Structural Expansion Joints

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Bridge Design Engineer at INDOT
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What’s the big deal?

Joint Fails*
Salts Reach Structural Member
Beams & Bearings Corrode
Now we have a problem!

* Shortest Life Expectancy of all Bridge Components
Like this...

Web Crack

and this...

Exposed Strands
What’s the plan?

- Increase Maintenance Efforts
  - Expand Bridge Joint Tool Box
  - Provide Better Detailing

- Eliminate when possible!!

Existing Tool Box

- Expansion Joint M (Modular)
  - Large Expansions
  - Not a lot of alternatives...

- Expansion Joint SS (Strip Seal)
  - Fairly Dependable
  - Costly to Repair/Replace

- Expansion Joint Sealing Systems (Poured Silicone)
  - Small Expansions
  - Installation Issues
  - Questionable Performance
SS Joint Issues

ONLY A THIN WIDTH OF CLASS C CONCRETE UNDER THE NEW EXTRUSION

EXISTING SS JOINT EXTRUSIONS WERE CUT OFF AT THE BOTTOM OF THE BLOCKOUT
Poured Silicone Issues

Opening Size at Installation
- Movement capacity reduced when installed at extreme temperatures

Skew Affects Material Width
- Large skews cause pours to be too wide

Quality Dependent on Installation
- Joint created in the field
- Movement capacity affected by shape/size of material
**Poured Silicone Issues**

**Limitations**
- Movement: +100/-50%
- Max. Opening = 3.25”
- Expansion Length < 75’
- Max. Depth: by Product

Source: Coastal Construction Products

**Nosing Material Issues**

Nosing Material MUST be placed on Horizontal Surface

Source: Coastal Construction Products
Add to the Tool Box...

Preformed Silicone Joint

- Preformed Silicone Gland
- Silicone Adhesive
- Backer Rod
Preformed Silicone

- Expansion Lengths ≤ ±400’
- Installation Width: 0.5” Min. to 5” Max.
- Provide in Plans:
  - Expansion Length
  - Existing Max. & Min. Joint Opening*
  - Note: “Minimum Installation Depth Per Manufacturer’s Requirements”

*See Reference Slides and back calculate Minimum and Maximum Existing Opening

INDOT Preferred Installation Resting on Ledge

Preformed Silicone

- Pay Item: 724-12157
- No Bid History....YET!
  - $102-165/Lft (as different pay item)
- Unique Provision
- Suppliers
  - DS Brown: V-Seal
  - R.J. Watson: Silicoflex Joint Sealing System
  - Watson Bowman: Wabo SPS Preformed Silicone Joint Seal System
  - Silicone Specialties: SILSPEC Silicone Strip Seal
- Must provide patching or concrete reconstruction items when necessary
Pre-Compressed Foam Joint

Factory Applied Silicone Facing

Two-Part Epoxy

Field Applied Silicone Sealant Bead

Polymer Impregnated Foam

Pre-Compressed Foam

10 Minutes Time Lapse
Pre-Compressed Foam

- Expansion Lengths ≤ 400’
- 50% Contraction/50% Expansion
  (from Width @ Mean Temperature)
- Provide in Plans:
  - Thermal Movement Range
  - Existing Opening at 60º*
  - Minimum Recess Below Grade
    - ½” min. for ≤ 1.25” wide seals
    - ¾” min. for ≥ 1.5” wide seals

*See Reference Slides

Table Source: EMSEAL Tech Data Sheet

Pre-Compressed Foam

- Pay Item: 724-12103
- $50-55/Lft (2 contracts as of Dec 16 Letting)
- Unique Provision
- Suppliers
  - EMSEAL: BEJS System
  - Watson Bowman: Wabo HSeal
  - LymTal International: Iso-Flex Precom H-SL

- Must provide patching or concrete reconstruction items when necessary
### Comparison Summary

<table>
<thead>
<tr>
<th>Poured Silicone</th>
<th>Preformed Silicone</th>
<th>Precompressed Foam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion Lengths &lt; 75'</td>
<td>Exp. Length ≤ 400’</td>
<td>Exp. Length ≤ 400’</td>
</tr>
<tr>
<td>Movement +100%/-50%</td>
<td>Movement Model Specific</td>
<td>Movement +100%/-50%</td>
</tr>
<tr>
<td>Max. Opening = 3.25”</td>
<td>Max. Opening = 4½”</td>
<td>Max. Opening = 6”</td>
</tr>
<tr>
<td>Requires Conc. Or Nosing</td>
<td>Can attach to SS Extrusion</td>
<td>Can attach to SS Extrusion</td>
</tr>
<tr>
<td>$65-$175/Lft</td>
<td>$100-$165/Lft</td>
<td>$50-$55/Lft</td>
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<tr>
<td>Field Fabricated</td>
<td>Single Piece Gland</td>
<td>Field Spliced Sections</td>
</tr>
<tr>
<td>2-3 Year Life Expectancy</td>
<td>Unknown Design Life</td>
<td>Unknown Design Life</td>
</tr>
<tr>
<td></td>
<td>Better Choice @ ledge</td>
<td>Better Choice @ extrusion</td>
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</tbody>
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### Improved Plan Details

- Provide Expansion Length and Opening Size @ Mean Temperature
- Require nosing be placed on horizontal surface
- Mechanical Anchor Bolts for Concrete Patches without Exposed Rebar
- Build or Reuse a Ledge when feasible
MOT Resources

- Safety is Paramount
  - Construction Worker
  - Traffic/Public

- Truck Mounted Attenuator Provision
  - On the Unique Provisions samples index

- Work Zone Traffic Control Guidelines
  - [www.in.gov/indot/files/WorkZoneTCH.pdf](http://www.in.gov/indot/files/WorkZoneTCH.pdf)
  - Must still be detailed in plans

Reference - Existing Opening

Source: 1992 INDOT Standard Drawing
Reference - Existing Opening

Source: Std. Dwg. 724-BSSJ-04

<table>
<thead>
<tr>
<th>Ambient Temperature °F</th>
<th>DIMENSION &quot;W&quot;</th>
<th>Expansion Length</th>
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<tbody>
<tr>
<td></td>
<td>100'-200'</td>
<td>200'-300'</td>
</tr>
<tr>
<td>120°</td>
<td>2&quot;</td>
<td>1½&quot;</td>
</tr>
<tr>
<td>100°</td>
<td>2&quot;</td>
<td>1½&quot;</td>
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<tr>
<td>80°</td>
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<tr>
<td>0°</td>
<td>3½&quot;</td>
<td>3½&quot;</td>
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Questions/ Thoughts/ Concerns

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