



BRIDGE EXPANSION JOINTS

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- Miscellaneous Standards – posted April 2019
- Bridge Joint Standards
 - Updated due to field performance
 - SEJ-A – RETIRED the Name of Standard
 - SEJ-B and SEJ-M – replace the SEJ-A
 - Paint notes – paint entire section
- Bridge Expansion Joint Guide – NEW
 - Attached to New and Revised Miscellaneous Bridge Standard Drawings Memo
 - <ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/bridge/memoi58e.pdf>
- Guide to Bridge Standard Drawings
 - Updated to remove most joint information



April 1, 2019

BRIDGE EXPANSION JOINTS GUIDANCE

Material

Refer to TxDOT's Standard Specification for Construction and Maintenance of Highways, Streets, and Signs, Item 454, "Bridge Expansion Joints" for material requirements.

Geometric Constraints

- Bridge deck continuity by providing multi-span units is recommended in order to minimize the number of joints. Unit lengths of up to 350 feet are not uncommon.
- All expansion joints in de-icing zones should be sealed or drained. Stream crossing structures may have open joints in the salt-free zones.
- Joints for all grade separation structures should be sealed.

Design Criteria

Thermal Expansion

The total movement required through a bridge deck expansion joint should be based on a temperature range of 10 to 110 degrees for concrete bridges and 0 to 120 degrees for steel bridges. Alternatively, the temperature contour maps in AASHTO LRFD Bridge Design Specifications, Section 3.12.2 may be used.

The expansion length considered for sizing a joint can be assumed as one-half the unit length on one side of the joint plus one-half the unit length on the other side of the joint.

Use coefficients of expansion equal to 6.0×10^{-6} for concrete and 6.5×10^{-6} for steel.

When placed on a skew, sealed expansion joints (SEJ) have a reduced ability to accommodate longitudinal movement. Calculate reduced movement range by multiplying joint size by cosine (skew).

When integral or semi-integral bents are used, consider the effect column stiffness has on the distribution of thermal movement.

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- Bridge Expansion Joints Guidance

- Material – Item 454

- Geometric Constraints

- Deck continuity is encouraged (joint elimination should be considered)

- Sealing of joints (typically always recommended)

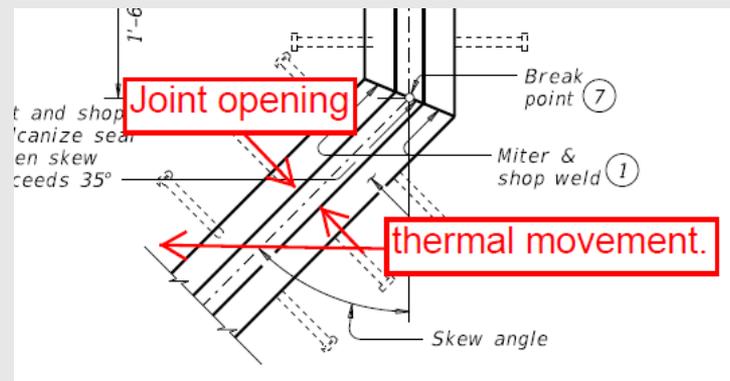
- De-icing zones

- Grade separations

- Design Criteria

- Thermal expansion

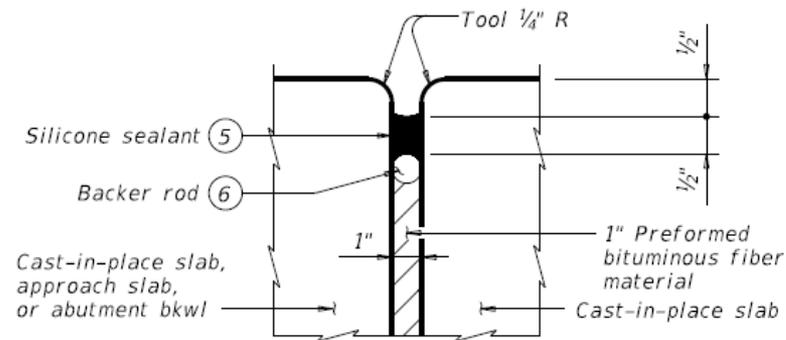
- Skews – joint has reduced movement



- Available Joints for New Construction
 - Pourable Seal (Type A)
 - Open Armor Joint (ARMOR JOINT)
 - Pourable Seal (Seal Armor Joint)(ARMOR JOINT(SEALED))
 - Sealed Expansion Joint (SEJ)
 - Mechanically Bonded (SEJ-M and SEJ-S(O))
 - Bonded Strip Seal (SEJ-B)
 - Header Type Joints with Seal
 - Finger Joint and Modular Bridge Joint Systems (MBJS):

- Pourable Seal (TYPE A):

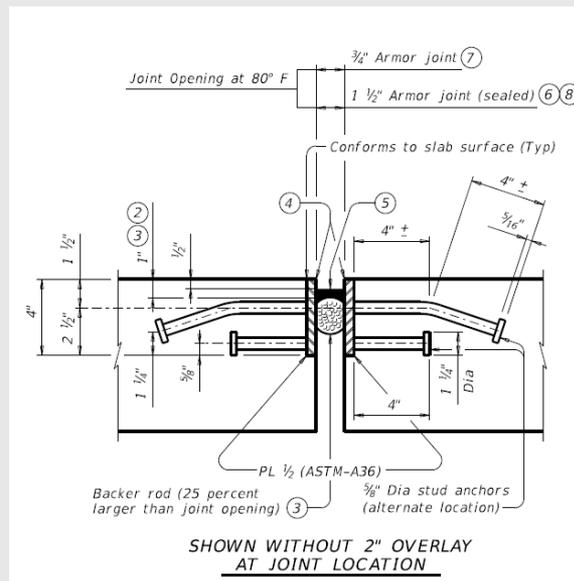
- Preferred joint for low traffic volume, off-system structure
- Used for spans or units no longer than 100 feet



TYPE A JOINT DETAIL ⑦

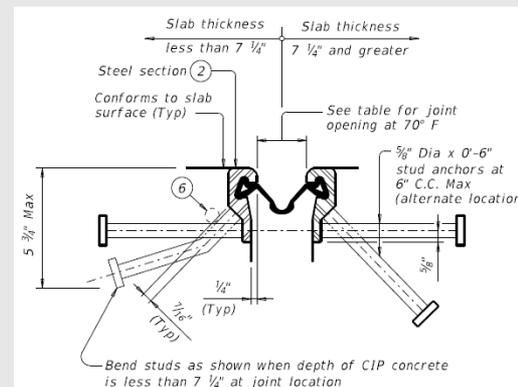
- Pourable Sealants (DMS-6310)
 - Class 1—two-component polyurethane, rapid curing, self-leveling (none approved)
 - Class 2—two-component synthetic polymer, self-leveling
 - **Class 3—hot-poured rubber (asphalt joint seal-low movement)**
 - Class 4—low-modulus silicone, nonsag
 - Class 5—low-modulus silicone or polyurethane, self-leveling (does not bond to steel)
 - **Class 7—low-modulus silicone, rapid curing, self-leveling (high movement bridge joint)**
 - Class 8—low-modulus silicone or polyurethane, self-leveling, concrete only (construction joints)

- Open Armor Joint (ARMOR JOINT)
 - Not allowed on CIP slab spans, de-icing zones, or over steel beams
 - Min opening = 0-in.
 - Max opening = 2-in.
 - Total movement = 2-in.
- Pourable Seal (Sealed Armor Joint) (ARMOR JOINT)(SEALED):
 - Min opening = 0.75-in.
 - Max opening = 2.25-in.
 - Total movement = 1.5-in.

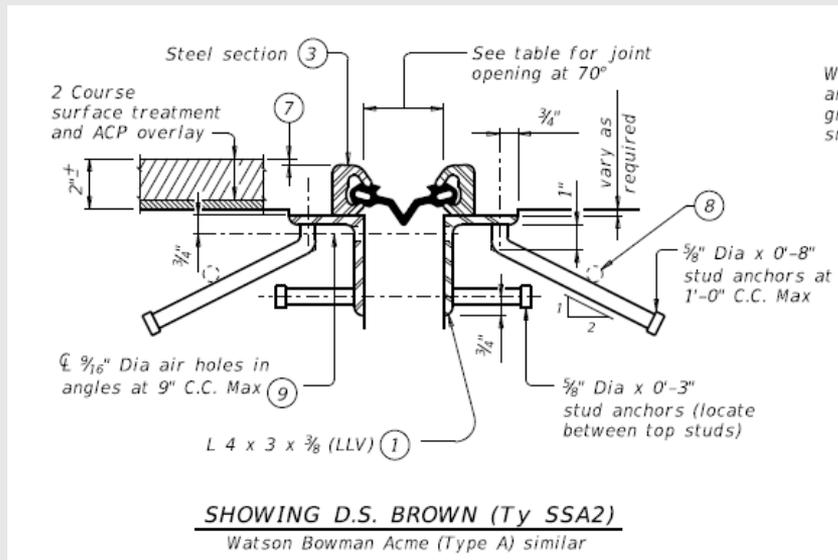


- Sealed Expansion Joint (SEJ)
 - Mechanically Bonded (SEJ-M and SEJ-S(O))
 - Preferred joint for freight corridors or other high truck volume roadways
 - SEJ-M - No overlay
 - SEJ-S(O) – With ± 2 " Overlay
 - Minimum slab and overhang thickness = 6.5-in.¹
 - Option to galvanize instead of paint**

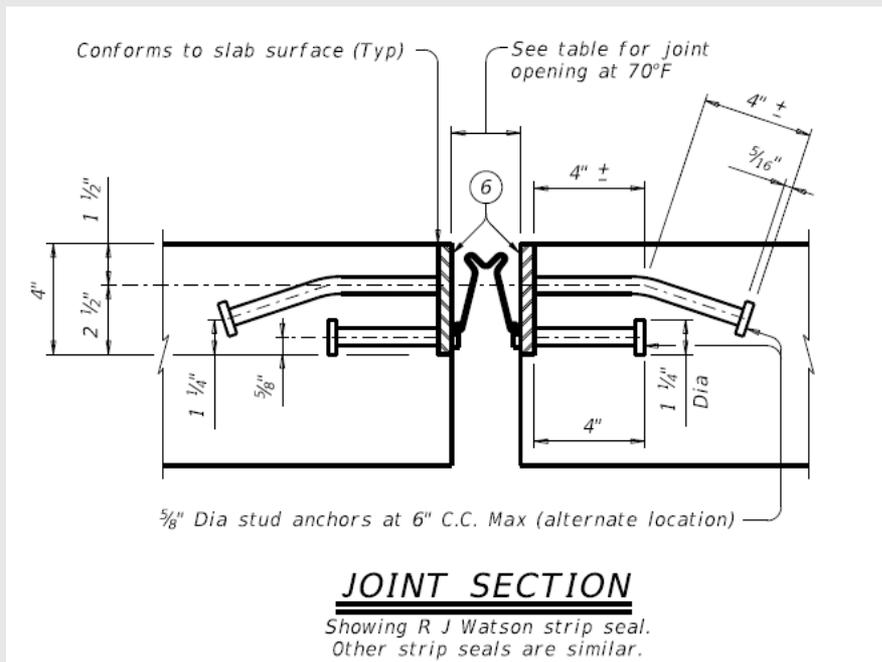
Note 1: Adjacent box beam and slab beams have 5" slab thickness. These beams have a required block out in the beam that allows an increased slab thickness for the AJ and SEJ joints.



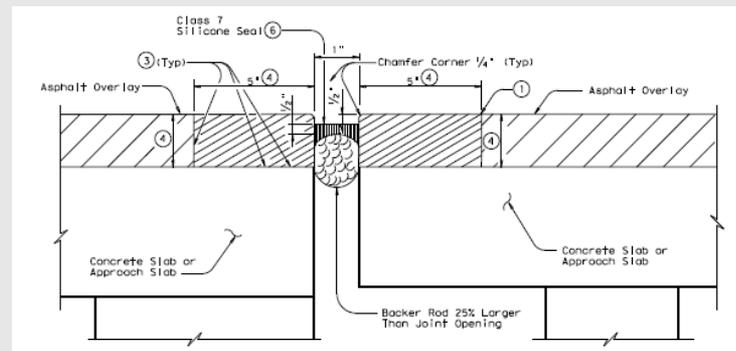
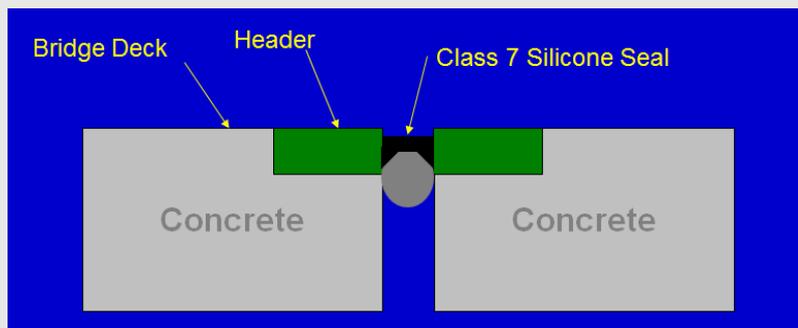
- Sealed Expansion Joint (SEJ)
 - Mechanically Bonded (SEJ-M and SEJ-S(O)) (continued)
 - Available in two sizes:
 - 4-in.
 - » Min opening = 0-in.
 - » Max opening = 4-in.
 - » Total movement = 4-in.
 - 5-in.
 - » Min opening = 0-in.
 - » Max opening = 5-in.
 - » Total movement = 5-in.



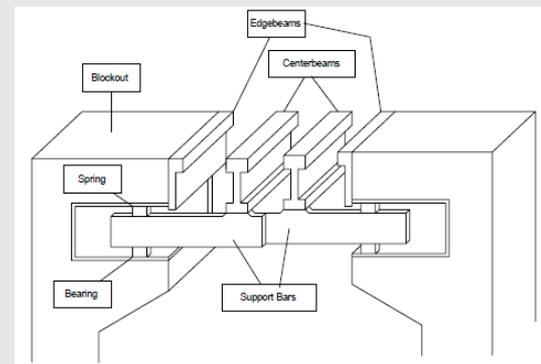
- Sealed Expansion Joint (SEJ)
 - Bonded Strip Seal (SEJ-B)
 - No overlay
 - Minimum slab and overhang thickness = 6.5-in.¹
 - Available in one size:
 - 4-in.
 - » Min opening = 0-in.
 - » Max opening = 4-in.
 - » Total movement = 4-in.



- Header Type Joints with Seal
 - Snow plows or deicing, select an unarmored concrete header with seal.
 - Thickened slab end
 - Set joint opening based on design requirements with the following limits:
 - Minimum joint opening = 1-in.
 - Maximum joint opening = 3-in.
 - Do not cantilever the material past the concrete



- Finger Joint and Modular Bridge Joint Systems (MBJS)
 - For expansion movements greater than 5-in., but are not recommended.
 - These systems tend to be expensive, expensive to maintain, and high maintenance.
 - Consult with the Bridge Division on the use of these joint types.



- Which joint should I use?
 - Off system, low volume – considerer the Type A
 - Freight corridors – SEJ-M
 - Heavy truck traffic, not a freight corridor – SEJ-M
 - All other structures
 - Select based on available joint movement
 - District preference based on past performance

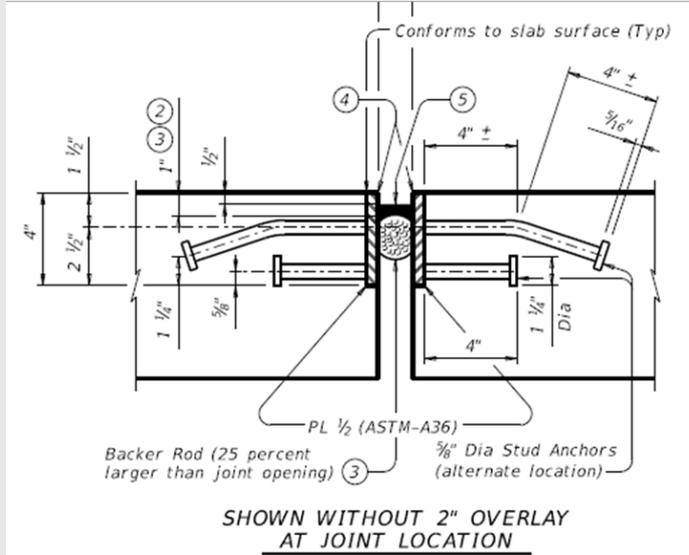
- Everything discussed previously is in the Bridge Expansion Joint Guide – NEW
 - Attached to New and Revised Miscellaneous Bridge Standard Drawings Memo
 - <ftp://ftp.dot.state.tx.us/pub/txdot-info/cmd/cserve/standard/bridge/memoi58e.pdf>

MAINTENANCE – Clean out existing Joint Openings

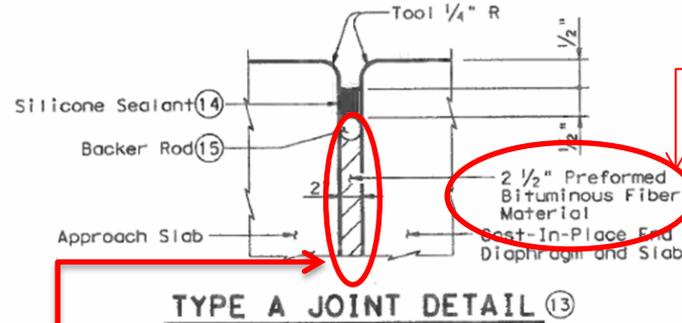


MAINTENANCE – Reseal – Item 438, “Cleaning and Sealing Exist Joints”

- In addition to clearing debris, joints should also be re-sealed where existing sealant has failed
- Class 7 Silicone is specified because it is rapid setting

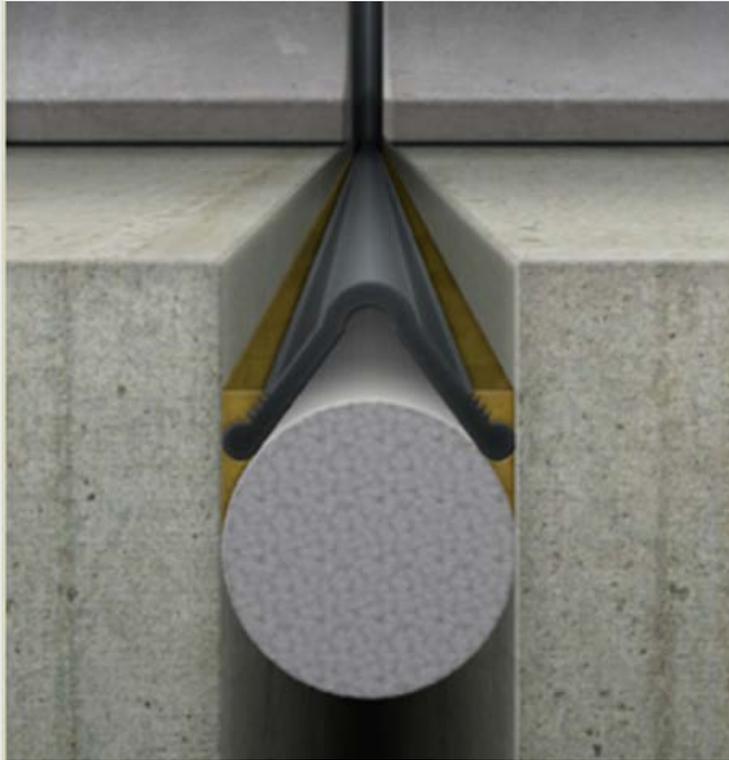


Clean out Joints Full Depth To Top of Cap



Switch joint Filler material To Extruded Polystyrene Foam

MAINTENANCE – Other Joint Re-Seal Options



Similar to SEJ-B Seal



Silicone Topped Foam Seal

MAINTENANCE – Joint Treatment for Asphalt Overlay

- Many Options
 - Do Nothing (let it crack and see what happens)
 - Saw ACP at joints (both fixed and expansion)
 - Saw ACP at joints and Seal (both fixed and expansion)
 - Install Fabric Underseal prior to ACP and then Saw and Seal
 - Header Type Expansion Joints (Item 454)
 - Two Payment Options – by LF for CF
 - Both options require expected overlay thickness shown in the plans – history has shown we typically underestimate the thickness
 - Asphalt Plug Expansion Joints (Special Specification 4001)

MAINTENANCE - Do Nothing Option (after 15 years)

- 15 Year Old ACP
- No initial joint treatment
- Post treat with Class 3 Seal



MAINTENANCE - Saw-cut and Seal/with or without fabric underseal



- Plan the Work for Cooler Months
 - Joints are wider, easier to clean
 - Joints are wider, pourable sealants work better
 - Bats less likely to be present
- Inspect Joint Maintenance Operations
 - Backer Rod Placement Critical
 - Thickness of Sealant – 1/2” – Not More or Less
 - Header material installations very sensitive to moisture
- Seal Up Into Curb or Rail
 - May need to use Class 4 (Non-Sag) Sealant
 - SEJ-B (Preformed Silicone only) Seal spliced to the Class 7 Seal

QUESTIONS?

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