BDA 412-05 | SEPTEMBER 23, 2024

BRIDGE JOINT RETROFITS

Reference: IDM 404-2.06(03) Expansion Joints
IDM 412-3.01(02) Minimizing Bridge Joints

As per IDM 404-2.06(03), bridge deck expansion joints should be eliminated whenever practical. All types of bridge joints will eventually develop leaks, and many joints begin to leak before the bridge is due for a significant preservation, such as a deck overlay. This often leads to accelerated deterioration of bridge components below the joints. INDOT has successfully converted expansion end bents to semi-integral end bents, thereby eliminating the expansion joints, on hundreds of bridges. However, semi-integral end bent conversion is not always feasible or cost effective within a project scope. Life cycle cost analysis can help determine the appropriateness of semi-integral end bent conversion, but all project scope decisions should ultimately be approved by District Technical Services.

This Bridge Design Aid is intended to provide information on bridge joint repair and retrofits when semi-integral end bent conversion is not feasible.

General Expansion Joint Considerations

The Designer should carefully evaluate the existing expansion joint during the initial field check. The existing joint gap should be measured at a few locations per joint and the corresponding temperature should be noted so that the replacement joints can be properly sized. The as-built or existing plans should not be relied upon for expansion joint openings since components could shift over time, resulting in changes in the gap. If the existing joint has come loose in large sections or is completely displaced, this could indicate the joint was undersized. The condition of the concrete deck or mudwall adjacent to the joint should be evaluated to estimate the amount of patching or reconstruction required in conjunction with the joint replacement.

When the project scope includes a rigid overlay that will result in a grade raise, overlay dams or bridge joint nosing material should be considered to create a more durable edge of deck and mudwall. Overlay dams consist of a thickened portion of the overlay adjacent to the expansion joints that encapsulate the top layer of existing deck reinforcement. These should be detailed on the plans and paid for in accordance with the *Standard Specifications*. Bridge joint nosing materials are non-cementitious products that are not covered by the *Standard Specifications* and will require a unique special provision in the contract. A sample USP is included on the INDOT Recurring and Unique Special Provisions webpage. The use of bridge joint nosing

material should be coordinated with the District Bridge Asset Engineer and INDOT Bridge Design. See attached sample details for Joint Retrofit with Grade Raise.

Replacement of Existing Non-Anchored Joints

Non-anchored bridge expansion joints include open joints, BS compression joints, poured silicone joints, or any other joint type that relies on compression or chemical adhesives to keep the joint in place. INDOT's current practice is to use pre-compressed foam, PCF, joints in these applications. Satisfactory performance of the PCF joint relies on sound concrete, and patching details should be shown on the plans and described in unique special provisions. See IDM Figure 404-2J and attached sample details for Bridge Joint Concrete Repair Detail linked HERE.

Retrofit of Existing SS Joints

SS joints have historically been the best performing joints in INDOT's inventory. However, the rubber/neoprene seals will eventually tear or come loose from the steel extrusions and leak. Complete joint replacement may not be feasible in all bridge preservation projects due to cost and lane closure time, so a retrofit may be the best solution.

Replacing the existing seal with a PCF joint is often the preferred retrofit when the scope of the project does not include other significant treatments or long-term lane closures. IDM Figure 404-2J shows general details for this application.

If the steel extrusions are in good condition, free of excessive rust or impact damage, it might be possible to leave the steel in place and replace the seal in-kind. However, replacing the existing seal in-kind requires extra attention to detail by the EOR, Contractor, and Inspection personnel and INDOT has experienced mixed results with this treatment. Therefore, this retrofit option should only be considered on relatively new joints due to the following challenges. Seal replacement requires the exact make, model, and size of existing seal be determined and shown on the contract plans. If shop drawings of the existing joint are not available, a sample of the joint must be removed and sent to joint manufacturers to identify the make and model. Contractors will likely need to use specialized tools to facilitate removal of the old joint and proper installation of the new joint. This retrofit method should be thoroughly coordinated with the INDOT Bridge Asset Engineer and INDOT Construction to determine feasibility.

See table on next page.

This table compares the three possible treatments.

Scope of SS Joint Treatment	Pro	Con
Complete Replacement	- Provides the longest service life - Scope of construction is well understood and doesn't require specialized training or tools	- Requires partial removal of deck and mudwall - Highest construction cost - Longest construction duration with multi-day closures
Replacement of Seal In-Kind	- Less expensive and time consuming than complete replacement - May be performed under multiple short-term closures	- Requires identification of existing seal make and model prior to letting - Requires specialized tools and training for proper and efficient construction
Replacement of Seal with PCF (See IDM Fig. 404-2J)	- Least expensive and time-consuming option - Minimal specialized training and tools required for proper installation	- Shortest anticipated service life - Bond between new joint and existing steel requires proper surface preparation