10x - 6.19.12



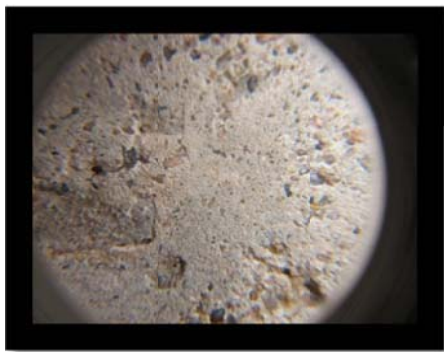
Photograph H - Panel 3; No Organic Nodules or Staining Present - 10x - 6.19.12



Photograph J - Panel 3; No Organic Nodules or Staining Present - 10x - 6.19.12



Photograph K - Panel 4; No Organic Nodules or Staining Present - 10x - 6.19.12



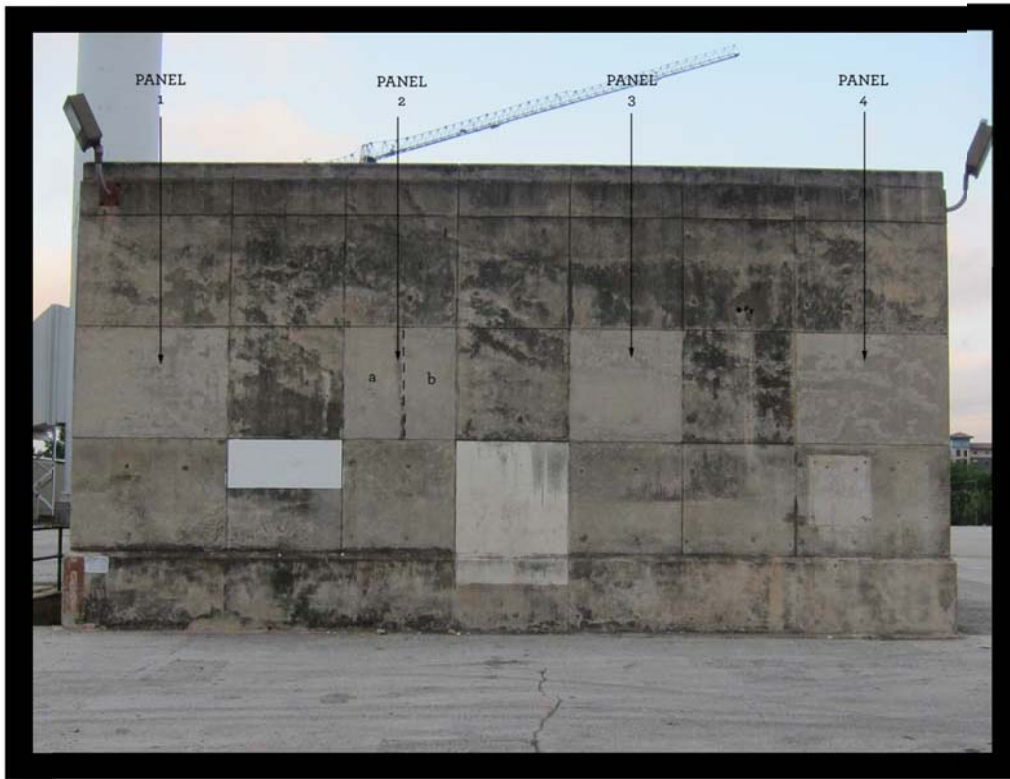
Photograph L - Panel 4; No Organic Nodules or Staining Present - 10x - 6.19.12

Action Item 3. 7.24.12 7:30 am

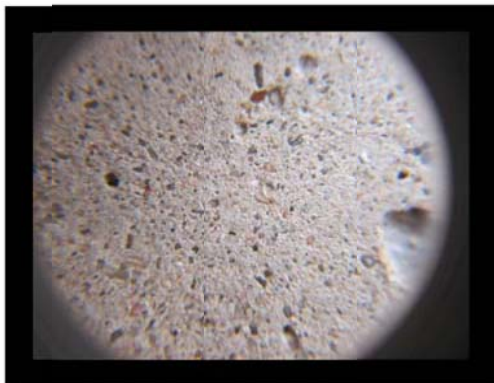
Attended by: Elizabeth Brummett (EB) – Texas Historical Commission; John Rosato (JR) – Southwest Strategies Group; Andrew Altman, Jeff Columbus – CIM Group; Dave Stauch (DS) & Bill McCann (BM) – HS&A; Jack Tisdale, Thomas Kemp – STG Design; Emily Little (EL) & George Wilcox (GW) – Clayton&Little Architects

1. Test panels 2a, 2b & 3 were visually inspected by George Wilcox, with no magnification and with a 10x magnifying lens. No regrowth of organic materials was noted in any of the test panels.
 - a. Panels 2a & 2b – No evidence of organic nodules or staining was seen on either panels 2a or 2b. Reference Photographs N and P.
 - b. Panel 3 – No evidence of organic nodules or staining was seen on panel 3. Reference Photographs P and Q.

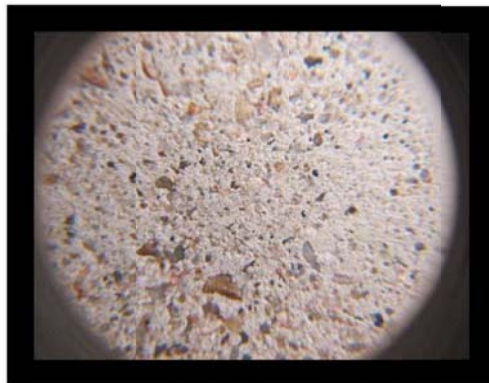
Photographs from 7.24.12:



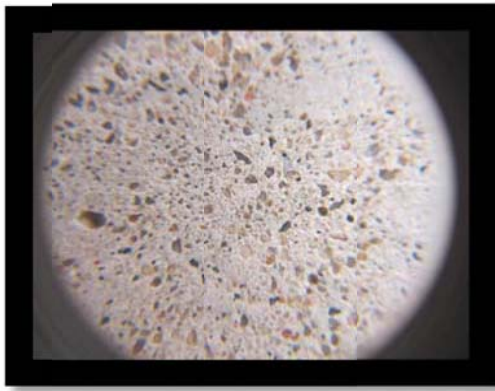
Photograph M – Eastern facade Fuel Oil Heating Building – Three Weeks After Rain - 7.24.12, 7:30 am



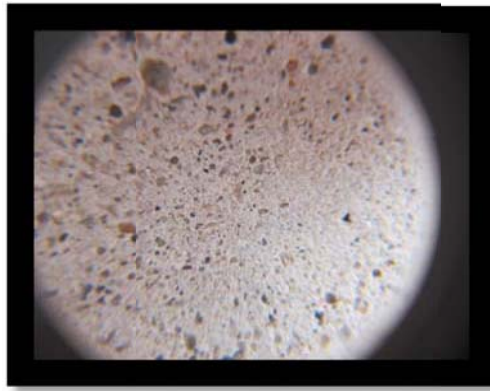
Photograph N – Panel 2a; No Organic Regrowth Apparent – 10x - 7.24.12



Photograph P – Panel 2b; No Organic Regrowth Apparent – 10x - 7.24.12



Photograph P - Panel 3; No Organic
Regrowth Apparent - 10x - 7.24.12



Photograph Q - Panel 3; No Organic
Regrowth Apparent - 10x - 7.24.12

Conclusion & Recommendations

1. The cleaning method for test panel 1 (water only) has been discarded due to its apparent ineffectiveness.
2. The cleaning method for test panel 4 (sodium hydroxide) has been discarded due to its toxicity with no apparent benefit.
3. Ferrous stain removal has not yet been addressed; it is anticipated that for ferrous stain removal, diluted local applications of phosphoric acid, or other approved commercially available products will be used. Trial ferrous stain removal is to be addressed when paint stripping takes place.
4. Based on the findings to date, we recommend a full strength solution of "Concentrated Simple Green - All Purpose Cleaner" detergent be used on the Seaholm Turbine Generator Building exterior concrete. The solution should be spray applied to soak the surface of the concrete, with pressure washing to follow immediately afterwards, before the detergent dries on the surface of the building. Pressure washing is to be 2,500 psi, with ambient temperature water, with a 15 degree fan tip and a feeler gauge maintaining a minimum of 12" clearance from the building. Based on the test panel cleaning, for an approximate 20 square foot area, pressure washing should take approximately four minutes for the horizontal spray pattern and approximately four minutes for the vertical spray pattern.
5. Construction document specification SECTION 03 01 30.51 - CLEANING OF CAST-IN-PLACE CONCRETE should also be referenced for additional information.

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