Preferred PARKING

BY JASON D. ROBINSON, PE

A new ramp brings parking relief to downtown Morgantown.

All photos: ADS; Rendering: Paradigm Architecture

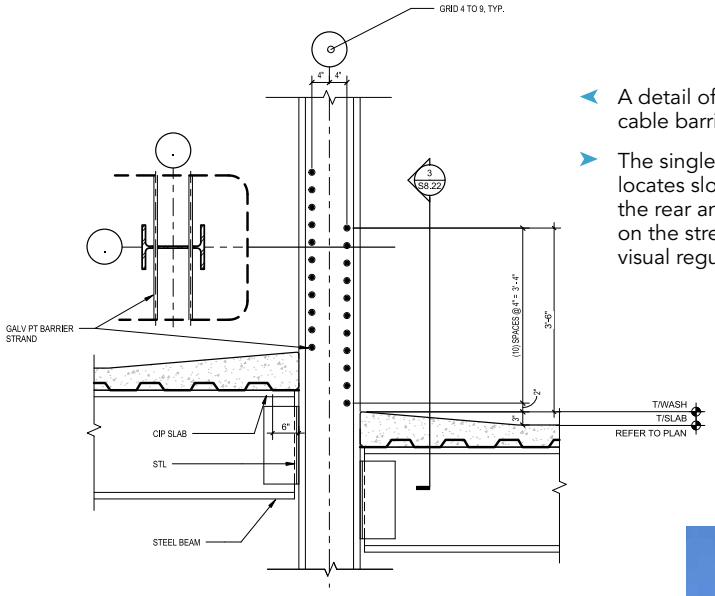
MORGANTOWN, W.V., excels at natural beauty and football, among other things.

Home to West Virginia University and its acclaimed Mountaineer football team, the town of roughly 30,000 (twice that when WVU classes are in session) sits amongst the rolling hills of northern West Virginia along the banks of the Monongahela River.

But one thing the town lacks is public parking, particularly in the downtown area. However, a recently completed parking garage is helping to meet parking needs. Built to service the University Place apartment development as well as provide public parking for retail stores in the area, the project is a public-private partnership between WVU and Downtown Campus Parking.

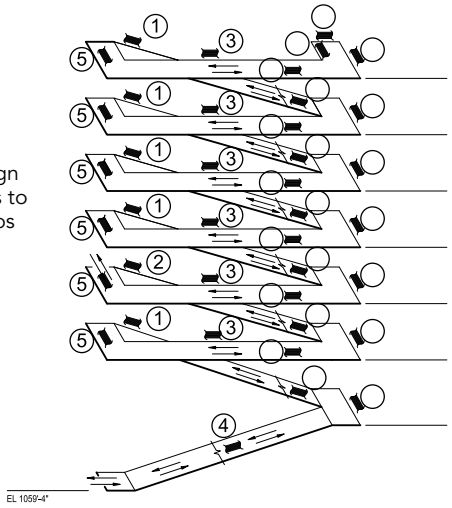
Completed in December 2015, the garage is six levels high, with 390 parking spaces and 12,000 sq. ft of retail space at the ground floor, and sports a red brick veneer with a metal screen cladding system for the parking areas. And it's framed in steel, an option selected by the contractor over common concrete alternatives for several reasons:

- Precast concrete would have been shipped in from out of state, resulting in a long lead time
- The contractor/erector, March Westin, is very proficient with conventional steel construction
- Contracting Engineering Consultants, the fabricator, is just a few miles from Morgantown, thus minimizing shipping distance
- Conventional steel framing was more architecturally flexible than precast, which was a major consideration for a parking garage in an historic downtown area



A detail of the cable barrier.

The single-helix design locates sloped ramps to the rear and flat ramps on the street side for visual regularity.



The base of the garage incorporates 12,000 sq. ft of retail space.

Chevron bracing comprises the lateral-force-resisting system.

The steep grade and tight site created challenging construction conditions.

Battling the Elements

The big question with any parking structure is how to minimize corrosion. A common misconception is that concrete parking structures do not have corrosion issues, when, in fact, they can start to corrode beneath the surface long before there are cosmetic concerns. The truth is that all parking structures require periodic maintenance, for both aesthetic and structural reasons.

For this steel-framed garage, corrosion protection came in the form of both galvanizing and a zinc-rich primer. All of the main beams columns and beams were coated with Carbozinc 11 FC. Braced frames, designed in a chevron pattern, made up the lateral-force-resisting system, and simple bolted connections were used for this system. The lateral system elements were hot-dip galvanized.

The protection requirements presented a challenge when it came to erection since March Westin didn't want the coating to become damaged, so the connections were designed in such a fashion that no field welding was necessary. A composite beam system was used, with shear connectors welded to the top flanges of the beams in the shop prior to painting.

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▲ The garage uses 1,230 tons of structural steel in all.

▼ The metal screen system on the facade curves from top to bottom.

➤ Shear connectors were welded to the beams in the shop to protect the coating.

The deck system was composite—concrete slab on top and vented, galvanized deck beneath. The vents are meant to allow any water that might seep through the concrete slab to escape, thus preventing water build-up between the bottom of the concrete and the metal deck. The garage also incorporates a tension cable barrier for vehicles and pedestrians. All steel members for the barrier system were hot-dip galvanized as well, and all connections were either welded in the shop before galvanization or bolted in the field.

When it came to the metal screen system, attachment proved challenging due to the different deflections of the beams on each level depending on car movement and loading. Every upright had a slotted connection and the metal cladding was curved, which made for complicated layouts in the field. Also, every connection featured nylon bushings to allow for movement between the outriggers on the beams and the aluminum uprights. (This might not seem like much, but when everything has to line up perfectly on a curve and installation is happening with 80-ft hydraulic man-lifts, things can get difficult.)

Dense Downtown

Downtown Morgantown is relatively dense, not to mention on a fairly steep grade, leaving little wiggle room when it came to erecting the structure. Overhill Street, to the side of the garage, is at a 23° grade, and roof steel had to be set out of the elevator tower via a crane man-basket because there wasn't an area level enough for a regular man-basket to reach. The site was particular challenging in the winter, as the various cranes needed to be maneuvered around in icy conditions on the steep grade to install the various steel components.

The lack of lay-down room required a higher level of coordination when it came to steel deliveries. Individual trucks had to be loaded in order of erection so beams could be rigged for erection directly on the truck. The proximity of the trucks to the road was a safety concern because the beams would have to be lifted above the road before they could be swung into place. This was alleviated by stopping traffic every time a pick was made. Given the size of the members, each had to be picked individually. In addition, because the beams had the studs attached prior to erection (again, to protect the coating), this made it impossible for the iron workers walk the steel as it was being erected. As such, all field connections had to be made via man-lift instead of traditional methods.

Owner
West Virginia University and Downtown Campus Parking, LLC, Morgantown, W.V.

General Contractor
March Westin Company, Morgantown

Architect
Paradigm Architecture, Morgantown

Structural Engineer
Allegheny Design Services, Morgantown

Specialty Engineer (Cable Barrier System)
Carl Walker, Kalamazoo, Mich.

Steel Fabricator and Detailer
Contracting Engineering Consultants, Maidsville, W.V.

Thanks to this project, which used 1,230 tons of structural steel in all, the team discovered that a steel-framed parking garage was both faster to build than a concrete alternative and much more appealing from an architectural perspective. And as a result, downtown Morgantown now has an attractive new parking option. ■

▲ HSS braces resist lateral loads without creating large visual obstructions.

▼ The elevator lobby is bright and airy with tall windows, high ceilings and exposed structural elements.