The awesomeness of bridges over water

By Dan Rodericks
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If you're a daily commuter across the Chesapeake Bay Bridge, you probably find nothing awesome about it; the bridge is just part of a tired routine, 4 miles of the drive from Kent Island to Sandy Point and points beyond, then back again.

But many others, who only cross the bridge once a year, still find the whole thing amazing (or terrifying), a wonder of engineering and a monument to human audacity.

And if you've ever been on the water below, passing under the twin spans in a boat can set off a mashup of emotions — puniness, humility, reverence, fear, awe.

I felt that way whenever we passed under the Bay Bridge during fishing trips. Felt the same about the Francis Scott Key Bridge, further north, during our last outing there. We were focused on getting to nearby Fort Carroll for fishing and birding, but, as always, the tons of steel overhead, stretching across the Patapsco, reminded me that humans have achieved great things.

Pardon this moment to indulge in some awe for bridges like the one we lost on March 26.

The tragic disaster has focused worldwide attention on the importance of Baltimore in international commerce and, for those of us who live here, the steel-and-concrete feats of engineering that make travel possible and even efficient; they are all around us.

In this space last week, I noted that the steel from the Key Bridge would likely be melted into new steel because that's mainly what we do in this country now. Some 70% of new domestic steel comes from scrap melted in mills with electric arc furnaces that have lower carbon emissions than mills that use raw materials. We are constantly recycling scrap from cars, appliances, demolished buildings and bridges.

In 2017 and 2018, the old Goethals Bridge, connecting New Jersey to New York's Staten Island, was replaced by a pair of cable-stayed bridges — the type that engineers suggest as a possible replacement for the lost Key Bridge.

The original Goethals, a truss bridge designed in the 1920s, was demolished and recycled to make new steel, and thousands of tons of recycled steel went into the new Goethals bridges. With concrete towers and white cables fanning out from each, they are more aesthetically appealing than the bridge they replaced, plus the steel in their bones came from a greener, cleaner process.

There was another bridge project over a New Jersey-New York waterway, even more of an engineering marvel — the raising of the Bayonne Bridge, an arched roadway over a key passage to busy marine terminals.

The backstory on that project includes the Port of Baltimore.

Bigger ships carrying more cargo containers than ever prompted the widening of the Panama Canal, starting in 2007.

Looking ahead to the conclusion of that $5 billion project, the Port of Baltimore prepared for the arrival of Panamax ships by installing taller cranes and digging a deeper channel in the Patapsco. The Key Bridge, at 185 feet, had adequate clearance for those big vessels to pass beneath. That gave Baltimore a clear advantage over New Jersey and New York, where the Bayonne Bridge's clearance was only 151 feet.
Something had to be done to accommodate Panamax ships.

But, instead of tearing down the Bayonne Bridge and building a new one, engineers figured out a way to construct a new roadway 64 feet above the old one — and without stopping traffic. With the original roadway removed and the Bayonne Bridge's clearance now 215 feet, Panamax ships easily pass under it.

There's a time-lapse video of the project on YouTube.

I'm grateful that Habib Tabatabai mentioned it during our conversation about bridges the other day. He's a professor and director of the Structural Engineering Laboratory at the University of Wisconsin-Milwaukee, and he has specific expertise in the cable-stayed bridges, the type we might one day see across the Patapsco.

But, as Tabatabai emphasized, a lot of factors go into deciding where, when and how to build a bridge — cost, clearance requirements, the composition and contour of a riverbed, the desired length of a bridge's main span, steel towers versus concrete, to name only a few.

Cable-stayed bridges are popular and eye-pleasing, Tabatabai said. "And the technology has matured pretty much worldwide," he said. "You have a system that's modern, but mature because they've learned a lot through all these years aboutoptimizing the cable systems."

I asked Tabatabai about the main span of such bridges because Maryland's port and transportation officials might want to see one wider than the 1,200 feet of the Key Bridge. (The span refers to the distance between the towers of a cable-stayed or suspension bridge.)

Tabatabai mentioned the bridge over the Cooper River in South Carolina, with a main span of 1,546 feet at a height of 186 feet.

That's impressive, but far from the longest.

"The cable-stayed bridge with the longest main span is in Russia, the Russky Bridge," Tabatabai said. "It's 3,622 feet for the main span, more than three times the Key Bridge."

And just as I tried to grasp that — two-thirds of a mile between towers — the professor mentioned a suspension bridge across the Dardanelles Strait in Turkey. Completed two years ago, it is now the world's longest suspension bridge, with a span of more than a mile between towers.

I'll stop here for a moment of awe.