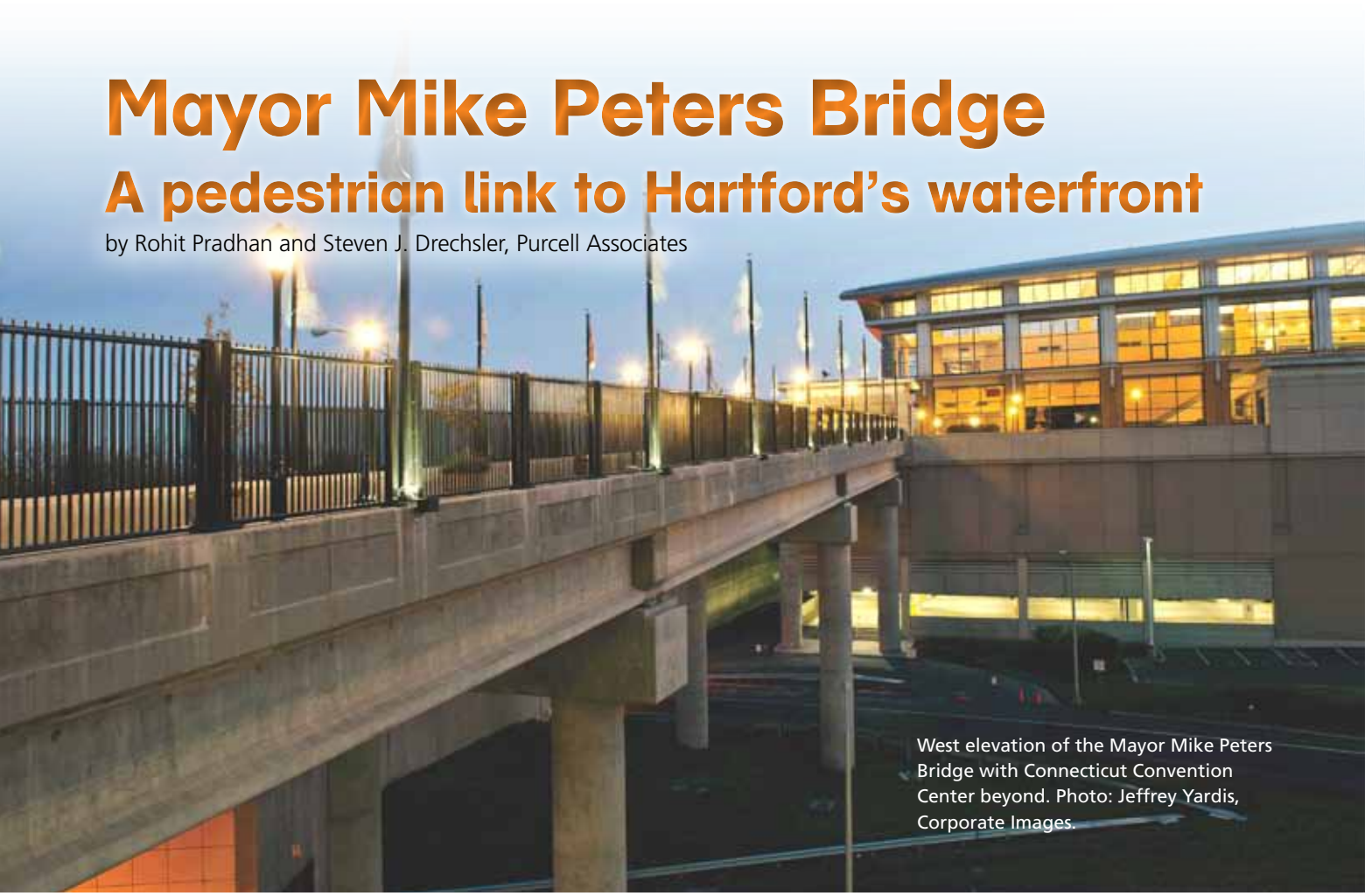
Mayor Mike Peters Bridge

A pedestrian link to Hartford's waterfront

by Rohit Pradhan and Steven J. Drechsler, Purcell Associates



West elevation of the Mayor Mike Peters Bridge with Connecticut Convention Center beyond. Photo: Jeffrey Yardis, Corporate Images.

The Mayor Mike Peters Bridge is part of the Adriaen's Landing development project at the easternmost edge of the city of Hartford, Conn. Adriaen's Landing is part of the revitalization plan for Hartford and one of the key elements of the state of Connecticut's vision known as the "Pillars of Progress." The state's development team broke ground on the project in the spring of 2001. Four key projects of Adriaen's Landing had been completed prior to the construction of the bridge: the Connecticut Science Center, the Connecticut Convention Center, the Hartford Marriott Downtown Hotel and the Front Street Retail project—all within the 27-acre site adjacent to the Connecticut River. The Mayor Mike Peters Bridge is the final connecting element of the projects allowing pedestrian access to all of these attractions and the Connecticut River waterfront. The bridge also serves as a means of egress for the Science Center with an egress load of 1423 occupants in accordance with the state of Connecticut Building and Fire Safety Codes.

The New Bridge

The bridge has an approximate length of 268 ft, an overall width of 33 ft, and is located on an approximate north-south alignment. It provides for pedestrian traffic over I-91 and I-84 on-ramps, with a vertical clearance of approximately 40 ft. The bridge consists of three spans of 63-in.-deep precast, prestressed concrete bulb-tee beams (PCEF-63) and precast, prestressed concrete deck panels made composite with the beams. There are four beams in the cross section spaced 9 ft 0 in. on center. The concrete design compressive strength was 6500 psi. The beams were designed as simple spans but made continuous for live loads with cast-in-place diaphragms at the intermediate piers. Reinforcement to resist tension from the negative moment

profile

MAYOR MIKE PETERS BRIDGE / HARTFORD, CONNECTICUT

BRIDGE DESIGN ENGINEER: Purcell Associates, Glastonbury, Conn.

PRIME CONTRACTOR: Loureiro Contractors Inc., Plainville, Conn.

PROJECT ADMINISTRATION: Connecticut Department of Transportation; Connecticut Office of Policy and Management; and Capital City Economic Development Authority

PROGRAM MANAGER: Waterford Development LLC, Waterford, Conn.

ARCHITECTURAL CONSULTANT: Milton Lewis Howard Associates Inc., Bloomfield, Conn.

MECHANICAL AND ELECTRICAL CONSULTANT: AI Engineers, Middletown, Conn.

ENVIRONMENTAL CONSULTANT: GZA Geoenvironmental Inc., Glastonbury, Conn.

GEOTECHNICAL CONSULTANT: Clarence Welti Associates Inc., Glastonbury, Conn.

was provided in the cast-in-place deck that was full depth over the piers. This reinforcement was spliced into the precast deck panels with dowel bar splicers. The precast panels were held back from the area over the piers. To extend the service life of the bridge, epoxy-coated reinforcement was used in all superstructure elements.

Precast Concrete Deck Panels

The precast deck panels are 8 ft long, 32 ft wide, and 8 in. thick. They are pretensioned in the transverse direction and post-tensioned in the longitudinal direction. The specified panel concrete compressive strength was 6000 psi. The panels are connected to the bulb-tee beams by pairs of bar loops extended from the beams into pockets cast into the panels. The pockets are 3 in. by 9 in. and spaced at 1 ft on center. The grout used to fill the block outs and in the haunch over the beams was a 5000 psi, nonshrink mix. The panels are post-tensioned together longitudinally in units of five or six. Spaces were left over the piers, at the Convention Center, and at the skewed approach to the Science Center where the deck concrete was placed full depth. The gaps over the piers were 11 ft wide. The precast concrete panels have a 4-in.-thick structural composite overlay with decorative surface treatments.

Geometric Details and Substructure

The south end of the bridge is connected to the Convention Center with no skew, whereas the north end is connected to the Science Center at a skew angle of approximately 15 degrees. The center span is approximately 94 ft long. The north span is 73 ft long and includes a 10-ft-long cantilever beyond the end of the span and the south span is 101 ft long and includes a 15-ft-long cantilever beyond the span. The deck slopes down toward the Science Center on a 4.98% grade. The superstructure is supported on four reinforced concrete piers. The piers are two-column bents with 5-ft 6-in.-diameter columns and 6-ft-deep by 7-ft-wide pier caps. Each column is supported on a 6-ft-diameter by 50-ft-long drilled shaft socketed into bedrock.

Project Goals

The new bridge met the following criteria:

- Provide a safe area for 1423 people exiting from the Science Center in the event of an emergency.
- Provide a safe means for pedestrian traffic to and from the Science Center.
- Support H10 vehicular loading in the event that emergency or maintenance vehicles need to use the bridge.
- Support asymmetric pedestrian loading that may occur during riverfront events.
- Provide aesthetic details that are consistent with the prominent structures that the bridge serves.
- Construct within the budgetary and time constraints.
- Provide design flexibility for location of the substructures to minimize disruption to the Interstate highways on-ramp traffic and to the functioning of the Science Center and the Convention Center.
- Provide sufficient clearance over the interstate highway on ramps and meet all Connecticut Department of Transportation safety requirements.

Structure Type Selection

A three-span precast concrete option was selected over a steel I-beam option because of its overall economy, durability of construction materials, and potentially low maintenance. Also, the precast option offered accelerated construction opportunities that would minimize disruption to the interstate highway entrance ramps below the bridge and primary vehicular entrances to the Convention Center and Science Center.

The bridge, under construction, connects the Connecticut Convention Center (left) with the Connecticut Science Center (right). I-91 is in front of the bridge. The west bank of the Connecticut River is visible in the lower left corner of the photo. Photo: Aerial Photography by Don Couture.

THREE-SPAN, PRECAST, PRESTRESSED CONCRETE BULB-TEE BEAM PEDESTRIAN BRIDGE WITH PRECAST, PRETENSIONED AND POST-TENSIONED CONCRETE DECK PANELS AND CAST-IN-PLACE CONCRETE SUBSTRUCTURE / STATE OF CONNECTICUT, OWNER

CONCRETE SUPPLIER: Tilcon Connecticut Inc., New Britain, Conn.

PRECASTER: Northeast Prestressed Products LLC, Cressona, Pa., a PCI-certified producer

BRIDGE DESCRIPTION: A 268-ft-long by 33-ft-wide, three-span, precast, prestressed concrete bulb-tee superstructure supported on reinforced concrete, column bent piers founded on drilled shafts. The span lengths are 73, 94, and 101 ft including 10-ft- and 15-ft-long cantilevers on the first and last spans respectively.

STRUCTURAL COMPONENTS: 63-in.-deep, precast, prestressed concrete bulb-tee beams; 8-ft-long by 32-ft-wide by 8-in.-thick precast, pretensioned and post-tensioned concrete deck panels with a 4-in.-thick composite concrete wearing course; reinforced concrete piers with 5-ft 6-in.-diameter columns and 6-ft-deep by 7-ft-wide pier caps; and 6-ft-diameter by 50-ft-long drilled shafts

BRIDGE CONSTRUCTION COST: $5.9 million ($667/ft^2)

Challenges

The project posed several challenges. Significant among them was the fact that many underground utilities are located at the site. The utilities include an 84-in.-diameter sewer running north-south just to the east of the new bridge, a primary electrical duct bank, a fuel cell duct bank, storm drainage, and miscellaneous electric and abandoned utilities. Since the recommended foundation was 6-ft-diameter drilled shafts, it was critical that the utilities were accurately located in the field prior to the start of foundation work. Test pits were excavated at each shaft location enabling the design team to precisely locate each pier to avoid subsurface conflicts.

A program of vibration monitoring was instituted during construction given the proximity to major buildings and I-91. A limit of 2 in./second of peak particle velocity was established for safety of the adjacent structures.

Maintenance of traffic was an important consideration given the on-ramp traffic to the interstates and also traffic to the Convention Center and Science Center. Detours were set up to move traffic at certain times as well as limiting construction operations during scheduled events at the Convention Center.

Four lines of bulb tees were used in the superstructure with cast-in-place concrete diaphragms. Photo: Purcell Associates.

Ornamental lighting, flagpoles, planters, and fields of etched concrete, bordered by bands of integrally colored stamped concrete, were used to enhance the bridge aesthetics because of its prominent location. Photo: Jeffrey Yardis, Corporate Images.

The bridge was designed to meet both the *AASHTO LRFD Specifications* and the *Connecticut Building Code* (2003 IBC) seismic requirements. Because the bridge deck was approximately 40 ft above grade, the lateral seismic forces were significant. Designing adequately for these forces and controlling the bridge displacements resulted in 5-ft 6-in.-diameter piers. Seismic isolation joints were placed at each end of the bridge, isolating the structure from the buildings.

Due to the elevation difference at the ends of the bridges, it was critical that the grade of the walkway not exceed 5%, which would classify the bridge as a ramp according to the Connecticut Building Code. In addition, due to the winter exposure and the potential for sliding on the sloped walking surface, a glycol snow melting system was installed in the topping slab.

Architectural Features

Aesthetics was an important element of design since the bridge served as a connector between two landmark structures in the city of Hartford. Several aesthetic elements included the following:

- Stamped and acid-etched, integrally-colored concrete deck surfaces to compliment the plazas at each end
- Black color galvanized open steel rail pickets
- Ornamental above-deck light fixtures
- Planters to accommodate trees along the walking surface.
- Decorative flags along both parapets

Construction and Dedication

Construction of the bridge was started in April 2009. The bridge was named in honor of the late Mayor Mike Peters who served as Mayor of Hartford from 1993 to 2001. A dedication ceremony was held on July 26, 2011. The final connecting piece of Adriaen's Landing is now in place. The bridge will long serve as a legacy to the late mayor in the city he was known to love.

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Rohit Pradhan is principal structural engineer and Steven J. Drechsler is senior structural engineer, both with Purcell Associates in Glastonbury, Conn.

For additional photographs or information on this or other projects, visit www.aspirebridge.org and open Current Issue.

The heaviest pick was approximately 50 tons. Interstate highway on-ramps were temporarily closed to allow for beam delivery and erection. Photo: Purcell Associates.