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Engineers, architects ensure new uses for old structures

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Structural engineers and architects who have been in the business awhile aren't strangers to working on old buildings.

The rehab business is good, accounting for 75 percent of the work at some Twin Cities firms. It also generates some of the toughest assignments.

"With computers, any graduate engineer can design a new steel floor," said Chris Hartnett, the lead for the preservation engineering group in the Minneapolis office of Meyer Borgman Johnson. "It's different when you're creating and re-creating load paths in a building that's been standing for 100 years."

Dan Gach, Paul Whitenack, and Lucas Malm of Wiss, Janney, Elstner Associates' "difficult access team" test the exterior of the Pillsbury A-Mill last year in Minneapolis. The activity is one of the measures engineers and architects take to make sure older buildings can be used for new purposes. (SUBMITTED PHOTO: WISS, JANNEY, ELSTNER ASSOCIATES)

Three quarters of the firm's work this year will come from projects in existing buildings.

Where new construction operates on accurate plans and predictable budgets, reuse and preservation projects hinge heavily on guesswork. Over time, original schematics are lost, what is sealed inside walls is forgotten, and weather and people cause unseen damage**.**

Restoration, preservation and reuse projects are under way or in the planning stages throughout the Twin Cities. The challenge for the architects and engineers involved is to make old buildings useful, last longer and increase their value.

The toughest task can be keeping a project on budget. Reuse and preservation projects that don't involve demolition cost somewhere between 12 percent less and 9 percent more than new construction, according to a 2005 study by the Brookings Institution. But those numbers don't necessarily describe market conditions in the Twin Cities.

"Nine times out of 10, new construction is going to pencil out better," said Meghan Elliott, founder and owner of Minneapolis preservation consulting firm Preservation Design Works.

Rehab bigger than new

Engineers and architects working in the Twin Cities identify the area as the largest Midwest building preservation and reuse market west of Chicago and north of St. Louis. Between 2010 and 2012, the value of rehab construction permits in Minneapolis and St. Paul – $2.82 billion – was double that of new construction, according to figures kept by the planning departments at both cities.

In 2011, Minnesota tied California for having the 16th most federal historic tax credit proposals approved, according to statistical reports kept by the National Park Service. And while the number of approved Minnesota projects dropped in 2012, the state ranked sixth in the nation for the dollar value of the projects, $266 million.

The projects seem to be everywhere. Warehouses, industrial buildings and breweries are popular for reuse, while some historic buildings — such as the recently completed Union Depot in St. Paul — are updated to serve their original purposes.

Greg Donofrio, an assistant professor specializing in preservation architecture at the University of Minnesota in Minneapolis, thinks preservation and reuse work for engineers and architects will continue to grow. State and federal historic preservation tax credits make many projects work financially, which is good news for his students.

"Preservation has become a mainstream activity," he said.

Unknown risk increases the price of redesigning and repurposing old buildings. Sometimes, a lack of compatibility between an old building and its intended reuse can delay a project. Elliott saw that recently when one of her clients learned that the steel structure of a historic building under reconstruction would not take to welding. New steel structural members added in a remodel had to be bolted on, a more costly process.

"Different pieces of information are going to impact your cost," Elliott said.

Exploring A-Mill

To account for unseen conditions on one ongoing project, Plymouth-based developer Dominium recently commissioned Wiss, Janney, Elstner Associates to examine the exterior walls of the 130-year-old Pillsbury A-Mill in Minneapolis. The mill and two other historic buildings on the property are slated to be converted into 251 apartments.

Paul Whiteknack, an associate principal with the Minneapolis engineering firm, actually rappelled down the exterior walls of the main mill building last year along with other members of his firm's Difficult Access Team. The engineers and architects on the team tapped stones on the 2- to 6-foot-thick limestone exterior walls with rock hammers to find crumbling material or eroded spots in need of repair.

After that, WJE engineers looked deeper into the building to determine whether the vibrating flour milling machinery that worked around the clock in the mill until 2006 had damaged the structure. Whiteknack said his team found that the structure is "viable" for use as an apartment building.

Because the machines produced so much heat, the mill never needed to be insulated against winter weather. Now, the engineering and architecture team has to figure out how to insulate walls and windows without violating Minnesota's rules on historic preservation, or trapping moisture against old stone, terra cotta and brick.

"You don't want to inadvertently cause damage to the walls," Whiteknack said.

Owen Metz, Dominium's project supervisor for the A-Mill, said the insulation and weatherproofing will account for 10 to 20 percent of the $140 million project budget. He said it would be far less expensive to build an energy-efficient skin over the building, but that would disqualify the project from receiving state and federal historic preservation tax credits.

Some of the extra cost will be for engineering. Those bills can be five times as much as the usual 0.5 percent project budget set aside on new buildings, according to Hartnett. Contingencies run as high as 25 percent, whereas 10 percent is often enough for new construction.

Chuck Liddy, a principal with Miller Dunwiddie Architecture in Minneapolis, recommends the higher percentage based on experience. A few years ago, his firm designed a new elevator shaft in the old Nate's Clothing Store building in Minneapolis. As contractors prepared to build the shaft, engineers discovered a stream bed underneath the building. It took an extra $100,000 in soil and structural work to get the shaft built.

"We try to advise our clients to have realistic contingencies on older buildings," he said.

Sometimes, original schematics and drawings are available for a building undergoing restoration or conversion. Books and drawings as old as 1860 are easily found at workstations in Hartnett's department at MBJ. Elliott's company specializes in finding rare engineering information and historic construction documents.

Firms want to see the preservation and reuse sector continue to thrive. Liddy said the surest way to make this happen is for engineers, architects, developers and preservationists to broaden the definition of which buildings are worth saving.

Though buildings constructed in the 1960s, '70s and '80s may not look attractive now, "the filter of history" may judge them differently, he said.

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