# SR520: FLOATING BRIDGE DE-COMMISSIONING

SEATTLE, WA

**SDI Scope**

*De-Tensioning of 3,600 ft. Grouted Tendons*

**Contractor**

*Kiewit General Manson JV (KGM)*

**Owner**

*Washington Department Of Transportation (DOT)*



## EVERGREEN POINT FLOATING BRIDGE

## DE-TENSIONING PROJECT DESCRIPTION

The SR520's Floating Bridge De-Tensioning project is "the most complicated Post-Tensioning challenge of my career", as noted by Guido Schwager, President of Schwager Davis Inc., an industry leader whose decades of post-tensioning experience has overseen countless de-tensioning projects. The origin of the challenged began in 1963 when Washington State's Evergreen Point Floating Bridge on SR520 opened for traffic. This bridge's claim to fame is found in its staggering 7,580 ft. record-setting length. The bridge received a post-tensioned seismic retrofit to prepare for stronger storms in 1997 and set a new record for its thirty-two new, external, grout-bonded tendons running through the pontoons, sixteen measuring 3,200 ft. and sixteen 3,600 ft. For comparison, a typical tendon length is approximately 400 ft. These longer tendons added 500 psi axial compression to keep the thirty-three bridge pontoons together.

When the Washington State Department of Transportation (WSDOT) decided to build an even greater bridge in preparation for a one-hundred-year storm, engineers were faced with a significant challenge: how to safely destress the retrofitted tendons to keep the old pontoons whole and serviceable for use as floating docks.



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## SDI's CHALLENGE

The complication arises due to the type of tendon installation employed: grouted and external. If the decommissioned bridge's added tendons were unbonded (thus injected with grease instead of grouted) and external (running longitudinally through end walls and hollows of each pontoon), they could be safely cut or mechanically released strand by strand. If they were grouted (thus bonded) and internal (running their span within the original concrete walls), they could be cut as the load would transfer from the strand to the grout and from the grout to the pontoon structures, also safely releasing force incrementally.

The retrofitted tendons were both grouted and external, creating a serious de-tensioning problem. Cutting or mechanically releasing one strand simply transfers load into the bonded whole, yet with one fewer strand holding. After four strands are cut, the remaining strands reach 100% GUTS (specified guaranteed ultimate tensile strength) of the tendon, resulting in catastrophic failure, which in this case, releases up to 615,000 lbs. of force, instantly retracting up to twenty-four feet of tendon. Such forced could injure or kill workers in the pontoons or possibly sink the bridge. Traditional tendon de-tensioning at Evergreen was impossible.

## SDI's SCOPE OF WORK

SDI was sought to prepare a solution to the complex de-tensioning of Evergreen Point Floating Bridge.

- Near the center of the tendon span, remove 50 ft. of HDPE pipe and grout.
- Install two re-anchoring devices approximately 10 ft. apart connected by high strength rods.
- Mechanically de-tension, cut, re-anchor, and re-tension one strand at a time.

This process allows the force in the tendon to temporarily increase by 7% but never exceeding safe working loads. After all strands are re-anchored and re-tensioned, the load is transferred to the high strength rods and can safely be released hydraulically one stroke at a time.

SDI built a 180 ft. mockup to test the re-anchoring device fitted to high-tension bars in casting beds. These trials cleared successfully. SDI was awarded the de-tensioning contract and began work in May 2016.



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