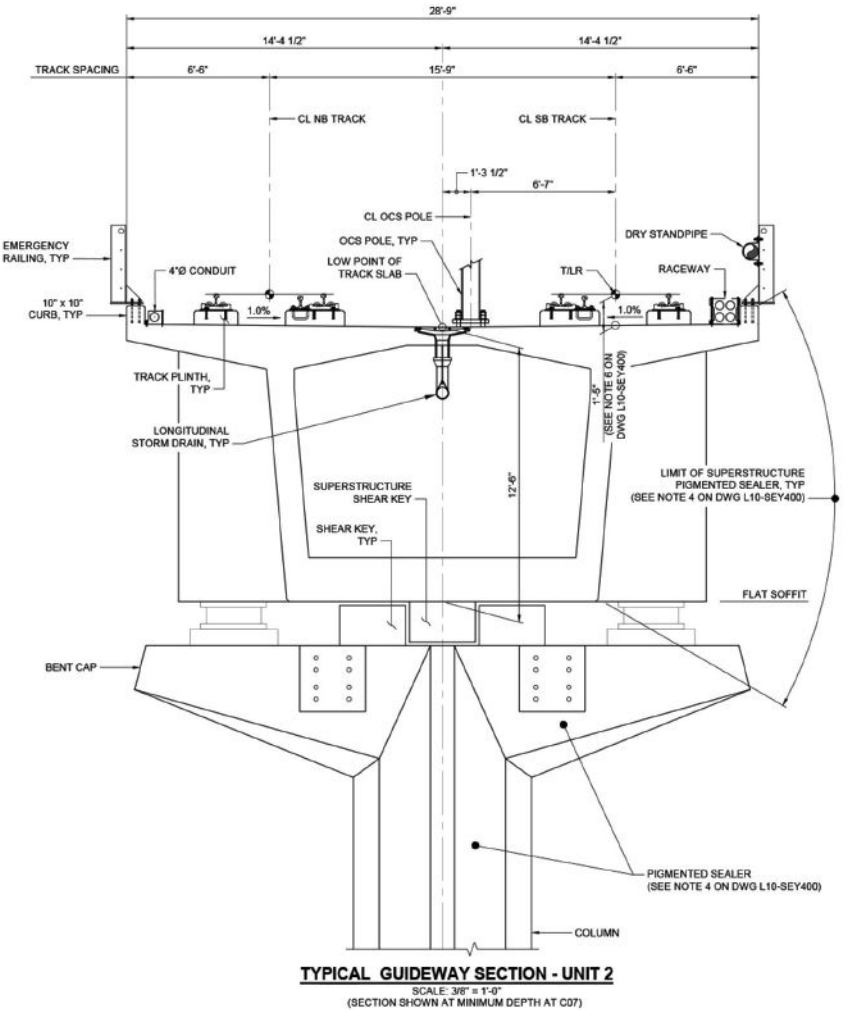
The 1100-ft-long cast-in-place concrete segmental box-girder Structure C is built adjacent to the heavily traveled Interstate 5, which is located on a 50-ft-high embankment. Photo: Kiewit.

Final Design

After some iterations and coordination with Sound Transit, the design of Structure C Unit 2 was finalized. This design featured an approximately 1100-ft-long CIP concrete segmental box-girder structure that would be built adjacent to the existing, heavily traveled I-5, which is located on a 50-ft-high embankment. The team chose to construct the CIP concrete segmental structure from above, using the balanced-cantilever method, to accommodate long spans, avoid problematic soil conditions, and mitigate the project's impact on the wetlands.



The constant-width, typical box-girder section of the concrete segmental bridge carries two light-rail tracks, emergency railings, and acoustic panels. Figure: Kiewit.

The Structure C bridge guideway design was performed in accordance with the *Sound Transit Design Criteria Manual*,[2] supplemented with the WSDOT *Bridge Design Manual*[4] and the seventh edition of the American Association of State Highway and Transportation Officials' *AASHTO LRFD Bridge Design Specifications*.[5] Sound Transit requires that structures be designed for a 2500-year maximum design earthquake to promote resiliency in their system and ensure that operations can resume quickly after lesser seismic events. In addition, the design criteria for this project included concrete durability, corrosion control, and sustainability requirements to provide a 100-year design life, which was investigated and then documented in a project-wide durability report.

Structure C consists of two units. Unit 1 is the approach spans that comprise three spans of precast, prestressed concrete wide-flange girders for a structure length of 370 ft 2 in. Unit 2 delivers the innovative solution required to span the weak soils and sensitive environment along the FWLE route. Unit 2 is a three-span 1097-ft 7-in.-long,

AESTHETICS **COMMENTARY**

by Frederick Gottemoeller

"'Improving aesthetics always adds cost!' How many times have you heard that one?" About a year ago, I began a commentary on the Honolulu Authority for Rapid Transportation's transit system with those sentences (see the Winter 2024 issue of *ASPIRE*®). Well, the Federal Way Link Extension is another example where improved aesthetics came along with reduced cost. This example is also a transit project, but this time, the impetus to investigate an innovative approach was a wretched foundation situation.

When an innovative solution competes against a conventional one, the innovative solution is often penalized because the design and construction team are not familiar with it and therefore feel the need to tack on unnecessarily large cost margins for uncertainties and "contingencies." On this project, the design-build team recognized that danger, so they brought aboard experts in segmental concrete design and construction early in the project's life. The results were money-saving innovations such as dual travelers and integrated shop drawings.

The solution derived for this project addresses the difficult soil conditions and costs less than competing solutions. Also, as a bonus, the design gives the guideway a sleeker and more streamlined shape, which is more interesting because it reflects the forces on it. As a result, the structure is a more welcome component of the communities through which it passes.

As I said a year ago, "Such 'twofers' are available more often than most designers imagine. They should be the goal of all engineering refinement."