Design of the Portsmouth Memorial Bridge

The design for the Memorial Bridge strives for visual clarity and transparency, an important goal for movable bridges, which often suffer from the clutter associated with machinery and its associated access ladders and platforms. This visual clarity is achieved by tucking the lift machinery below deck, placing the pedestrian walkways inside the truss planes, and using an innovative truss that eliminates gusset plates and sway bracing. The bridge is designed to be faster to fabricate and erect, enabling us to open the new bridge 5 months ahead of other designs. It is designed to be less expensive to inspect and maintain over its design life. It also sets new standards in safety and redundancy in truss design.

The proposed design incorporates a number of innovations, in much the same way that Waddell's 1929 Portsmouth Memorial Bridge served as a precursor to 80 years of vertical lift bridge design.

These design innovations include:

1. The truss design eliminates gusset plates, the Achilles heel of trusses and the element that failed and caused the collapse of the I-35 bridge in Minneapolis. Gusset plates are highly susceptible to corrosion, difficult to inspect, repair, and replace. This is the first such truss of its kind.

2. The tower is fabricated independently of the flanking spans and connected over the last panel point, a major innovation that simplifies fabrication and better integrates the tower into the truss design. This allows all three truss spans to have identical geometry and a visual consistency throughout.

3. The superstructure incorporates intermediate floorbeams and eliminates stringers. This framing results in half the number of connections, resulting in reduced maintenance and inspection as well as increased navigational clearances (vertical clearance in the down position). This eliminates fracture critical members and results in enhanced safety and reduced inspection and maintenance costs.

4. The vertical lift bridge span incorporates 70 ksi high performance steel for enhanced strength and durability.

5. The lifting machinery for the span is placed underneath the deck at each end, instead of above the deck at midspan. This is a major mechanical innovation as it allows for the span to be lifted from below, minimizing tower height and avoiding mechanical equipment and inspection access along the truss tops. All equipment is readily accessed from the pier tops below deck.