Bridge Deck Replacement and Extending Webs of Precast Concrete Bulb-Tee Girders to New Superelevation

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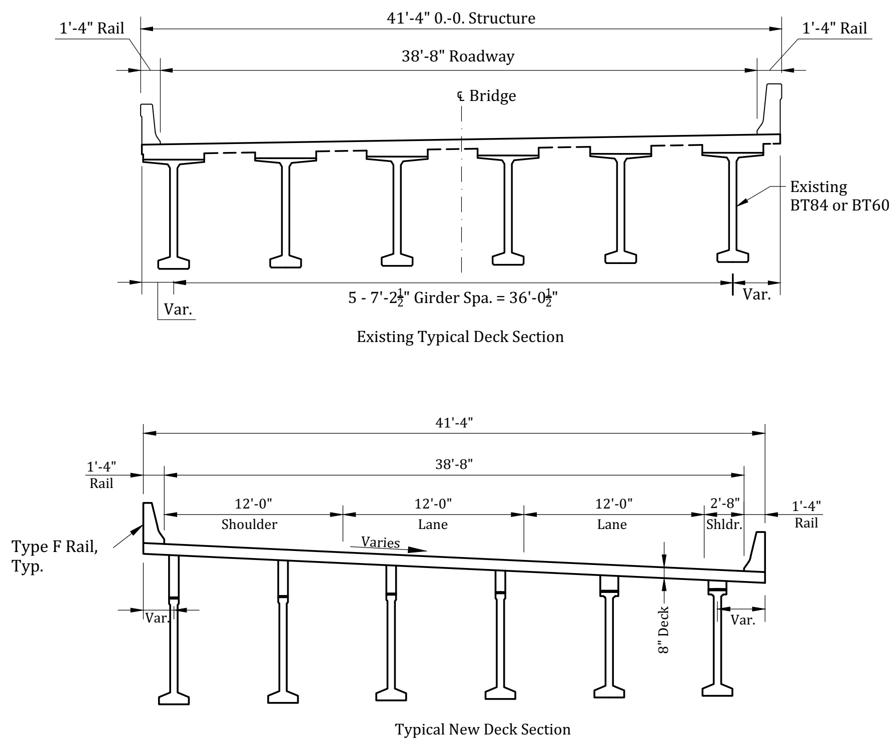
Built in 2003, the Lower Perry Bridge is located on Interstate 84 (I-84) near La Grande, Ore. The bridge is situated on a 1066-ft-radius horizontal curve with a total length of 426.5 ft, including three spans made simple for dead load and continuous for live load. During the original design process, a decision was made to construct the bridge with a reversing 2% superelevation for drainage purposes. After several truck toppling accidents at the bridge, Oregon Department of Transportation decided to replace the old bridge deck with a properly designed superelevation varying from 2% to 5%.

The as-designed plan for deck replacement used a traditional concept to cut the diaphragms; remove the concrete deck, while preserving girder flanges; jack the girders to set elevations; and construct new diaphragms and a new bridge deck. These construction stages are possible, but involved the following risks and issues during construction:

- Girder instability during jacking operation
- Safety for construction workers
- Complicated work containment system
- Long construction time

To reduce and resolve the mentioned problems, bridge contractor Oregon State Bridge Construction, consultant McGee Engineering, and general contractor Oregon Mainline Paving submitted a value engineering proposal to cut the bridge deck including the precast concrete girder flanges, extend the girder webs to new set elevations, and build a new bridge deck. With this method, the girders could be left in place at all times during the construction.



Existing and new typical sections for bridge deck replacement with new superelevation. Figure: Oregon State Bridge Construction and McGee Engineering.

Deck removal operation is shown. The precast concrete flanges were cut with the removal of the existing bridge deck. A jack hammer was used to expose stirrups before they were bent and extended by mechanical couplers. Photo: Oregon Department of Transportation.

Immediately after the existing bridge deck was cut, girder sweep up to 1 in. was observed in the exterior girder. The girder sweep was stabilized by the existing intermediate diaphragm in each span. After the deck removal was complete, cracking at the bottom of precast concrete girders near interior bents was observed. The cracking was caused by the upward bending movement of the continuous girder configuration that occurred due to the dead load removal. The cracks were closed after the new bridge deck was constructed. Near interior bents, cracks in the new extended webs were observed and later injected with epoxy. Skin steel was not adequately provided in these portions.

New bridge deck with extended webs of precast concrete bulb-tee girders. Photo: Oregon Department of Transportation.

This construction concept provided safe construction and was done quickly. The concept can be applied even when deck grades remain unchanged. Cracking issues were minor and can be reduced by providing additional reinforcement. Girder sweeping can occur after uncoupling bridge deck from girders. Restraining elements should be planned and arranged. A

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