



Axial Confinement of Concrete Columns with Carbon Wrap

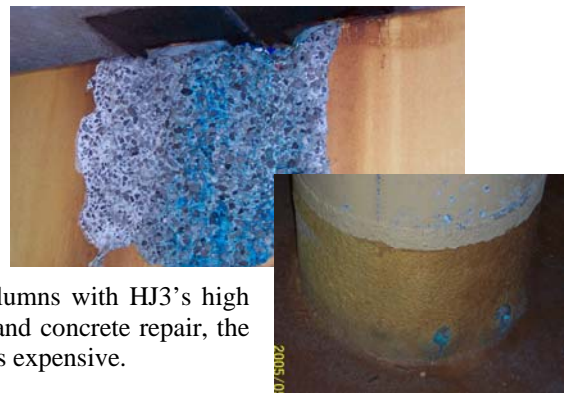
Case Study – HJ3 CS200912

Introduction:

The Copper Mine discussed in this case study utilizes an electrowinning process to extract high end copper from iron-ore. The electrolyte that is used to extract the copper is highly corrosive and acidic. Over 1,000 electrolytic tanks that hold the electrolyte are supported by concrete beams and columns in the basement of the SX/EW plant. The columns are reinforced with #9 steel bar spaced 6-inch on center around the circumference of the column.

Problem:

During a plant survey extensive corrosion to both reinforced concrete columns and beams was noted. The problem stems from electrolyte attack of steel re-bar. As the tanks over flow electrolyte floods the basement and pools at the base of the columns. The electrolyte also leaks through the floor of the tanks and pools in the concrete beams. Over time the steel reinforcement will lose 50% to 75% of its strength causing risk of failure. The mine considered two options (1) Re-core new #9 bar 6-inch on center into the existing columns and re-pour concrete to rebuild the columns, or (2) wrapping the columns with HJ3's high strength s-glass system. After attempting the traditional steel and concrete repair, the plant determined that the carbon fiber would be 75% to 80% less expensive.



Installation

The columns were first abrasive blasted to remove loose particles and clean the substrate. Corroded rebar were cleaned and treated to prevent further corrosion. Then a 6000-psi grout was used to resurface the columns back to their original shape. After surface preparation, the columns were primed with 10 mils of the HJ3 PC-100 Primer Coat. Then two layers of HJ3's s-glass fabric were saturated with SR-400 Saturating Resin and wrapped around the columns.

Conclusion:

In total over 150 columns were repaired and strengthened with the HJ3 Carbon Composite System. The total installation resulted in 75% to 80% cost savings over the traditional steel and concrete repair. The main advantages of the HJ3 Carbon Composite System were as follows:

- 10 x Tensile Strength of Steel
- Chemical Resistance to Electrolyte
- 3-Year Warranty
- No Downtime Costs
- 75% to 80% Cost Savings over alternatives



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