

# Steel on Track!



David C. Monroe

A two-story addition to the Station Square Parking Structure in Pittsburgh, PA was completed in less than 100 days using a design-build approach.

In the early 1980s, developers converted an industrial site located across the Monongahela River from downtown Pittsburgh, Pa., into a multi-use complex consisting of offices, shopping, restaurants and a hotel. The centerpiece of the project was the conversion and restoration of the Pittsburgh & Lake Erie Railroad Station into a major restaurant attraction. An 800-car parking structure, consisting of a steel frame with post-tensioned concrete decks and pre-cast concrete panels used as an architectural façade treatment, was also built to service the complex. The use of steel was featured prominently as an architectural element throughout the entire complex as a statement to the historical heritage of the site. Over the ensuing years the project, known as Station Square, became a significant tourist attraction, entertainment complex, retail center and home to numerous companies.

In the late 1990s, ownership passed to Forest City Enterprises in Cleveland, Ohio. Forest City proceeded with plans to dress up and expand the project. An expansion to the hotel was the first order of business, followed by the addition of new theme restaurants and attractions. In the process, surface parking-area capacity previously utilized was lost, and demand for additional parking generated. An addition to the existing parking structure was the obvious solution to this problem.

In the fall of 2000, Carl Walker Construction, working with Churches Consulting Engineers, was retained on a design-build basis to evaluate the potential for the parking structure expansion. The project requirements included evaluating the potential for a vertical expansion to the existing structure; minimum disruption to the existing parking operation; maintenance of the architectural character of the existing structure and surrounding buildings; a very tight construction schedule; and of course, cost. A steel-framed structure and a design-build approach to the project met all the requirements perfectly. The result was a \$3.5 million, two-story, 120,000 square foot vertical expansion to accommodate an additional 400 parking spaces. The project represents an excellent example of how the design-build process can be combined effectively with a steel-framed structure to serve the interests of an owner for a fast-track parking structure project.

## THE DESIGN-BUILD APPROACH

The design-build approach emphasizes the requirements of a whole project rather than focusing on the design process in the way it assigns responsibility for undertaking the project. As a result the design-builder, the trade contractors, the suppliers, and the design consultant all make valued contribu-

tions to the project from the beginning of the design process to the completion of construction. This process allows a fast-track approach to a project, so design and construction activities proceed simultaneously on parallel tracks. In this project, a working budget was established early in the process and used as the basis for a Guaranteed Maximum Price (GMP) without the time and expense required to develop a complete design. The owner stayed involved in the process and made decisions based on real time and real dollars as the project developed. The process gave the owner flexibility, accelerated the time period required for design, reduced design costs and accelerated the construction schedule.

In a parking structure project such as this one the structural frame and deck system typically represents 50–60 percent of the total cost of the project. By selecting the steel fabricator, pre-cast supplier and erector early in the process, Carl Walker Construction was able to utilize their experience during the design phase of the project and maximize the benefits of their expertise. The process also allowed for the scheduling of long-lead items before designs were finalized and the client had fully committed to the project.

“These advantages led to the successful completion of the aggressive construction schedule and the minimum of disruption to the site,” said

Len Tsupros, Carl Walker Construction vice president and design-builder for the project. "The steel frame design allowed for off-site fabrication of the structural steel members, while the site was made ready for erection. We couldn't have completed the project within the time frame of the aggressive schedule without the steel frame design and the design-build process" he said.

### DURABILITY ISSUES

Controlling corrosion is a major concern for parking structure projects, especially those located in harsh winter environments such as Pittsburgh, where chlorides and freeze thaw conditions are encountered. These concerns were addressed by incorporating state-of-the-art practices into the project. Potential for corrosion of reinforcement in the concrete decks was addressed by using a low water/cement ratio (.38), 5000 psi concrete mix with superplasticizer and an air entrainment admixture. The encapsulated post-tensioning system allowed the elimination of most joints common to other types of construction, and virtually eliminated random cracking on the deck surfaces. The concrete was water cured for seven days after placement to ensure proper curing. All embedded metals and reinforcing in the deck were epoxy coated. Finally, a silane sealer was applied to the finish surface to decrease moisture absorption into the concrete.

Minimizing the potential for corrosion of the exposed structural steel was also a concern. A special anti-corrosion paint system was utilized to accomplish this objective that included the following components:

1. Shot blasting of the steel in the shop to SSPC SP-6 standard (commercial blast cleaning) is a key to the long-term success of the coating system.
2. Shop application of a zinc-rich epoxy primer.
3. Field application of a polyamide epoxy topcoat to provide a finished color coat.
4. Application of a clear coat of urethane for perimeter elements to provide UV protection in areas exposed to direct sunlight.

In addition to the special paint system, all connections were bolted with galvanized connection hardware.

The coating system manufacturer claims a service life of 20-plus years for the system. The effectiveness of these provisions was demonstrated by the sound condition of the structural steel and deck slabs used in the existing 20-year-old deck areas.

### CONSTRUCTION FEATURES

The project required that two levels of parking (approximately 120,000 sq. ft.) be added to the existing structure to provide an additional 400 parking spaces. The foundation system for the

existing structure had been built with future expansion planned. The only modifications to the existing structure required for the expansion were:

- adding some "X" bracing at four locations for additional lateral stability; and
- raising the existing stair and elevator towers to accommodate the new levels.

About 450 tons of wide flange beams, columns and tube steel were required for the structural frame. Marietta Structures of Marietta, Ohio,



Use of a structural steel framing system allowed for complete erection of the structural support system and exterior façade panels during a three week period prior to placing any of the concrete decks.



Only the upper level of the parking structure was closed during construction. This level was used as the staging area for construction materials. All the lower levels remained open for continuing parking operations with minimal interference during the construction period.

provided the architectural pre-cast concrete panels. Both were erected by Century Steel Erectors of Pittsburgh, PA. The use of steel and pre-cast concrete panels in combination for the structure's frame minimized site disruption. Fabrication of the steel and pre-cast concrete elements was accomplished off site on a coordinated basis and erection proceeded very rapidly once the site was ready. The entire erection process took less than a month and the garage operation never closed.

Carl Walker Construction was directly responsible for forming, placing and post-tensioning the concrete decks. They began this process on a continuous basis once the steel started going into place by coordinating the forming, concrete placement, post-tensioning and stripping operations so that each of the individual trades always had something to do. Pour sizes ranged from 8000 to 12000 sq. ft. and the entire project was completed with 12 pours.

Once the pours were completed and the forms stripped, the finishing operations followed closely behind. Lights,

drains and waterproofing elements were installed. The steel received a finish coat of a special anti-corrosion paint system. Tube rails were installed for barrier protection. The decks were cleaned, sealed with a silane sealer, stripped and opened to traffic. Masonry, roofing and elevator installation in the stair towers proceeded simultaneously on a parallel track with the structural work.

The process began on April 1 and was completed by the July 4 holiday weekend. In slightly less than 100 days on site, 120,000 sq. ft. of new parking space had been successfully added to the existing structure. "Carl Walker Construction was very efficient and worked closely with our operations people to keep the garage open while renovations were going on ... we are very pleased with the service they provided and the results of the whole project," said Tim Dittmer, senior vice president of construction for Forest City. Design-build and a steel-framed structure proved to be a winning com-

bination for the Station Square parking structure expansion project.

*David C. Monroe is with Carl Walker Construction, Pittsburgh, PA.*

#### OWNER

Forest City Enterprises

#### STRUCTURAL ENGINEER

Churches Consulting Engineers, Washington, PA

#### ERECTOR

Century Steel Erectors, Pittsburgh, PA (NEA member)

#### GENERAL CONTRACTOR

Carl Walker Construction, Pittsburgh, PA