

INTEROFFICE COMMUNICATION

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FROM: Nicholas Chaney, P.E., District Bridge Engineer

DATE: July 6, 2026

SUBJECT: Abbreviated Structure Type Study (STS) for bridge MAH-193-00.55 (SFN: 5004446) PID:123780

The subject bridge is to be evaluated for complete removal in place of rehabilitation. Should the determination be made that MAH-193-0055 must remain, this memo serves as an abbreviated structure-type study 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.

Existing Structure Overview

MAH-193-0055 is a 118.5' long (36'-0", 45'-0", 36'-0"), variable width (98.6' avg), three-span continuous reinforced concrete slab bridge carrying SR 193 over Crescent St. in the City of Youngstown. The bridge was constructed in 1966 and consists of a 19.5" concrete slab over reinforced concrete stub abutments and column piers on pile supported foundations. Eastbound and westbound SR193 are detached slab structures separated by 2" median joint on same abutments. Pier caps are not tied together. The bridge has a 14.5' clearance over Crescent St.

Past rehabilitation work includes concrete and asphalt overlays (dates unknown), 4" of wearing surface removal followed by a 3" SDC overlay and reconstructed approach slabs (2009), and minor deck and substructure repairs (2022). The most recent load rating indicates the bridge currently supports 140% of the legal load for HS20 design loading.

Condition Assessment

The 2025 bridge inspection rates the structure general appraisal as fair (5 rating). This rating is driven by fair (5) superstructure and deck conditions. Deficiencies are primarily seen in the deck underside including transverse and longitudinal cracking, efflorescence including areas with stalactites, delaminations (some progressing into spalls), spalling with exposed reinforcing steel, and moisture saturation. These conditions are most pronounced along the abutments, median, and throughout span 1. The left deck edge also has a short section of collision-related spalling. The wearing surface remains in good condition since the 2009 overlay, with only shallow spalls mostly near the approach slab joints.

The substructure (rated 6) is in satisfactory condition. Deterioration is present in prior abutment repairs with recurring delaminated areas along the abutment/deck interface. Piers are in good condition with only one patched column in Pier 1.

Findings

Given the extent of deck saturation, efflorescence buildup, spalling, delamination in the deck underside, and the structure's overall age, a superstructure replacement is warranted. Minor rehabilitation measures, such as installing a new concrete overlay, are not economically viable since subsequent overlays offer no significant extension of service life without excessive full depth patching. The satisfactory condition of the substructure (rated 6) indicates a full structure replacement is unnecessary per BDM C401.4. Minor repairs to the existing substructure will still be required.

Design Alternatives

For all alternatives, existing substructure elements would be re-used as much as possible with modification to both the roadway profile and substructure to accommodate a likely thicker superstructure over the existing 19.5" slab depth. The proposed structure's low-chord elevation must match or exceed the current elevation to maintain or improve the 14.5 feet of vertical clearance over Crescent St. Three superstructure replacement alternatives have been investigated:

Concrete Slab Superstructure

This alternative replaces the superstructure in kind with a presumed 22" depth concrete slab deck.

PROS:

- Maintains the existing load path, minimizing required substructure analysis or modifications.
- Longest service life of all alternatives considered.

CONS:

- Longer construction duration and higher initial cost (without considering substructure modification).
- Longer roadway closure

Prestressed Concrete Box Beam (PSBB) Superstructure with Composite Deck

This alternative involves replacing with a presumed 17" depth PSBB superstructure with an 8" composite deck (6" minimum + 2" sacrificial haunch). A Non-composite PSBB superstructure will not be considered due to insufficient service life.

PROS:

- Faster time to construct than in-kind slab replacement.
- Likely lowest initial cost (without considering substructure or roadway modification).

CONS:

- Requires substructure analysis and modifications due to the changed load configuration.
- Requires additional modification to the roadway profile compared to in-kind slab replacement.
- Likely shortest service life of all alternatives considered.

Steel Beam Superstructure with Composite Deck

This strategy proposes a steel beam with a composite deck superstructure and would include a galvanized or metalized protection coating system (PCS).

PROS:

- Faster time to construct than in-kind slab replacement.
- Lower initial cost (without considering substructure or roadway modification).
- Good service life available if PCS is maintained

CONS:

- Requires substructure analysis and modifications due to the changed load configuration.
- Requires additional modification to the roadway profile compared to in-kind slab replacement.
- PCS maintenance required.

Preferred Alternative

Due to the substructure analysis and modifications required for PSBB and steel options, an in-kind replacement using a continuous reinforced concrete slab is the preferred alternative.

Design Considerations

- The new slab design shows a dead load increase over the existing slab by approximately 13% which is permissible per BDM C401.4B. The dead load check did not account for the existing overlay and only compared original construction to the new proposed slab.
- To account for the new slab thickness, minor profile adjustments to SR 193 are anticipated to maintain the vertical clearance on Crescent St.
- All substructure elements shall be re-used with modification expected to the top portions of the abutments and pier caps along with any minor repairs. The designer should consider incorporating galvanic anodes in repaired portions of the substructure to extend service life.

MOT Considerations

The district prefers part-width construction to maintain traffic on SR 193. Access from SR 193 to the Crescent St ramp may require detouring. Crescent St. would be closed and detoured for the duration of the project.

Conclusion

Should the results of a removal study or investigation find that MAH-193-0055 must be maintained, the recommended rehabilitation strategy is an in-kind superstructure replacement with a continuously reinforced concrete slab. The design shall at least maintain the existing vertical clearance over Crescent St and adjust the SR 193 profile as necessary to accommodate the thicker slab. A planning-level estimate for this scope of work is \$4.0 million. Further refinement of the cost estimate is anticipated upon completion of the conceptual/Stage 1 review.