

# INTEROFFICE COMMUNICATION

TO: Nick Chaney P.E., District Bridge Engineer  
FROM: Brian Ross P.E., Structures & Pavements  
DATE: July 23rd, 2024  
SUBJECT: Brief Structure Type Study (STS) for bridge SUM-59-1241(SFN: 7702019) PID: 118709

This memo serves as a brief structure type study for the subject bridge to assist in establishing a rehabilitation or replacement strategy. The conclusions of this study are based upon analysis of the existing structure design, previous project history, existing conditions, and field observations.

SUM-59-1241 is a 26' long, single span, non-composite prestressed concrete box beam (PSBB) bridge carrying SR 59 over Fish Creek. The original structure was constructed in 1925/1932 and received a superstructure replacement in 1990 on a SR59 widening project. The structure received minor repairs and an asphalt concrete overlay in 2020. The current wearing surface is 3" of asphalt concrete (with 1½" being waterproofing asphalt). The HS20 Modified legal load limit is 145%. The 2023 bridge inspection summary indicates the bridge is currently in satisfactory condition with a GA of 6. The GA rating is driven by the satisfactory deck/superstructure ratings. Edge spalling is present in beams 5,12,13,15. Beams 8 and 9 show heavy leakage/saturation along the centerline joint along with significant spalling and strand exposure. Exposed strands have been sealed but are continuing to deteriorate. The substructure (rated 7) is in good condition with only minor cracks and sound patches present. The channel (rated 7) is in good condition with no defects noted.

With the accelerated degradation of the PSBBs expected, a superstructure replacement is warranted. The substructure has a good rating (7), suggesting that a full replacement is not required per BDM C401.4. 3 alternatives structure types have been examined:

- **Prestressed concrete box beam w/ composite deck** - A composite box beam superstructure will likely be the fastest to construct of all the alternatives. The roadway profile will likely need to be increased to accommodate the composite concrete deck. Because of reduced lifespan, non-composite PSBB is not being considered as an alternative.
- **Single span concrete slab deck** - A concrete slab superstructure will require additional closure time to construct but will have a longer service life than the other alternates. The deadload increase over the existing superstructure would likely warrant substructure analysis and substructure modification.
- **Steel beam w/ composite deck** - Replacement with a steel beam superstructure would require reconfiguring of the top abutments to properly seat the steel beams. the depth of beams and required 8" deck would require profile adjustment. Profile adjustment needs could be reduced but at the cost of additional beam lines. This alternative will require a protection coating system (PCS).

For superstructure replacement on SUM-59-1241 the preferred structure type is a prestressed concrete box beam w/ composite deck. The greater profile adjustment, PCS required for the steel beam type superstructure and the substructure loading / longer construction time for the concrete slab makes PSBB's the preferred alternative. While exact cost differences between the 3 superstructure types were not examined the shorter construction time and minimal modification to the substructure likely means PSBBs are the most economical option.

The superstructure replacement should maintain the original hydraulic opening. The proposed bottom deck cord elevations should match the existing elevations. The substructure will retain the existing design loading. Address existing substructure defects with 519 / 844 patching or 512 epoxy injection crack repair. The surrounding inlets, valve boxes, and manholes in the approach roadway will need to be adjusted to the new grade required for the composite deck.