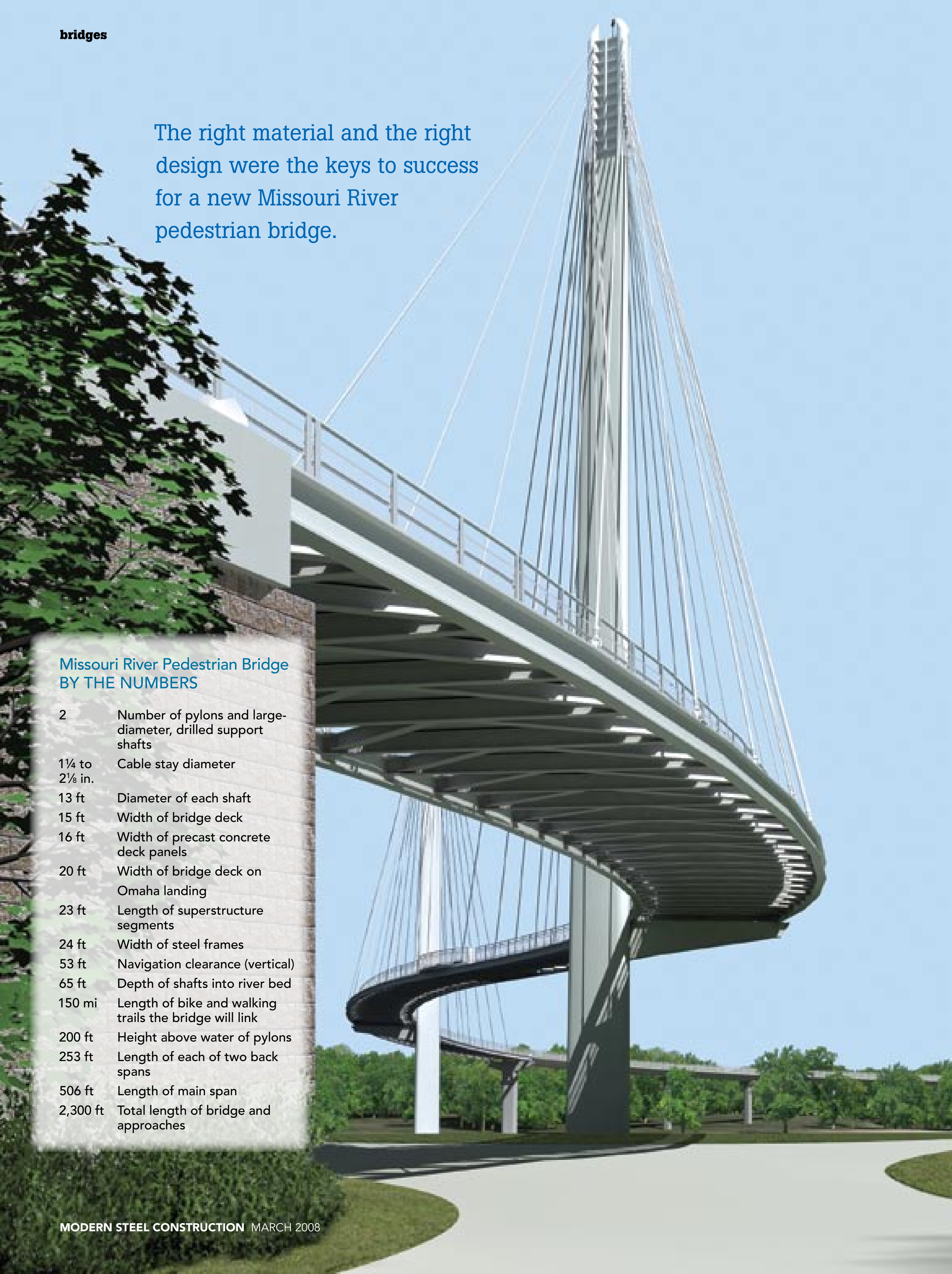


The right material and the right design were the keys to success for a new Missouri River pedestrian bridge.

Missouri River Pedestrian Bridge BY THE NUMBERS

2	Number of pylons and large-diameter, drilled support shafts
1¼ to 2⅛ in.	Cable stay diameter
13 ft	Diameter of each shaft
15 ft	Width of bridge deck
16 ft	Width of precast concrete deck panels
20 ft	Width of bridge deck on Omaha landing
23 ft	Length of superstructure segments
24 ft	Width of steel frames
53 ft	Navigation clearance (vertical)
65 ft	Depth of shafts into river bed
150 mi	Length of bike and walking trails the bridge will link
200 ft	Height above water of pylons
253 ft	Length of each of two back spans
506 ft	Length of main span
2,300 ft	Total length of bridge and approaches

Meandering Across the Missouri

BY CHRISTIAN BROWN, P.E.

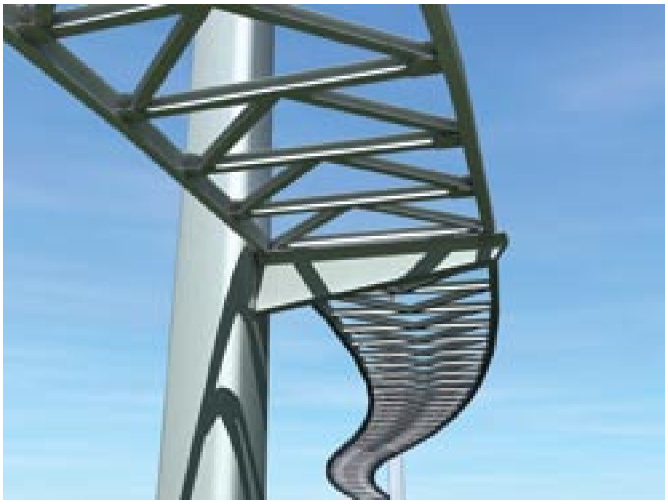
THE MAN OF STEEL HAS AN UNCANNY ABILITY TO ARRIVE AT THE LAST MINUTE AND SAVE THE DAY. Though the situation in the Omaha, Neb.-Council Bluffs, Iowa metropolitan area was not so dramatic that it required the intervention of a superhero, the creative use of steel itself did provide a last-minute solution that enabled a signature span to move forward. As such, the Missouri River Pedestrian Bridge will cross the Missouri River and link these two cities when it opens this fall.

STOP-AND-GO PROCESS

Early in the process, the development puzzle was missing a significant piece: a way to deliver a design the city wanted at a price it could afford. The first request for proposal in 2004 asked for design-bid-build estimates for a curvilinear, cable-stayed bridge. The city was shocked when bids came in at twice the $23 million budget. Officials decided to resubmit the RFP as a design-build project.

"It required a big leap of faith for us to consider another direction after the initial failure to get an acceptable bid," says Larry Foster, administrator of parks, recreation, and public properties for the city of Omaha and project manager for the bridge. "The easy route would have been to drop the project, but our mayor told us to find another way to get the bridge built—within budget."

HNTB Corporation had submitted a proposal under the initial RFP and continued to follow the process as it unfolded. For the second RFP response, the firm teamed with transportation construction firm APAC-Kansas, Inc. to submit a design-build bid, and was awarded a contract in 2006. Hans Hutton, lead designer at HNTB, was given free rein to select materials and design a span that would make a statement, and the design team knew the city preferred the curvilinear, cable-stayed structure. The challenge was to provide this design while staying within budget.



Steel to the Rescue

HNTB's final design for the bridge consists of a horizontally curved, cable-stayed bridge with a 506-ft main span and two 253-ft back spans. Two single-tower, three-sided pylons rise more than 200 ft above the river to complement the superstructure.

Instead of following a straight line, the superstructure meanders from one side of the first pylon to the opposite side of the second pylon in an "S" curve. The total bridge length, including approaches, is about 2,300 ft, resulting in one of the longest pedestrian bridges of its type in the world.

The ability to convert the Missouri River Pedestrian Bridge from a failed design-bid-build concept into a successful design-build project—while achieving the standout appearance the city wanted—can be summed up in a single word: steel.

"A concrete superstructure would have been much more expensive than the steel alternative," Hutton says. "We felt steel was the appropriate choice, given the style of bridge. We also felt that the steel, rolled-beam superstructure addresses the design challenges and makes an aesthetic statement. It has a nice look to it."

Reduced Costs

It would be difficult to overstate the cost advantages of using steel instead of concrete for this project. Steel saved money not only in building the superstructure, but also in reducing the need for temporary falsework.

The superstructure is being constructed using the balanced cantilever method, which lessens the need for falsework. Each 23-ft superstructure segment consists of a 24-ft-wide steel frame and a 16-ft-wide precast concrete deck panel. The gap between the edge girders and the deck is designed to enhance the performance of the bridge when subjected to wind loads.

Hutton has gone so far as to say that the final design would not have been economically feasible using any material other than the Grade 50 fracture-critical steel that was selected.

"The success of this project is directly related to the advantages that steel has over concrete," says Hutton. "Using steel significantly reduces the dead weight of the structure, reduces the projected area of the wind load, and minimizes the amount of falsework necessary, all of which significantly reduce the costs. Where concrete would have cost $40 million, the steel alternative costs $22 million. One could speculate that a concrete alternative could not have been built within the budget."

Appealing Aesthetics

Steel also helped designers create the clean, open look the city sought.

The bridge is set on a radius, and all dimensions are based on that radius. Although the bridge alignment is curved, the superstructure segments and precast deck panels are not. Instead, steel sections are straight-edged and identical in size and shape—with one side slightly longer than the other—and arranged to create the "S" curve.

The use of straight-piece sections is among the more innovative features of this project and couldn't have been achieved with any material other than rolled steel.

"Using straight pieces gave us a curvilinear shape that simplifies fabrication and also should help a great deal with erection," says Scott Gammon, vice president of APAC. "Being able to use standard rolled steel shapes gave us great latitude in developing the design and staying on budget."

Smaller detail, such as hand rails, pavement treatment, and lighting, will enhance the already striking design.

"A number of members of the arts community were on the selection panel, and they were very supportive of the light, attractive look of the APAC/HNTB proposal," says Foster. "Some proposals using materials other than steel appeared more massive and heavy. Because the HNTB design is narrower than the other proposals, it seems to be floating over the surface of the water."

Because much of the environmental work had been completed during the design-bid-build phase, APAC was able to begin construction quickly after the final design was approved. The bridge is expected to begin welcoming cyclists and walkers in November 2008.

When budget-busting estimates came in three years ago, no Caped Crusader was around to save the day. However, a strategic change in delivery method and building materials became the heroes that have led to an attractive bridge project that is set to meet its time and budget goals. MSC

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Design-Build Team
HNTB Corporation, Kansas City, Mo.
APAC-Kansas, Inc., Kansas City, Kan.

Construction Engineering
Genesis Structures, Inc., Kansas City, Mo.

Civil Design
Schemmer Associates, Inc., Omaha, Neb.

Construction Coordination
Gregory A. Peterson Consulting, Inc., Omaha, Neb.

Steel Fabrication
DeLong's, Inc., Jefferson City, Mo. (AISC/NSBA Member)

Bridge Cable
CBSI, Inc., Houston