



PROJECT PROFILE

Chemical Plant Blast Wall

Investigation and Repair of Concrete Deterioration | United States



CLIENT

Confidential

BACKGROUND

In 1981, a product-dedicated unit was constructed within the larger infrastructure of the subject chemical plant. It has been in continuous operation since that time.

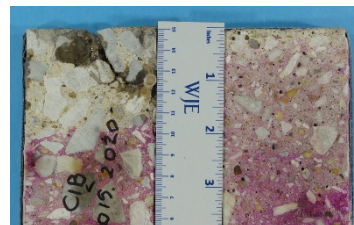
The structure is primarily an open-air reinforced concrete system with thick concrete walls. Structural steel framing was used to frame mezzanine levels and pipe supports. Reinforced concrete blast walls separate the catalyst injection rooms from the reactor bays.

During a routine walkthrough of the subject plant, cracks were discovered in the blast wall with 1/4- to 3/8-inch faulting (i.e., outward displacement of concrete). Removal of displaced concrete revealed a large area of delaminated concrete. Immediate assistance was required to confirm the structural integrity, and WJE engineers were on-site the following day.



SOLUTION

During the initial site visit, WJE engineers recorded visual observations of cracks, spalls, delaminations, exposed reinforcing steel, and concrete thickness. Four concrete cores were extracted and sent to WJE's Janney Technical Center laboratories for petrographic studies and chemical analysis for chloride and sulfur content. The petrographic studies discovered carbonation of the concrete at greater depth than would have been predicted by its age. This depth of carbonation resulted in the loss of the protective alkaline coating, allowing corrosion of the reinforcing steel to occur. Accelerated carbonation—a result of prolonged exposure to high temperatures, humid conditions, and higher-than-normal levels of carbon dioxide—was determined to be the cause of deterioration.



On a subsequent site visit, WJE used nondestructive evaluation methods and field carbonation testing to determine the extents and depths of the delaminated concrete and accelerated carbonation. WJE was then retained to perform a peer review of and consult in a design-assist role for the repairs and rehabilitation. WJE also assisted with coordination of the repair construction so that the repairs were completed within a planned fourteen-day maintenance shut down, and the plant did not experience lost revenue from the repair process.

