

Style on Schedule

By Gene Martin, P.E. and Lena Singer



Recessed into a hillside, this three-level steel parking structure in Farmington, PA was erected quickly to meet rigid scheduling requirements.

Falling Rock hotel made its debut in 2004 as the latest in a line of luxury accommodations at Nemacolin Woodlands Resort and Spa in Farmington, PA. The hotel overlooks the 18th hole of the resort's Mystic Rock golf course, which was scheduled to host the PGA Tour's 84 Lumber Classic at the end of September. To accommodate guests and the expected influx of spectators, a quality parking structure for the hotel was an immediate necessity.

Schedule

From the project's planning stages, schedule was the driving force.

"The owner's biggest concern was that he had to host the PGA tournament on a specific date, and that date couldn't move," said Charles Churches of Churches Consulting Engineers, structural engineer for the project.

Framing options for the new garage included cast-in-place (CIP) concrete, pre-cast concrete, and steel. CIP concrete was quickly eliminated because of its slow construction schedules, while delivery schedules for a pre-cast garage were too long. With its speed of construction from design to erection, a steel frame was chosen to satisfy the tight time constraints.

After the project was underway, daily communication between the engineer, detailer, and fabricator helped accelerate the detailing and drawing approval process. The engineer worked hand-in-hand with the detailer to expedite drawings, while the fabricator worked closely with the engineer to order the steel before the designs were complete.

Quality

Beyond schedule concerns, it was imperative that the new parking structure complement the Falling Rock hotel and blend into the resort's upscale surroundings. According to Len Tsupros of Carl Walker Construction, the proposed steel-framed garage, with CIP post-tensioned concrete decks, was deemed the "Cadillac of parking structures."

"We think it's the very best system on the market," Tsupros said.

The steel frame would provide the ability to attach a façade of the owner and architect's choice. Pre-cast façade panels and cultured stone masonry were chosen to match the façade of the hotel, providing aesthetic continuity between the garage and the Frank Lloyd Wright-inspired hotel.

"They were real high-end finishes," Churches said. "It's detailed architecturally as much as you could."

Even with its high-end exterior, the steel framed garage had low initial costs, with lighter weight, reduced foundation costs, quicker erection schedules, and smaller crane sizes. Low life-cycle costs were also attractive to the owner, who had gone through recent repairs with a pre-cast garage at another location on the resort.

Steel and Structure

Space limitations on the Falling Rock site, proximity to the golf course, and severely sloping terrain eliminated the option of an on-grade structure. Instead, the garage was built approximately 40' within a hillside beneath the hotel, with the top level set at the hotel's grade elevation. A soldier beam-lagging wall was constructed against the hill to provide support, while two sides of the structure were left open. This earned the garage a classification as an open parking structure and eliminated the need to install sprinkler and mechanical ventilation systems. In addition, it provided passive security advantages and an open, airy feel to the garage—an aesthetic that appealed to the resort's owner.

Plans for the structure called for three parking levels of cast-in-place post-tensioned concrete decks. The top level of the parking structure supports an out-

door plaza, top-quality media center, and commercial space. Two hydraulic elevators and two steel stairs, constructed within cultured stone masonry enclosures, provide vertical circulation in the garage.

On the top level, the media center and multi-functional space were set at a 45-degree angle to the garage, with the corners of the shell space partially extending over the grade position.

"There are areas of the media center where you're over grade," Churches said. "You can walk ten feet, and then you're over the garage."

Before construction began, the hill was excavated beyond the construction site to create access for equipment. Caissons were constructed for the garage's deep foundation system, with augered steel H-piles set in concrete. A retaining wall system was built to anchor the garage to the hillside. To fill space and retain the surrounding earth, pre-cast concrete panels were inserted between the columns.

Wide-flange columns and beams with HSS barrier railing were used for the garage's frame. The lateral bracing system consisted of field bolted moment connections and "staged connections." Staged connections are moment connections whose bolts are fully tensioned only after the concrete slab has been post-tensioned. This sequence relieves negative moments in the slab due to dead loads while fixing the connection to resist lateral loads.

Structural steel members for the parking levels received an SSPC-SP6 Commercial Blast Cleaning. The corrosion

protection system consists of a shop-applied zinc rich epoxy primer, an intermediate macro epoxy coat, and a field-applied finish coat. Steel not exposed to the elements received an SSPC-SP3 Power Tool Cleaning and one shop coat of red oxide primer.

The roof for the plaza deck's media center and multi-functional space was comprised of steel joist and metal deck construction. In order to expedite joist delivery, the fabricator, structural engineers, and joist manufacturer worked together to redesign the roof system from an LH-series joist system to a K-series joist system. Because they could be produced in three weeks, the K-series joists were used exclusively. The media center's interior was finished with shop primer.

Concrete was placed on the plaza-level deck first to provide weather protection for work on the lower levels of the garage and to allow construction to proceed concurrently on the enclosed structures above the plaza level. Exposed concrete surfaces were treated with a urethane membrane for protection against traffic and the weather.

In the end, 523 tons of structural steel were used for the garage, including 156 tons of H-piles, 40 tons of joists, and 57,000 sq. ft of metal deck.

Only ten weeks after steel erection began, a high-quality, steel-framed parking garage was turned over to the owner on schedule and in time for the upcoming tournament.

"From sticking a shovel in the ground," Tsupros said, "we were parking cars 90 days later."



W-shape columns are smaller than most columns in concrete parking structures, contributing to the open feel of the structure while reducing door "dings" and enhancing safety.

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Owner

84 Lumber Company, Eighty Four, PA

Architects

Churches Consulting Engineers, Claysville, PA (parking structure)
WSI Architects, Dallas, TX (media center)

Structural Engineer

Churches Consulting Engineers, Claysville, PA

Engineering Software

STAAD Pro

Erector

Century Steel Erectors, Kittanning, PA (NEA member)

General Contractor

Carl Walker Construction Group, Inc., Pittsburgh, PA

Painter

Regal Paint & Sandblast, Donora, PA