The PowerHouse—BIM to the Future

BY NEIL WEXLER, PH.D., P.E.

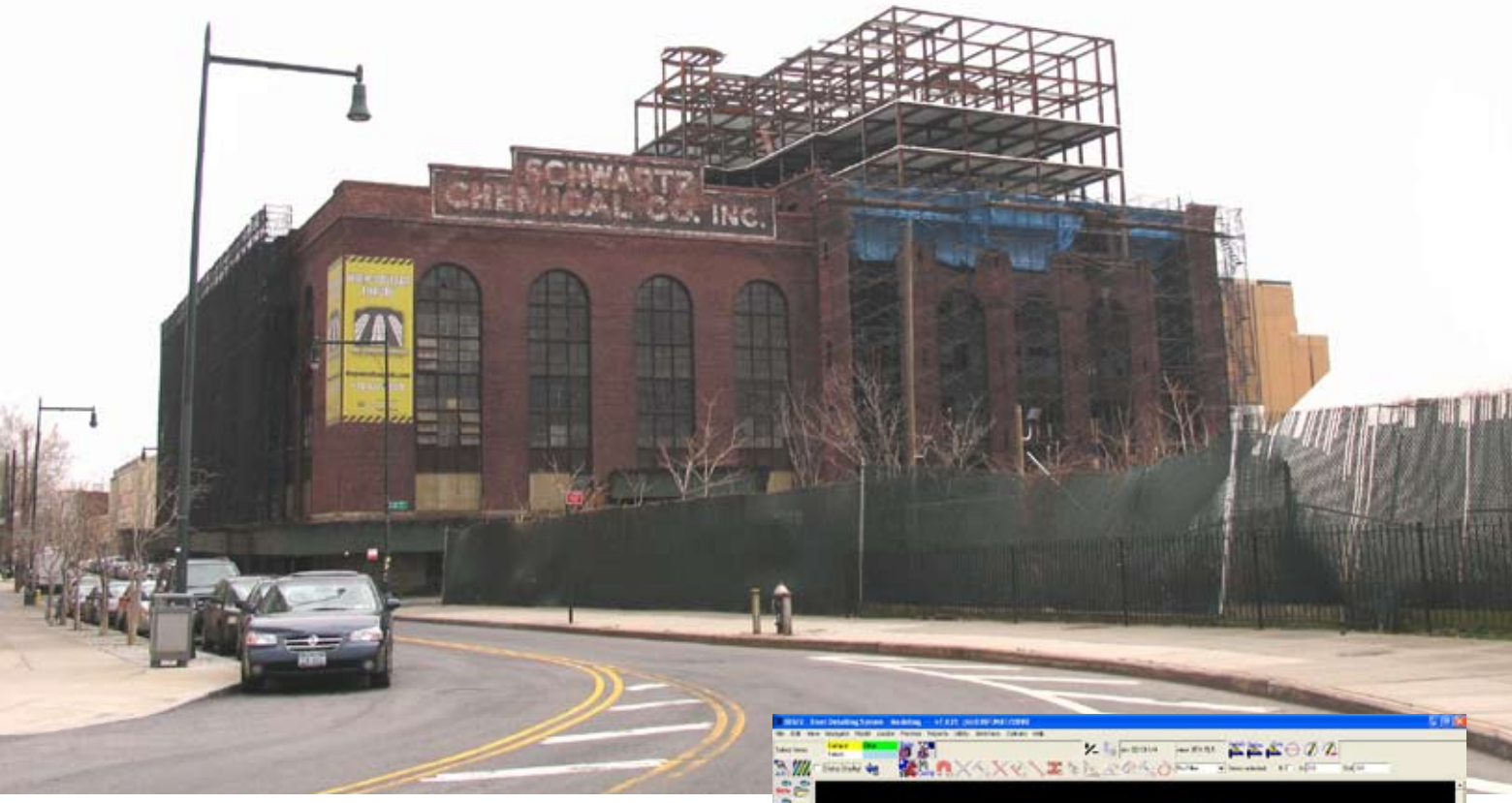
Renovation preserves history and adds style to offer luxurious urban living.

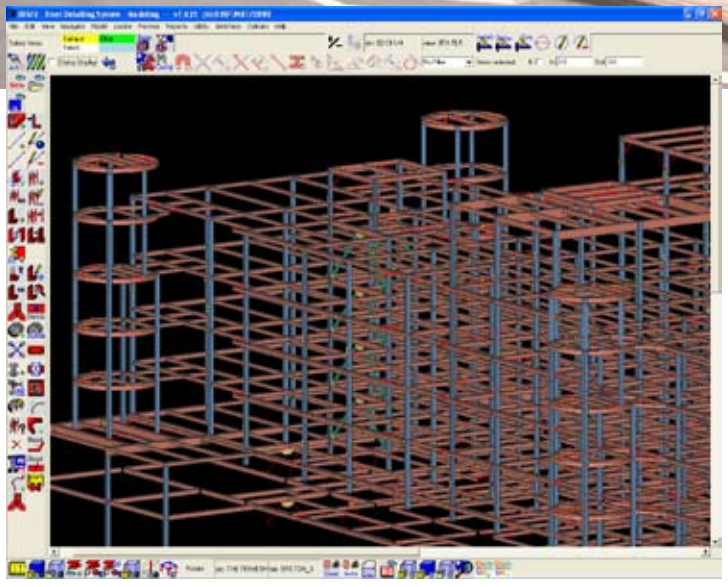
LOCATED ALONG NEW YORK'S EAST RIVER at 50-09 Second Street, The PowerHouse is situated one block from the waterfront and one subway stop from Manhattan on the 7 line. Built in 1906, it was part of the world's most extensive power-generating system for the electrification and expansion of the Long Island and Pennsylvania Railroads. The firm of McKim, Mead and White was the project architect, with the engineering firm of Westinghouse, Church, Kerr & Co. responsible for the building's structural design.

In the 1920s, the building's imposing structure caught the eye of famed artist Georgia O'Keefe, who included it in one her paintings looking across the East River. The station housed steam turbines for generating electricity and also supplied steam power. Upon the opening of Penn Station, it was providing over 32,500 KW of energy into the train tunnels. The facility was decommissioned in the 1980s and currently is being converted into the PowerHouse Condominium—a luxury building consisting of 427 residential units.

The original proposal was to raze the historic PowerHouse, which in the overall plan would have saved $40 million. However, the community outcry convinced the developer into preserving at least some of the original building.

This $200 million project is being developed by CGS Developers, renowned architect Karl Fischer and designer Andress Escobar and is going up in two phases. The recently completed first phase consists of an 11-story, 240,000-sq.-ft building and 177 residences. Phase two includes 250 additional residences. When completed later this year, the project will have 340,000 sq. ft and





Opposite page: Reinventing a turn-of-the-century power plant in Long Island City, N.Y., enabled the project developers to blend raw industrial chic with contemporary styling and extraordinary amenities. Rendering by Karl Fischer Architect.

This page: BIM played a key role in simplifying the addition of steel framing atop the century-old structure. Photo: Wexler Associates.

include a gym, restaurants, coffee shops, a conference facility, and the building, decommissioned in the 1980s, will retain much of its exterior architecture.

In order to meet the challenges this kind of renovation project sets, structural steel was chosen. Additional floors were added within the exhisting envelope. Four new floors were added on top. The existing pile foundation and underground tunnels were reused with no additional reinforcement. In total 12 floors were accommodated.

Using BIM (building information modeling) simplified project delivery. With BIM, the structural design and steel shop drawings were prepared in house by Wexler Associates, a Manhattan-based structural engineering firm. The design for the project was done using 3D software. The existing conditions were carefully surveyed and added into the 3D steel model.

The advantage of BIM for renovation projects such as this cannot be over emphasized. On large renovation projects where existing conditions are exposed during construction, hundreds, if not thousands of requests for information (RFIs) may be required. However, using BIM effectively can dramatically improve the ability to share data, so typically there are very few RFIs. All questions are taken and answered in house.

The structural design scope for the PowerHouse renovation included the following:

Neil Wexler, Ph.D., P.E., is the president, chief structural engineer and founder of New York City-based Wexler Associates (www.nwexler.com).

Additional steel framing facilitated the development of individual condominium units inside the old power generation station. Photo: Wexler Associates.

1. Demolition and structural stability, removal of existing chimneys, coal hoppers, cranes and other miscellaneous structures. Tall masonry walls throughout the structure were supported by temporary bracing. In addition, selective demolition and reconstruction were designed to minimize the need for temporary braces that were judged to be too expensive.
2. Evaluation and reuse of the existing pile and mat foundations. Column loads were limited where needed due to foundation capacities. This was accomplished by reframing and redirecting loads where capacity was available.
3. Design the new building addition.
4. Add floors and mezzanines within the existing building envelope.
5. Detail and design reinforcement, shoring, bracing, needling and reconstruction of existing masonry walls where new architecture was required.
6. Add reinforcement for wind and seismic, to comply with New York City Building Code.
7. Prepare drawings and obtain needed approvals from the New York City Transit Authority.
8. Observe construction progress and assist with modified designs, as needed due to existing conditions.
9. Provide 3D modeling and shop drawings for steel fabrication. Provide redesign and revised shop drawings as needed due to field conditions.
10. Provide structural analysis and design of existing steel connections and design of new connections.

At Wexler Associates, BIM has been used for the last seven years, and each year many millions of sq. ft of new buildings have benefited from its use. Using BIM and integrated project delivery (IPD) has helped reduce schedules, improve designs and ultimately reduce construction costs. As seen on the PowerHouse project, BIM saved significant time and money and simplified project delivery. MSC

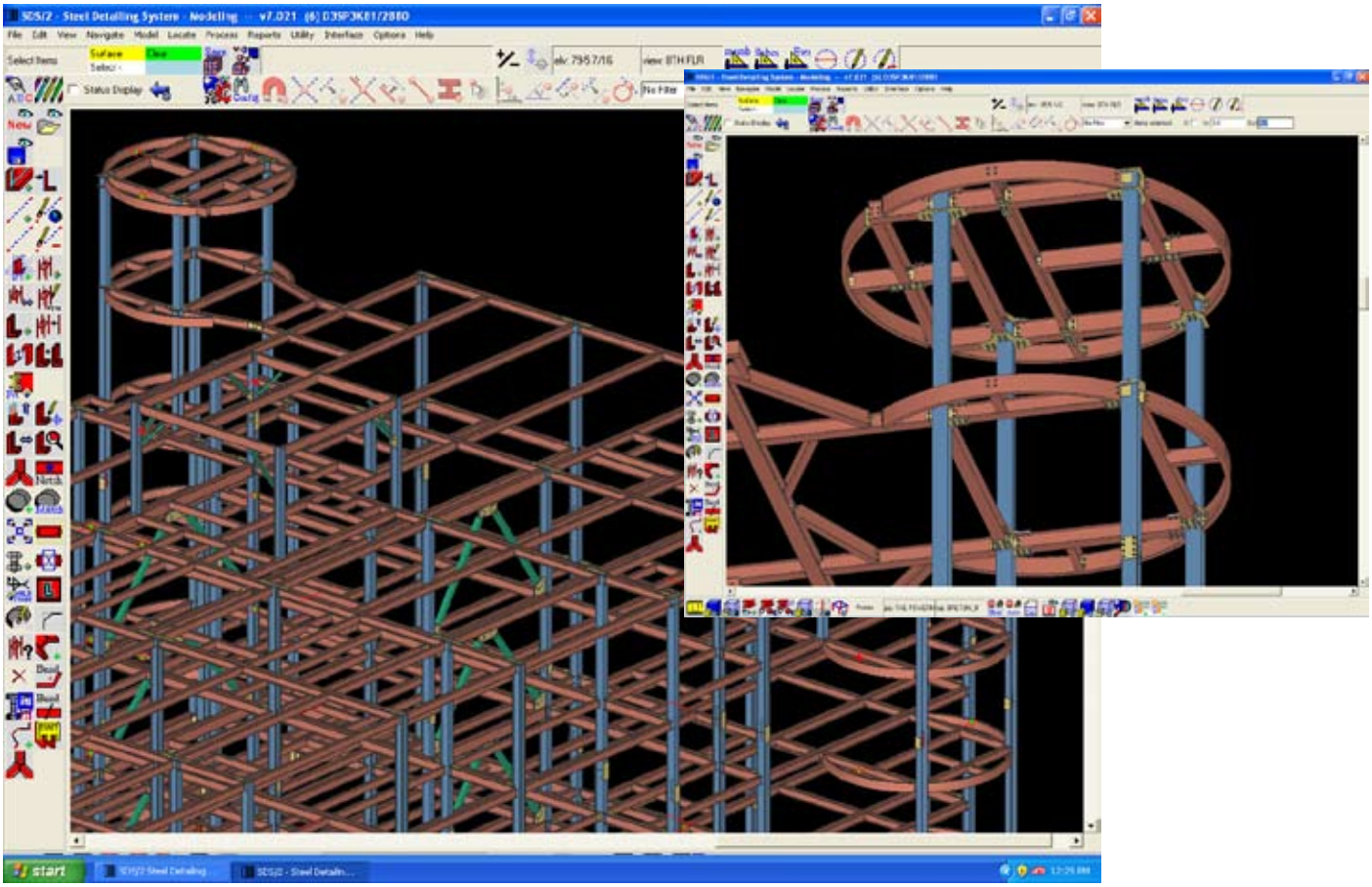
Owner
CGS Developers, Long Island City, N.Y.

Architect
Karl Fischer, New York

Structural Engineer
Wexler Associates, New York

Steel Detailer
WES Consultants LLC, New York (NISD Member)

Software
SDS/2



The amount of detail included in the 3D model—including much data that is not visible here—meant that the PowerHouse BIM could be consulted for many of the questions that otherwise would have become RFIs.