

Inventive Solutions Underlie Success of Chicago Roof Deck Restoration Project

Constructed in 1869 and seriously damaged in the legendary fire of 1871, the Chicago Avenue Pumping Station is one of Chicago's premier landmarks. Along with the Water Tower, it is one of only two city structures that survived the Chicago Fire.

By mid-2000, it was clear that the roof was failing: historic cast iron deck pans were partially rusted through, the original slate shingles that had been covered with a built-up roof system were no longer serviceable, and the roof deck had to be replaced.

Under contract with the City of Chicago, HDR develop a rehabilitation design and final contract documents. The facility houses not only essential water operations but also a tourism center, souvenir shop and a restaurant, all requiring public access while the roof deck and a new performing arts center were under construction. Given its location on Chicago's "Magnificent Mile," the facility's reconstruction project drew interest from numerous influential stakeholders. Gaining access to the roof underside to work on deck removal and replacement was a significant challenge. The restrictive clearances around the pumps, 60 feet below the roofline, and requirements for a bridge crane below the bottom chords of the main wrought-iron trusses ruled out conventional floor-supported scaffolding.

The solution required use of a unique, suspended interior scaffolding and enclosure system to provide access to the roof underside while ensuring that operational activities below continued without hindrance. The lightweight scaffolding was shallow to allow the bottom to clear the topside of the bridge crane. However, since the scaffolding had to be suspended from existing wrought-iron I-bar trusses, the potential of overloads on the existing roof framing system existed.

To address this problem, the team developed a unique, ultra-light structural-grade concrete. The ultra-light concrete serves as the substrate for the replacement slate roofing shingles, and is believed to be the world's lightest structural concrete. It delivered a 3,500 psi, 28-day compressive strength and had a dry unit weight of only 67 pcf.

One big challenge was gauging the strength of the existing roof. The roof system had been erected more than a century ago using materials of unknown properties. There was no ASTM when the post-fire roof was erected. Consequently, when the roof retrofit design was conceived it had to accommodate the unknown capacities, and also address the requirements of the current Chicago Building Code.

High on the list of objectives was restoring the Chicago Avenue Pumping Station to its post-1871 condition and 1880's splendor. The team meticulously researched various archives to pinpoint building details. With this background, an historically sensitive design was adhered to from planning through construction.

Re-crafting interior metal work, roofing finishes and the three cupolas recreated the look of the 1880's. The cupolas were raised, which providing much-needed light to the interior. New custom-arched and corrugated metal decking mimicked the profile and look of the original iron deck pans.

The project also included comprehensive lead paint abatement, including removal of 120 years of coatings from the underside of the roof deck which had lead content as high as 50 percent.

The project was completed within the proposed \$5 million budget and prior to the opening of the new Lookingglass Theatre.

**For additional information, contact
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Roof section during construction showing temporary enclosures, framing and suspended interior platform



INVENTIVE

Historic Chicago Avenue Pumping Station Roof Deck Replacement

TIMELESS

AWARD WINNING

INNOVATIVE



Restoring magnificence: Re-crafting interior metal work, slate roofing and cupolas recreated the 1880s splendor of this historic landmark.

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