

City of Ann Arbor's Library Lane Parking Garage: Beauty Meets Function

Summary

The Library Lane underground parking structure was strategically conceived to help revitalize downtown Ann Arbor's midtown area while encouraging new private investment and creating a stronger connection between Main Street and the University of Michigan campus. The city of Ann Arbor Downtown Development Authority wanted 761 spaces to support new business attraction while preserving the site surface for future mixed-use development. Among the many challenges were the need to create a user-friendly facility that avoided the stereotypical below-grade parking experience and foster a welcoming environment using open structural bracing, daylighting, and other design elements. Without knowing future uses for the top, its design had to anticipate the location of future building doors, elevators, and open space, and include infrastructure for potential development.

Ann Arbor has minimal land for new parking structures, so close attention was paid to site constraints such as water table, sandy soils, and a tight construction site with active uses on all sides. Both the superstructure and 10-foot-thick mat foundation needed to accommodate future buildings and a civic plaza, with foundation walls allowing for future connections to adjacent properties and horizontal expansion. The foundation required one of Michigan's largest continuous concrete pours (6,000 cubic yards in 36 hours). Its service alley and mid-block street also needed to serve future development.

Project Goals:

- Provide a welcoming and attractive underground structure with no sense of confinement, reduced visibility, or separation from the outside world.
- Meet sustainability, durability, and operational goals.
- Cope with challenging site conditions, including earth retention 80+ feet down with very sandy soils and large boulders.
- Create temporary site dewatering, directing water uphill six blocks.
- Provide a fire protection system that would allow stairwells to remain open.
- Provide a useful life of 75 years before major structural repair is required.
- Remove nearly 190,000 cubic yards of sandy soil.

The Library Lane parking structure has helped attract new tech businesses downtown and developer interest in future mixed-use development.



Approximate cost or budget: \$50 million, including the non-parking elements such as the supported roadways, structural capacity for the future building development, and future building services.

Challenges/Obstacles Overcome:

- Conditions included a tight site with adjacent buildings, granular soils, and construction below the water table. To solve these issues:
 - A temporary earth-retention system was required to retain the soil loads, resist adjacent building surcharge loading, and reduce dewatering volume requirements.
 - A mat foundation system, more than 10 feet thick in some locations, was designed to support a 20-story building. Installation required to complete dewatering to a depth of up to 15 feet below the static groundwater elevation.
 - The project schedule required one of the largest continuous urban concrete pours in Michigan – some 6,000 cubic yards of concrete during two days in February.

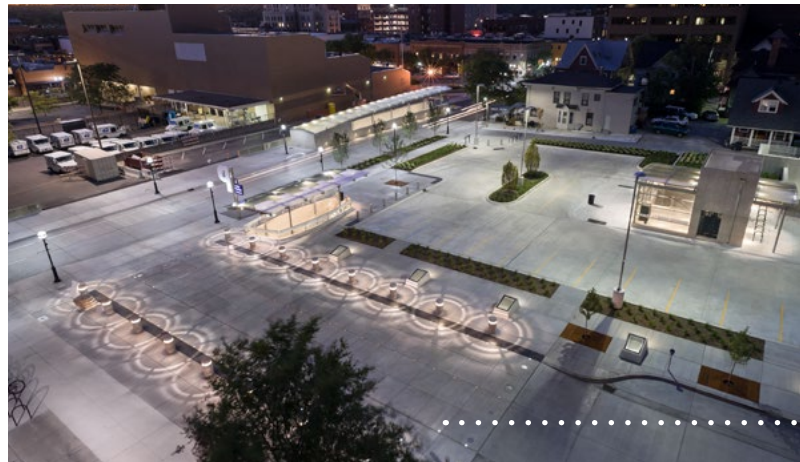
- Providing natural light in a four-level, below-grade structure required:
 - Design of precast concrete light wells with stainless steel mirrors to act as light cannons to the first level.
 - Design of large, open, curved stairs with glass canopies to bring natural light to the lowest levels .
 - High ceilings stained white.
 - Flat floors and unobstructed lines-of-sight.
 - Uniform lighting.
 - Glass-backed elevators to add to the sense of openness.
- Addressing security for pedestrian safety required:
 - A snowmelt system and segregated pedestrian walkways.
 - Security features including emergency phones, a cellular repeater system, and closed-circuit television (CCTV) cameras.
 - Staffed cashing and a 24-hour operations office at the lowest level to further emphasize safety.

Sustainability investment/features:

Recognized as a Green Parking Council Demonstrator Site, it reused the 190,000-cubic yards of soil removed during construction and used recycled concrete and steel, as well as energy-efficient LED and fluorescent lighting. Its six electric-vehicle stations are now in regular use and an oversized storm water detention system at the lowest level contains a 305,000-gallon tank.

Innovative/creative solutions or processes developed that may help others in the industry:

- Natural light was an important design element.
- Precast concrete light wells with stainless steel mirrors act as light cannons to the first level.
- Large, open curved stairs with glass canopies bring natural light to the lowest levels.
- High ceilings stained white, flat floors, and unobstructed lines-of-sight help expand impact.
- Long-span, post-tensioned concrete construction reduced the number of columns, while steel-braced frames and concrete shear walls with punched openings provide the lateral bracing to receive future development and unbalanced soil loads.
- Bright, uniform lighting and glass-backed elevators add to the sense of openness.



Conditions included a tight site with adjacent buildings, granular soils, and construction below the water table.

Additional information:

Much of the grade level superstructure was designed to carry AASHTO bridge loads and the portion of the structure supporting 5th Avenue (an Ann Arbor truck route) is a registered bridge with the Michigan Department of Transportation.

Consultants:

- Carl Walker, Inc., Prime Consultant, Structural Engineer, Parking Consultant
- Luckenbach Ziegelman Architects, PLLC, Architectural Consultant
- Beckett & Raeder, Inc., Site Planning & Landscape Architect Park Avenue Consultants, Owner Representative
- Civil Engineering Consultant Midwestern Consulting, Civil Engineering & Traffic Consultant
- Berbiglia Associates, Inc., Electrical/Mechanical/Plumbing Consultant
- Christman Company, Construction Manager

Project manager:

Michael Ortlieb, P.E., Executive Vice President, Carl Walker, Inc.