

Teamwork Builds a Collaborative Research Facility:

Bond Brothers Nears Completion of Harvard's Northwest Labs

Architect: Skidmore, Owings, and Merrill



Open Lab space



4160V Electric Room



07/31/2007 06:41 am
View Looking From Oxford Street at On Going Installation of Masonry on South Wing West and North Elevations.

As the extraordinarily complex Harvard University Northwest Science Center (Northwest Labs) nears completion, you can sense the excitement and pride of the Bond Brothers' construction team. This 500,000 square foot facility (designed by Skidmore, Owings & Merrill) comprising an 8-story multiple-use research laboratory and an integrated 4-story below-grade central energy plant, represents one of the region's most complicated multiple-component projects.

Bond Brothers began preconstruction for Northwest Labs at the end of 2002. During the 24-month preconstruction, Bond assisted Harvard in planning this large-scale project on a restricted site surrounded by historic buildings. Cambridge City building height restrictions limited the above-ground portion. Bond helped determine the optimal number of below-grade levels and, thus, the optimal gross square footage. They contributed to determining the footprint and construction techniques such as support of excavation, sequence of construction, structural systems, and below-grade column system. Meeting the university's schedule also demanded early purchase of slurry wall, concrete, earthwork, and steel.

Site enabling, performed by Bond's Civil & Utility division, involved demolishing a brick building containing switch gear and removing all utilities as well as bringing chilled water, steam, and electrical service to the site. Civil & Utility relocated multiple utilities to precise locations outside of the building footprint. In addition to careful mitigation and safety on this active campus, they had to guard against causing damage to historic buildings and delicate museum collections, such as the glass flowers in the Museum of Natural History. Coordinating with campus activities required bringing utilities from Divinity Ave to the site within the 2 to 3 week summer session break because the route used a narrow pedestrian walkway between 2 active buildings.

Bond evaluated several methods to determine the best construction sequence to meet Harvard's schedule for the 4 above- and 4 below-ground floors of the laboratory building. To meet the completion date and provide a necessary staging area at grade, they chose the up-down method, which erects the upper steel structure while excavating to create below-ground floors one level at a time. The ground level would face greater stresses and temporary forces as cranes lifted beams and concrete trucks parked on that floor, which the design team accommodated.

Slurry wall installation for the laboratory and traditional open-cut excavation for the energy plant began simultaneously. Once the lab building ground level was ready, steel went up and digging went down through 30 foot by 30 foot glory holes. Coordinating the process of building in 3 directions took tremendous effort and attention, espe-



Aerial view of NW Labs



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Removal of Bobcat From B4 Level. View Looking Down From B1.



Condenser and Chilled Water Piping and Sand Filtration Tanks



B4 Level Chiller Plant w Chiller and Air Rotation Unit

cially with the extremely limited space around the footprint.

The process of excavating involved digging to the floor level, placing the mud slab on existing soil, putting reinforcing down then pouring concrete, which cured for about 7 days before the next level could begin below it. As soon as the concrete cured, Bond began outfitting the floor, installing sprinkler pipe, duct work, and dry wall, while workers in mining hats and bull dozers worked below. Getting major mechanical equipment to the laboratory lower levels was ongoing and involved. A crane lowered such equipment as a 20x10x10-foot HVAC system through one of the glory holes to the floor. Then riggers used rollers and rigging equipment to slowly drag equipment to its location, place it on its pad, and the appropriate trade connected it.

The second level of the Central Plant contains switchgear and the lowest level contains 3 chillers to serve North Campus. The chillers provide chilled water to Harvard's main tel-data building and the chemistry building, both requiring uninterrupted service. The team faced the challenge of preparing to deliver chilled water in time for summer needs, 6 months sooner than the building process required and equally before the laboratory building would be ready to receive the piping. The below-grade laboratory team pushed to progress faster, and the Central Plant team worked 2 shifts 7 days a week to install permanent piping and get the system online by June 1.

In many ways, coordination and teamwork were the watchwords throughout. The building systems for the plant and the lab were extensive and complicated. Coordinating the installation plan and then the delivery and sequence of installing the systems was an intensive endeavor that included solving the problem of space on paper and in the building not perfectly matching. Managing multiple trades working across several floors in both was like conducting two orchestras. Scheduling included coordinating deliveries through at most two access points for the all activities across the project.

The building is beautiful inside and out and includes many complicated components. The curtainwall includes punch windows and pucte wood spandrel panels that required careful dimension calculations by the subcontractor. High-end interior finishes with complex details demanded minimal tolerances; for example, 300-foot corridors with lacquer wall panels required perfect installation to avoid causing problems for ceilings and other components. Glass-enclosed 'hubs' surround unsupported, architectural structural steel stairs. In some cases, a floor was set back to create a multi-floor glass atrium, in once case requiring that the slab hang from the roof steel.

With all the complexities of this significant laboratory building, the entire project team successfully worked together to meet the demanding schedule and proposed budget – a testament to the collaboration of all parties involved.