Dream Team

Beth S. Pollak

With design-build cooperation, a three-story addition to a hospital in Albuquerque, NM is a smooth operation.

When Presbyterian Hospital in Albuquerque, NM required additional square footage to create more rooms for patients, three additional stories were built on top of the existing four-story structure—and the hospital remained open throughout the construction process. Through careful teamwork, communication, and electronic data interchange, a design-build team met the challenge of expediting the expansion with little disturbance to hospital functions.

UPDATE AND EXPAND

The hospital required a three-floor addition to create more private rooms for patients. "The addition would increase the number of rooms and would be followed by a renovation of the existing hospital," said John Duquette, AIA, project manager for Architect Dekker Perich Sabatini.

Also, the footprint of the building would be made larger than the existing hospital to provide seismic upgrades and to take the additional load of the three new floors.

"Architecturally it was challenging," Duquette said. "Presbyterian has been there for so long that the surrounding neighborhood views it as a major element. We had to integrate the design of the existing structure and medical building, and maintain the appearance of the old brick structure—but at the same time give it an upgraded look. There have been other additions since it was built, and we had to pull it all together as an integrated campus."

The existing structure was built to an older building code. Although the hospital originally was designed for an additional three levels, the previous code's seismic requirements were less stringent than current requirements.

"The gravity columns were adequate for the additional levels, but the lateral-load carrying system needed to be retrofitted and upgraded," said SER George H. Bradley III, P.E., a principal with Chavez-Grieves Consulting Engineers, Inc. "Because of the more stringent seismic criteria in the current building code, it was necessary for us to modify the steel braced frames and a number of columns."

Steel was chosen in part to meet the project schedule, and in part because the existing tower was steel. The renovation used 1,200 tons of structural steel to add 150,000 sq. ft to the building. The gravity framing of the new construction consists of steel joists and wide-flange beams at the roof, steel wide-flange composite beams and girders at the elevated floors, and wide-flange columns. This system matched the existing building's structural system below. The new columns were connected to the existing columns. As part of the original construction, the existing columns were extended above the existing roof level in preparation for a future addition. Lateral framing consists of steel HSS braces, and wide-flange columns and beams. The steel structure was fire-protected with a two-hour cementitious fire-protective coating.

Design began in September 2001, and by January 2002, just four months later, construction started. Seismic upgrades and the building shell were complete in July 2003. Interior improvements and the entire renovation are scheduled to be complete by July 2004.

DESIGN-BUILD R_x

The choice of the design-build project delivery method was the result of careful planning. The hospital hired McCarthy Building Companies, Inc. as a construction manager and general contractor. Dekker/Perich/Sabatini, an Albuquerque-based architectural firm, was brought on board as the project architect, with Chavez-Grieves as their structural engineering consultant. "At that point it became a design-build project," Bradley said. "Although the owner hired McCarthy as the general contractor and construction manager, they still wanted competitive bids from subcontractors."

At this point in the project, the decision was made to bring a structural steel fabricator onto the project team so as to benefit from fabricator involvement in the design process. This decision was due largely to the many challenges the project team faced, especially the complexities of interfacing with the existing facility and constructing the seismic retrofits while keeping the existing facility operational.

McCarthy then set about the task of selecting a teammate and issued a best-value design-build RFP to multiple steel fabricators. The RFP took into account cost, schedule, safety, quality and sequencing in the selection criteria. AmFab, Inc., a design-build structural steel fabricator in Albuquerque, teamed with dtl's (Detail's), Inc., an Albuquerque based steel detailing company, and was selected as the result of this process.

EXAMINING EDI

Electronic Data Interchange (EDI) enabled the design-build team to create three-dimensional structural models of the building expansion and use them to expedite the detailing and fabrication process. Chavez-Grieves and AmFab were able to use their experiences of working together with EDI on previous projects to benefit this project.

During the design process, AmFab, Inc. conducted a site-survey of the original building in order to verify existing conditions. "Old records and drawings aren't always accurate," Bradley said. "AmFab used a survey crew to conduct the survey of the existing structure before design was completed and before shop drawings were started. From this information, we knew accurately where the existing members were located."

The team then used the survey information provided by AmFab along with RAM Structural System software to create an accurate three-dimensional model of the entire project. The model contained both the existing structure and the new construction.

"Using this design model, we were able to analyze both the new and existing structures, design the seismic upgrades for the existing system and design the new construction," Bradley said.

Once the design was complete to about 95%, the CIS-2 translator was used to send the three-dimensional structural model information to the detailer's software, SDS/2.

"We used EDI and the CIS-2 translator to have the two programs talk to each other," said Mark Mosher, managing partner for AmFab, Inc. "You can imagine, we already have a three-dimensional computer model built in the structural analysis software and we use the CIS-2 translator to pass this information to the SDS/2 detailing software. The effort that would have been required to create this model in SDS/2 from scratch would have been tremendous—it would have taken hundreds of hours to recreate. Passing information between software applications with the CIS-2 translator is a huge advantage."

Mosher says using EDI is even more helpful when working on expansion and renovation projects. "From the detailing standpoint, whenever you're detailing projects to existing buildings, it's always a mess, because you don't know what's there," he said. "But since they built the design model based on the existing structure—in the detailing model, which was imported from the structural model, our system already knew what we were attaching to. It was very easy to tie into the existing structure—and we were doing it in a 3-D world, rather than going out into the field"

The detailing model then was sent as a CNC (computer numerical control) file to the fabricator. "After we imported the model and detailed it, we generated CNC files out of detailing files, and e-mailed them to the shop," Mosher said. "The shop equipment then could use those files. The beauty of it is that we took it through the entire process digitally. We don't have people who lay out the beam—instead, the CNC uses the information directly from the detailing software, and it tells the equipment how to build a beam. It's a lot faster, and a lot more accurate than if a person were building the same beam by hand. We saved at least a couple of months as a result."

EXPLORATORY SURGERY

Adding on to the existing building required careful coordination of the construction process. "The first thing we had to do was open up the existing walls and column covers to upgrade the existing beams," said Bill Schuttler, project manager for McCarthy. "We tied all the expansion joints together with plates, and we installed the seismic bracing. Then we went inside with small units and drilled 75'-deep auger cast piles as a foundation for the steel columns to sit on. We dropped the long columns, two-story to three-story columns, then closed them in and closed up the roof. It required quite a coordination effort to make sure everything was plumb and level before we could close-up the building."

One challenge was making connections from the existing structure to the new one. " The biggest hurdle was connections to the hospital," Schuttler said. "We had concrete-covered beams and brick-covered beams that we had to open up."

Framing for a new three-story pedestrian bridge over the existing lobby is erected.

The building required extensive seismic modifications. "There was an expansion joint in the building that we stitched and welded together to make a larger diaphragm, because it worked better to distribute load to braced frames," Bradley said. "We put in as many new braced frames as we could, using a number of different strategies."

Another challenge was the location of a large electrical underground duct bank that supplied power to the hospital's entire east wing. "We had a column coming down right on top of that," Bradley said. The duct bank had to remain in operation, so auger-cast piles were installed on each side of the duct bank. A grade beam spans between the piles and over the top of the duct bank to support the column, which extends full-height of the building (approx 100'). "What we had to do was span a concrete-grade beam in the foundation over the top of this utility trench to avoid breaking utilities," he said. "We put columns on top of the grade beams and distributed load to the adjacent piles. It was a little tricky."

The new expansion also features a three-story pedestrian bridge that connects to an existing seven-story medical office building. The bridge goes over the top of the existing hospital's main entry lobby. The owner wanted to minimize any new columns in that area, so an offset vertical truss column was designed to support the bridge. This truss column was placed outside of the lobby area, and then steel beams cantilevered off of the side of the truss column to support the bridge floors. The truss column measures 16' wide by 72' tall.

DELICATE PROCEDURE

The challenge was to accomplish the expansion and renovation while the hospital was still in operation. "They didn't shut down the wings," Bradley said. "It was a huge challenge to the contractor to be welding, bolting, and hammering large pieces of steel into small spaces while keeping the hospital in operation."

The floor below the addition housed the intensive care and the neo-natal intensive care sections, which are sensitive to vibration and noise. To minimize disturbances to patients, the project team had to work closely with the hospital during construction.

"Lots of extra coordination was required to keep the hospital in operation," Bradley said. "Some of the design couldn't work in the field because it disturbed the hospital. We had to redesign some of the details in certain situations because the contractor couldn't get [the steel] to fit while meeting the hospital's requirements."

But the team was able to isolate construction areas and block them off to keep the dust, noise and smoke from getting into the rest of the hospital. "They gave us a room or two around a column for a short period of time," Schuttler said. "We created an air-tight space around the column. The noise and vibration would be a big issue when we were jack hammering, so we put up sound blankets, and furnished the hospital with earplugs."

Workers also installed soft-fans that removed welding smoke and prevented it from moving through the hospital.

"The hospital has been very considerate of the work we had to do," Duquette said. "We would turn over certain areas at a time, work on the infrastructure changes and column reinforcement, clean up the work and move on."

A temporary entrance was created while construction crews placed a column in the hospital lobby. "We actually put a new column right down through, into the existing lobby," Mosher said. "The column was for a corner of the building. We had to go down through to a footing. It shut the main exits down for about a week."

Also, the tower crane used to set the steel had to coordinate with the hospital's helicopter pad, to avoid interfering with take-offs and landings for emergency services.

Safety nets that cantilevered off the floor were placed around the building for safety purposes. "We rented nets with long arms, so that anything that might fall would catch in the net and not injure anybody," Schuttler said.

Another challenge was the lack of a staging area during construction "We had no lay-down room," Mosher said. "We had to back the trailer up to the entrance and hang steel right off of the truck. We spent a lot of time on the front end of the project—deciding in what order to load the truck. And we fabricated the steel in that order. We had no staging area, and just enough room to back the trailer in. There was no shaking out or excess time."

FOLLOW-UP VISIT

All parties agree that when companies that are familiar with each other work together as a team, success is the result. "The process we used on this project goes beyond EDI," Mosher said. "It would have taken much longer if the firms involved had not had an existing relationship."

Working from a central location meant quick communication and results. "We had weekly design meetings together to solve problems as they occurred on the spot, so we did not have to wait for RFIs to be sent back and forth," Bradley said. "It was definitely easy to accommodate changes. We were working as a team—with a teamwork atmosphere."

"It needed to be a team effort, to minimize the impact to Presbyterian."

Duquette said. "Everyone went into it already knowing who the players were and the whole project ran pretty smoothly."

Although the design-build process requires careful planning and discussion, construction went smoothly and the final product is near a successful completion. "It certainly is funny because we look at the internal process and see ourselves as scrambling," Mosher said. "But from the clients' perspective, none of this goes on, the process appears absolutely seamless."★

ARCHITECT
Dekker/Perich/Sabatini, Albuquerque

GENERAL CONTRACTOR & CM
McCarthy Building Companies, Inc., Albuquerque

STRUCTURAL ENGINEER
Chavez-Grieves Consulting Engineers, Albuquerque

ENGINEERING SOFTWARE
RAM Structural System

STEEL FABRICATOR
AmFab, Inc. (AISC member)

STEEL DETAILER
dtl's, Inc., Albuquerque
(NISD member)

DETAILING SOFTWARE
SDS/2

STEEL JOIST SUPPLIER
Canam Steel Corporation, El Paso, TX

Three stories were added on top of an existing four-story wing.