BUILDING DESIGN & CONSTRUCTION
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Out of **site**

By John Gregerson, Managing Editor

A tight, awkward site and an unwieldy program could have added up to trouble for the Francois-Xavier Bagnoud (FXB) Building in Boston, a new research facility for the Harvard School of Public Health (HSPH).

But project architect Payette Associates of Boston used geometry to solve the problem, employing a series of bold triangular forms to overcome site constraints and reconcile some of the program's more diverse points.

Chief among them were directives to furnish HSPH with sorely needed labs for AIDs and cancer research; integrate the new spaces with a pair of older, neighboring lab facilities; create a formal entrance for the larger HSPH campus, located behind the FXB site; and provide HSPH with a contemporary image that complemented elements of the surrounding area.

Payette responded with a 104,000-sq.-ft. complex comprised of three interlocking triangles, the first a seven-story research center abutting an existing four-story lab, the second a four-story skylit atrium nestled between the seven- and four-story structures - essentially a triangle within a triangle - and the third a two-story lobby - or "front door." The lobby connects to portions of the seven- and four story structures, as well as an existing 11-story research building, providing grade-level access to all three.

If the solution sounds convoluted, consider the architect's reaction. "After visiting the site - which is only about 10,000 square feet in size - I found it hard to believe we were drawing to the correct scale," recalled David Feth, project designer for Payette. "It didn't look as if it would all fit."

Fit it does, albeit snugly. Paul Riccardi, associate dean of operations for HSPH, indicated that the site helped drive the placement and configuration of FXB's major components. He explained that while the existing research buildings defined two edges of the site, the third edge was defined by a major diagonal street, Huntington Avenue. This resulted in a roughly triangular parcel. "To maximize space, we followed the layout of the land," he said.

But not without a structural detour. According to Jolanda Kenyeres-Pavlinic, principal with Souza, True & Partners (ST&P), the project's Watertown, Mass.-based structural engineer, existing below-grade labs beneath the planned steel-framed lobby precluded the use of interior columns to support its roof and mezzanine floor. The solution was to suspend the mezzanine from the structure's roof beams via 1 1/2-in.-diameter steel rods. In turn, the 55-ft. beams span from new perimeter columns along Huntington to the 11- and four-story buildings, where they were tied into the structures.

"The new roof beams rest on existing beams, which needed to be adapted to accept the additional vertical and horizontal loading," Kenyeres-Pavlinic said. "We had to strengthen the beams and beam-column connections with plate stiffeners and with brackets located beneath the beams. The plan basically allowed us to use existing beams to transfer lobby loads to existing columns."

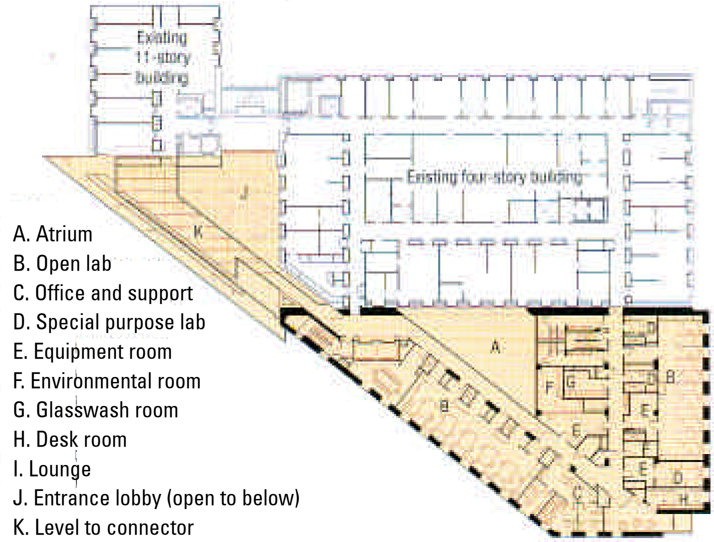
Integrating the seven- and four-story buildings likewise posed challenges for ST&P, and for contractor Richard White Sons of Auburndale, Mass. Plans called for joining common levels of the two by punching openings into the facade of the four-story structure where corridors for the two facilities met, then cantilevering portions of the new floor slab across a 1 1/2-ft. joint separating the two buildings. (The

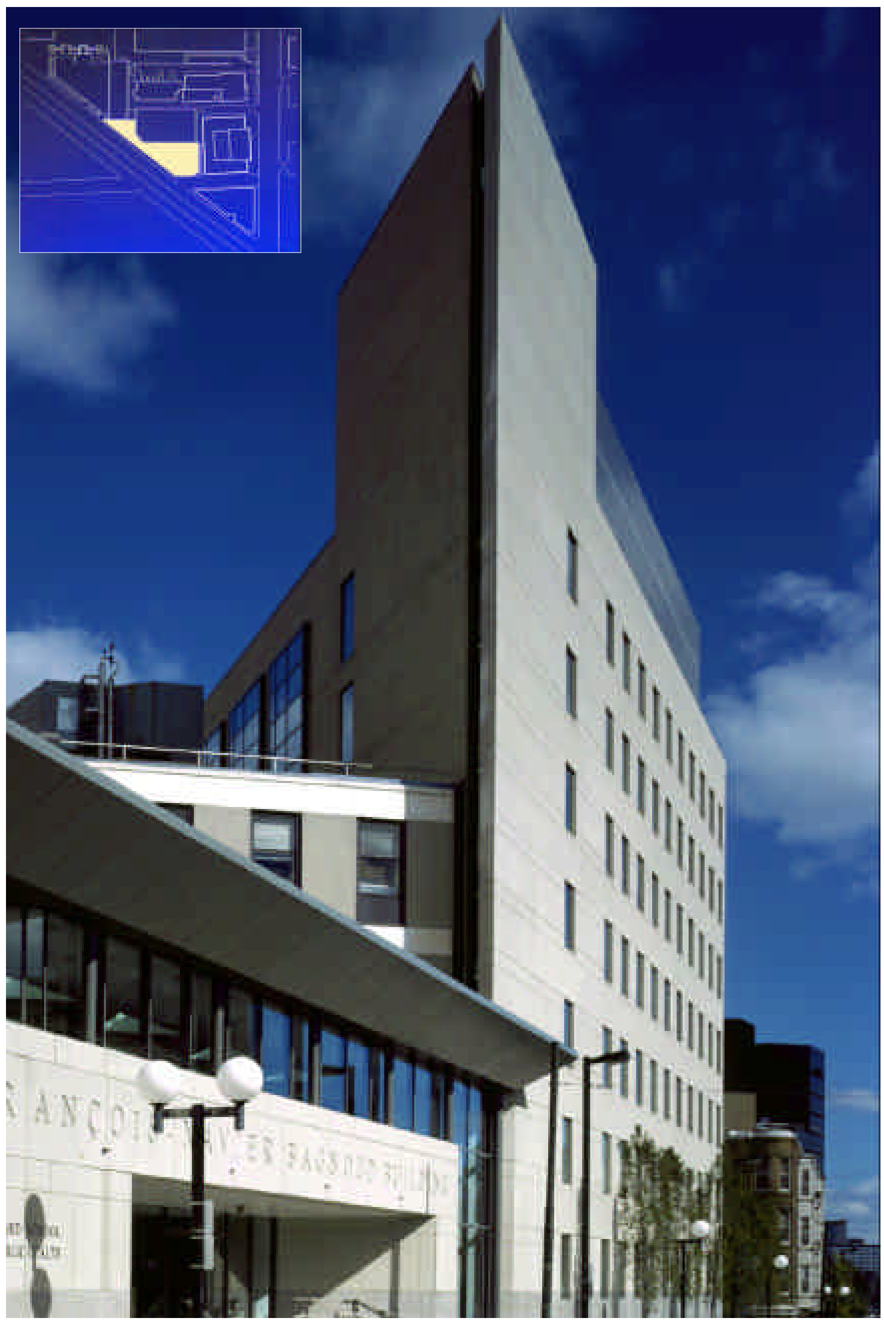
Integrating new and existing research buildings on a small parcel prompts project members to evaluate design and construction issues from all angles

CONSTRUCTION COSTS

Sitework	$1,050,000
Concrete	2,430,000
Masonry	710,000
Metals	2,390,000
Carpentry	1,170,000
Thermal/moisture protection	780,000
Doors/windows	974,000
Finishes	2,543,000
Conveying systems	290,000
Environmental rooms	480,000
Mechanical	4,235,000
Electrical	2,832,000
Telecommunications	166,000
Plumbing	1,130,000
Fire protection	428,000
Other	2,392,000
Total	**$24,000,000**

Second-Floor Plan





Tight fit: To maximize square footage for the $24 million, 104,OOO-sq.-ft. Francois-Xavier Bagnoud building, "We followed the layout of the land," said Paul Riccardi, associate dean of operations with the Harvard School of Public Health in Boston. The resulting triangular structures - a two-story lobby and seven-story research center - tie into a pair of existing HSPH buildings. Labs in the new seven-story structure are primarily configured as open plan suites.

Photos: (above) Peter Vandervwarker; (right) Bruce Martin

"After visiting the site, I found it hard to believe we were drawing to the correct scale"

remainder of the existing facade was to remain intact, forming one of the edges of the triangular atrium.) The joint would also serve as the location for a new full-height braced frame for the four-story structure, providing the required seismic capacity to eventually add three new floors to it.

"The work had to be performed before construction of the new building rendered the existing structure inaccessible for upgrades," Kenyeres-Pavlinic said, noting that steel tubes were specified to connect the frame to the existing beams at each level.

As a result, "we were trying to maintain operations in the building while workers were drilling steel into each of its floors," Riccardi said. "The work caused a huge amount of noise and vibration." As part of weekly construction meetings, White Sons would advise representatives from the building about work scheduled to occur three weeks later, so that the timing of specific tasks could be coordinated with research activities. "That went on for the better part of two years," Riccardi recalled.

Before breaching the existing facade, White Sons first had to ensure that negative air pressure was maintained in the building. "Due to ongoing lab operations, the entire building was under negative pressure, and there was concern that dust and debris would get sucked into it," said White Sons project manager Paul Gransaull. To maintain pressure, workers constructed temporary plywood "air locks" behind areas of the facade that were to be opened. The plywood enclosures were eventually replaced by permanent ones constructed of metal studs, gypsum board and doors equipped with stops and gaskets, according to Ted Athanas, partner with Bard, Rao + Athanas Consulting Engineers (BR+A), the project's Boston-based mechanical designer.

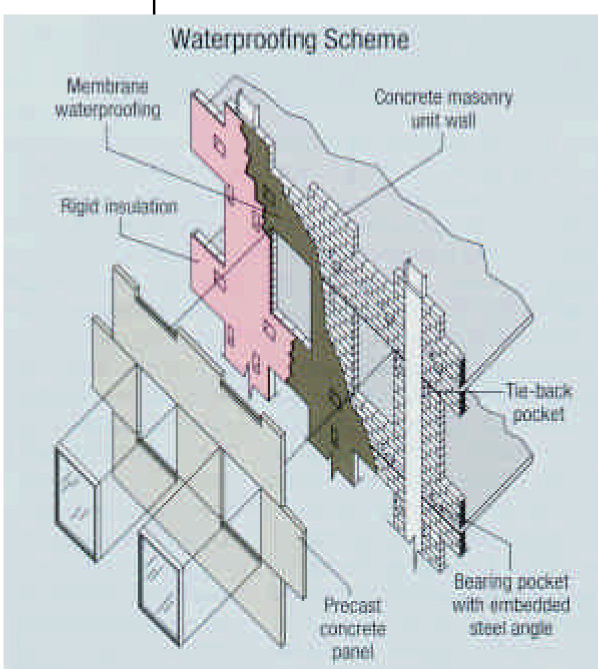
Because of FXB's close proximity to the four-story structure, project team members had to likewise reroute the latter's air-intake vents to prevent dirt and fumes from reaching labs during construction. "The intakes were at grade

WATERPROOFING

Waterproofing requirements turned plans inside out

When Paul Riccardi became associate dean for operations at the Harvard School for Public Health (HSPH), "I inherited three buildings that leaked," he said. He and other administrators were determined to make sure that HSPH's new seven-story Francois-Xavier Bagnoud Building (FXB) didn't add to his troubles.

As a result, project architect Payette Associates selected a concrete masonry unit wall as back-up for the building's precast exterior, then specified a continuous mastic sheet membrane to waterproof the inner wall. The design also called for locating 2-in.-thick insulation and a flashed 2-in. air cavity between the masonry and precast walls. The plan presented complications, however. "With precast, you typically build from the outside to the inside so there's nothing in the way when you're securing panels to the building frame," said Paul Gransaull,
project manager with FXB contractor Richard White Sons. "If we had done that here, we wouldn't have had any room to apply waterproofing to the masonry. There was only a 4-in. space between the face of the masonry and the back of the precast."



"With precast, you often have metal studs as your back up," said Paul Gransaull, project manager with contractor Richard White Sons. "But Harvard wanted masonry - something that would last." Openings in the masonry wall allowed workers to anchor precast panels to the building structure behind it.

The solution was to construct the masonry first, leaving "tieback" and "bearing" openings in the wall so that the precast anchors could be secured to framing behind it. "The precaster had to be well-coordinated with masons placing the block in the field," said Payette project designer David Feth "And that's a step you usually don't worry about much - how the block gets laid between column lines. We couldn't afford to have huge precast members dangling from a crane as a result of our points not lining up."

Once precast members were anchored in place, "we wrapped the openings in waterproofing from inside the building, insulated them, then closed them," Feth said.■

Air-intakes had to be rerouted to prevent dust from reaching labs

Fitting in: FXB's angular forms and precast cladding (above) were intended to complement contemporary buildings near the site. The design also reflects modern technologies inside the new seven-story research center, according to David Feth, project designer for architect Payette Associates. Open lab spaces in the center promote flexibility.
Photos: (above) Brian Vanden Brink; (left) John Horner

PROJECT SUMMARY

Francois-Xavier Bagnoud Building, Boston, Mass.

■ Building team

Owner: Harvard School of Public Health
Architect: Payette Associates
Interior architect: Bruner/Cott & Associates
Structural engineer: Souza, True and Partners
Mechanical/electrical engineer: Bard, Rao + Athanas Consulting Engineers
General contractor: Richard White Sons

■ General information

Area: 104,000 gross square feet
Number of floors: 7
Construction time: July 1994 to June 1996
Construction cost: $24 million
Delivery method: Design/bid/build

■ Project suppliers

Exterior glazing: PPG
Masonry, brick: Belden
Windows: Vista wall
Roof system: Versico
Roof insulation: Owens Corning
Life safety/security system: Simplex
Elevators: Payne
Energy management controls: Landis & Staefa
Plumbing fixtures: American Standard
Doors: Weyerhaeuser
Entrances, storefronts: Vistawall
Wall/floor tile: American Olean
Resilient flooring: Armstrong
Ceilings: Armstrong
Interior walls/partitions: USG; Georgia Pacific

level, with a below-grade, grated areaway routing air into a basement mechanical room," Athanas said. Before excavation, workers extended the areaway by constructing temporary plywood stacks up the side of the structure, so that fresh air could be drawn instead from the top of the building. Carbon filters were placed at stack inlets to ensure that residual dust and debris didn't infiltrate the building, Athanas said.

As built, the triangular, precast-clad structures help to create a "modern aesthetic that reflects adjacent buildings, as well as modern technologies found in FXB," Feth said. The forms also proved useful for integrating labs, administrative functions and common areas. In the seven-story facility, Payette located suites of labs along the arms of the triangle, and meeting and administrative spaces in adjacent corner "elbows."

Because research in many of the labs is tied to grants, and therefore subject to change, Payette employed an open plan in several of the suites to promote flexibility. "'The researchers essentially adapt to the space," Riccardi said. So that spaces remain as open and generic as possible, researchers share common glasswash and equipment rooms clustered outside the suites, at their midpoint. Within suites, researchers similarly share environmental rooms and special purpose labs located directly opposite lab stations. Risers in these shared spaces supply gases, distilled water and other services to the adjacent lab stations. The stations themselves are modular in nature, allowing suites to be divided into smaller units in the event that renovations are required. "Typically, you have a four-person lab every column bay," Feth said.

Variable-volume air-handling units and fume hoods provide 100 percent outdoor air to the open lab spaces, Athanas said, noting that 100 percent of the air is also exhausted from the building via manifold ductwork. To reduce energy consumption, BR+A specified a heat recovery system consisting of a glycol loop system to extract heat from the exhaust and transfer it to the incoming outside air.■