# STRIP JOINT SEAL ASSEMBLY

<table>
<thead>
<tr>
<th>XS Sheet Numbers</th>
<th>xs8-010</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description of Component</strong></td>
<td>The strip joint seal assembly can accommodate longitudinal movements and some limited movements in the transverse direction.</td>
</tr>
<tr>
<td><strong>Standard Drawing Features</strong></td>
<td>The strip joint assembly consists of two edge beams with anchor studs and the elastomer gland (one joint cell). The assembly is placed in recesses over joint openings.</td>
</tr>
<tr>
<td><strong>Design/General Notes</strong></td>
<td>• A minimum joint opening at installation “W” is given by the formula:</td>
</tr>
</tbody>
</table>
| | \[ W \text{ (in)} = \frac{1}{2}'' + \left( \text{Max. Str. Temp. in } ^\circ\text{F} - \text{(actual Str. Temp. in } ^\circ\text{F}) \right) \times (\text{ac or as})(12) \text{ (contributory length in feet), and} \]
| | \[ \text{min } W\text{(in)} = \frac{1}{2}'' \]
| | where, \text{ac} = 0.0000060 and \text{as} = 0.0000065 are the thermal expansion coefficients for concrete and steel respectively. |
| **Additional Drawings Needed to Complete PS&E** | |
| **Contract Specifications** | Current Standard Specifications are available from the Division of Engineering Services (51-2 Joints) |
| **Restrictions on Use of Standard Drawings** | • The Strip Joint Seal Assembly may be used for Movement Rates (MR) up to 4 inches regardless the skew at joint location. |
| **Special Considerations** | |
# JOINT ARMOR FOR PEDESTRIAN WALKWAYS

<table>
<thead>
<tr>
<th>XS Sheet Numbers</th>
<th>xs8-050</th>
</tr>
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<tbody>
<tr>
<td><strong>Description of Component</strong></td>
<td>Joint armor design for pedestrian walkways in conformance with ADA requirements.</td>
</tr>
<tr>
<td><strong>Standard Drawing Features</strong></td>
<td>A steel plate with taper edges and flat head cap screws is placed over expansion joints/joint openings in pedestrian walkways.</td>
</tr>
</tbody>
</table>
| **Design/General Notes** | - Openings on the walkways shall not allow passage of a sphere more than ½ inch diameter except as allowed.  
- Changes in level up to ¼ inch high shall be permitted.  
- Changes in level between ¼ inch high minimum and ½ inch high maximum shall be beveled with a slope not steeper than 1:2.  
- Changes in level greater than ½ inch high shall be beveled with a slope not steeper than 1:12 |

| **Additional Drawings Needed to Complete PS&E** | |
| **Contract Specifications** | Design Information Bulletin (DIB) 82-04 for “Pedestrian Accessibility Guidelines for Highway Projects” |
| **Restrictions on Use of Standard Drawings** | - The joint armor shall be employed over every expansion joint in pedestrian walkways when ADA compliance is required. |
| **Special Considerations** | |

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User Guide to Bridge Standard Detail Sheets
**SEISMIC JOINT (TYPE I, FULL CHANNEL)**

<table>
<thead>
<tr>
<th>XS Sheet Numbers</th>
<th>xs8-070-1 thru xs8-070-9</th>
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<tbody>
<tr>
<td><strong>Description of Component</strong></td>
<td>The Seismic Joint is based on a very simple concept and can be used for service and/or seismic demands. The Joint can accommodate large translational movements in the longitudinal and transverse directions, large rotations about the vertical axis, and limited vertical movements by allowing rotation about the transverse axis at its pinned end. Limited rotation about the longitudinal direction is also permitted due to flexible rubber washers at the pin. Unlike other joint systems, it shifts potential joint damage away from the critical joint opening, therefore preventing joint collapse and traffic disruption even after a major seismic event.</td>
</tr>
<tr>
<td><strong>Standard Drawing Features</strong></td>
<td>The Seismic Joint is a steel plate sliding system and comes in a modular form. Each module covers a half traffic lane and is made of i) a Box/Channel Assembly, ii) the Support Plate, iii) the Deck Plate and iv) the elastomeric sealant. The Deck Plate spans the joint opening and slides over the Support Plate. The elastomeric sealant accommodates the service demands and it is considered a sacrificial element at seismic. Since the sealant is located away from the joint opening on the bridge deck, the joint is still able to carry traffic after a major seismic event and the sealant could be replaced at a later time.</td>
</tr>
</tbody>
</table>
| **Design/General Notes** | • A minimum Deck Plate thickness Td equal to 1.5 inches is required for joint openings up to 2 feet at 70 °F. Similarly, Td equal to 2 inches is required for joint openings from 2 to 4 feet at 70 °F. For larger openings, contact the Joint Seals & Bearings Specialist  
  • xs 8-070-8. The construction sequence is included. Any alternative construction sequence shall be reviewed and approved by the Engineer.  
  • xs 8-07 0-9. An optional barrier detail is provided. The Engineer shall provide barrier details approved for the project.  
  • To access the Channel Assembly remove the Cover plate from the bridge deck. |
| **Additional Drawings Needed to Complete PS&E** | xs8-070-1 Joint information Table must be filled by the Engineer.  
  Joint opening @ 70 °F, min α70 (in) = [(SEE (seismic closing)) + (temp, rise)]  
  For a70° < 24”; min Td=1.5” and for 24° ≤ a70° ≤48°; min Td=2”  
  The thickness of the Cover plate, Tc, is equal to that of the deck plate Td; Td=Tc |
Deck plate length, \( L_d \) (in) = \((12” \text{, channel seat}) + (\text{joint opening @70 °F}) + (\text{creep & shrinkage}) + (\text{temp. drop}) + (\text{SEE (seismic) opening}) + 4”) \times (1/\cos(\text{skew}))

Note that the Deck/Cover plates are made of a steel plate and are covered by a 3/8” thick multilayer polymer overlay.

Support plate length, \( L_s \) (in) = \((\text{creep & shrinkage}) + (\text{temp. drop}) + (\text{SEE (seismic) opening}) + 4”) \times (1/\cos(\text{skew}))

To account for the skew at the joint location the joint capacity is increased by \((1/\cos(\text{skew}))\).

\(\text{xs8-070-2 thru 4 and 6 should be adjusted to the joint skew and the geometry of the external joint modules of the project.}\)

\(\text{xs8-070-7 shall be edited to project specific geometry.}\)

\(\text{xs8-070-9: at joint opening @70 °F, min overlap length (in) =[(creep & shrinkage) + (temp. drop) + 12”] }\)

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<tr>
<th>Contract Specifications</th>
<th>Current Nonstandard Specifications are available from the Division of Engineering Services. If these are unavailable then you may contact the Senior Technical Specialist for Joint Seals &amp; Bearings.</th>
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</table>
| Restrictions on Use of Standard Drawings | • The Seismic Joint Type I Full Channel may be used when the maximum Service (non-seismic) Movement Rate (MR) demand is 4 inches.  
• The access to the joint is performed by removing the Cover plate from the bridge deck. |
| Special Considerations | • Seismic joints must be completely assembled at the fabrication plant including painting, application and curing of the multi-layer polymer overlay.  
• Each joint module is assembled at its rest position (70 °F)  
• The installation of the joint shall take place after 1) constructing concrete barriers or bike paths, 2) placing deck overlays and 3) installing utilities  
• Each joint module is assembled at the shop, shipped and installed as one unit. |
| Design Example | Given: \( \text{skew} = 25° \) at joint location, \( \text{Temp. 3”/3”, Cr & Sh=2”, SEE=10”/12”}, \)  
\( \text{Joint opening @ 70 °F, min } a_{70} \text{ (in) = [(SEE (seismic) closing) + (temp, rise)]= = 10” + 3”= 13” } \)  
\( \text{Min Td= 1 1/5” ; because } a_{70} < 24” \)  
\( T_c=T_d=1 \ 1/5” \) |
Deck plate length, \( L_d \) (in) = \((12'', \text{ channel seat}) + \) (joint opening @70 \(^\circ\) F) + (creep & shrinkage) + (temp. drop) + (SEE (seismic) opening) + 4'') \* \((1/cos(skew)) = (12'' + 13'' + 2'' + 3'' + 12'' + 4'') \* (1/cos(25\(^\circ\))) = 50.8''

The Deck/Cover plates are made of a 1.5” thick steel plate and are covered by a 3/8” thick multilayer polymer overlay.

Support plate length, \( L_s \) (in) = \((\text{creep & shrinkage}) + \) (temp. drop) + (SEE (seismic) opening) + 4'') \* \((1/cos(skew)) = (2'' + 3'' + 12'' + 4'') \* (1/cos(25\(^\circ\))) = 23.2''
# SEISMIC JOINT (TYPE I, HALF CHANNEL)

<table>
<thead>
<tr>
<th>XS Sheet Numbers</th>
<th>xs8-080-1 thru xs8-080-9</th>
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<tbody>
<tr>
<td><strong>Description of Component</strong></td>
<td>The Seismic Joint is based on a very simple concept and can be used for service and/or seismic demands. The Joint can accommodate large translational movements in the longitudinal and transverse directions, large rotations about the vertical axis, and limited vertical movements by allowing rotation about the transverse axis at its pinned end. Limited rotation about the longitudinal direction is also permitted due to flexible rubber washers at the pin. Unlike other joints systems, it shifts potential joint damage away from the critical joint opening, therefore preventing joint collapse and traffic disruption even after a major seismic event.</td>
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<tr>
<td><strong>Standard Drawing Features</strong></td>
<td>The Seismic Joint is a steel plate sliding system and comes in a modular form. Each module covers a half traffic lane and is made of i) a Box/Channel Assembly; ii) the Support Plate; iii) the Deck Plate and iv) the elastomeric sealant. The Deck Plate spans the joint opening and slides over the Support Plate. The elastomeric sealant accommodates the service demands and it is considered a sacrificial element at seismic. Since the sealant is located away from the joint opening on the bridge deck, the joint is still able to carry traffic after a major seismic event and the sealant could be replaced at a later time.</td>
</tr>
</tbody>
</table>
| **Design/General Notes** | • A minimum Deck Plate thickness \( T_d \) equal to 2 inches is required for joint openings from 2 to 4 feet at 70 \(^\circ\) F. For larger openings contact the Joint Seals & Bearings Specialist  
• xs 8-080-8. The construction sequence is included. Any alternative construction sequence shall be reviewed and approved by the Engineer.  
• xs 8-080-9. An optional barrier detail is provided. The Engineer shall provide barrier details approved for the project.  
• Access to the Channel Assembly is provided from the joint opening. |
| **Additional Drawings Needed to Complete PS&E** | xs8-080-1 Joint information Table must be filled by the Engineer.  
Joint opening @ 70 °F, \( \min a_{70} (\text{in}) = \max(24", (\text{SEE (seismic) closing} + (\text{temp. rise}))\}  
For \( 24" \leq a_{70} \leq 48" \) then \( \min T_d = 2" \)  
Deck plate length, \( L_d (\text{in}) = ((13 5/8", \text{channel seat}) + (\text{joint opening @ 70 °F}) + (\text{creep & shrinkage}) + (\text{temp. drop}) + (\text{SEE (seismic) opening}) + 4") \times (1/\cos(\text{skew}))\,  
Note that the Deck plate is made of a steel plate and is covered by a 3/8” thick multilayer polymer overlay. |
Support plate length, $L_s$ (in) =\{(creep & shrinkage) + (temp. drop) + (SEE (seismic) opening) + 4’’\} * (1/cos(skew)),

To account for the skew at the joint location, the joint capacity is increased by (1/cos(skew)).

xs8-080-2 thru 4 and 6 should be adjusted to the joint skew and geometry of the external modules of the project.

xs8-080-7 shall be edited to project specific geometry.

Xs8-080-9: at joint opening @70 °F, min overlap length (in) =\{(creep & shrinkage) + (temp. drop) + 12”\}

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<th><strong>Contract Specifications</strong></th>
<th>Current Nonstandard Specifications are available from the Division of Engineering Services. If these are unavailable then you may contact the Senior Technical Specialist for Joint Seals &amp; Bearings.</th>
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</table>
| **Restrictions on Use of Standard Drawings** | • The Seismic Joint Type I Half Channel may be used when the maximum Service (non-seismic) Movement Rate (MR) demand is 4 inches.  
• The minimum joint opening available at 70 °F shall be 24 inches for access to the Channel/Box Assembly from the joint opening. |
| **Special Considerations** | • Seismic joints must be completely assembled at the fabrication plant including painting, application and curing of the multi-layer polymer overlay.  
• Each joint module is assembled at its rest position (70 °F)  
• The installation of the joint shall take place after 1) constructing concrete barriers or bike paths, 2) placing deck overlays and 3) installing utilities.  
• Each joint module is assembled at the shop, shipped and installed as one unit. |
| **Design Example** | Given: skew = 25° at joint location, Temp. 3”/3”, Cr & Sh=2”, SEE=10”/12”,  
Joint opening @ 70 °F, min $\alpha_{70}$ (in) = max( 24”, (SEE (seismic) closing + (temp. rise)) = max(24”, (10” + 3”))=24”  
Since 24” $\leq a_{70} \leq 48”$ then select $T_d=2”$  
Deck plate length, $L_d$ (in) =\{(13 5/8”, channel seat) + (joint opening @70 °F) + (creep & shrinkage) + (temp. drop) + (SEE (seismic) opening) + 4”\} * (1/cos(skew)) =  
\{13 5/8” + 24” + 2” + 3” + 12” +4”\} * (1/cos(25°))=64.7”  
The Deck plate is made of a 2” thick steel plate and is covered by a 3/8” thick multilayer polymer overlay. |
Support plate length, $L_s$ (in) = (creep & shrinkage) + (temp. drop) + (SEE (seismic) opening) + 4” } * (1/cos(skew)) =
= {2” + 3” + 12” + 4”} * (1/cos(25°)) = 23.2”
# SEISMIC JOINT (TYPE II, FULL CHANNEL)

<table>
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<tr>
<th>XS Sheet Numbers</th>
<th>xs8-090-1 thru xs8-090-9</th>
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<td><strong>Description of Component</strong></td>
<td>The Seismic Joint is based on a very simple concept and can be used for service and/or seismic demands. The Joint can accommodate large translational movements in the longitudinal and transverse directions, large rotations about the vertical axis, and limited vertical movements by allowing rotation about the transverse axis at its pinned end. Limited rotation about the longitudinal direction is also permitted due to flexible rubber washers at the pin. Unlike other joints systems, it shifts potential joint damage away from the critical joint opening, therefore preventing joint collapse and traffic disruption even after a major seismic event.</td>
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<td><strong>Standard Drawing Features</strong></td>
<td>The Seismic Joint is a steel plate sliding system and comes in a modular form. Each module covers a half traffic lane and is made of i) a Box/Channel Assembly, ii) the Support Plate, iii) the Deck Plate and iv) the elastomeric sealant. The Deck Plate spans the joint opening and slides over the Support Plate. The elastomeric sealant accommodates the service demands and it is considered a sacrificial element at seismic. Since the sealant is located away from the joint opening on the bridge deck, the joint is still able to carry traffic after a major seismic event and the sealant could be replaced at a later time.</td>
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</table>
| **Design/General Notes** | • A minimum Deck Plate thickness Td equal to 1.5 inches is required for joint openings up to 2 feet at 70 °F. Similarly, Td equal to 2 inches is required for joint openings from 2 to 4 feet at 70 °F. For larger openings contact the Joint Seals & Bearings Specialist  
• xs 8-090-8. The construction sequence is included. Any alternative construction sequence shall be reviewed and approved by the Engineer.  
• xs 8-090-9. An optional barrier detail is provided. The Engineer shall provide barrier details approved for the project.  
• To access the Channel Assembly, remove the Cover plate from the bridge deck. |
| **Additional Drawings Needed to Complete PS&E** | xs8-090-1 Joint information Table must be filled by the Engineer.  
Joint opening @ 70 °F, min $\alpha_{70}$(in) = $\{(\text{SEE (seismic closing) + (temp. rise)})\}$  
For $\alpha_{70} < 24"$;  min Td=1.5” and for $24" \leq \alpha_{70} \leq 48"$;  min Td=2”  
The thickness of the Cover plate, Tc, is equal to that of the deck plate Td; Td=Tc |
Deck plate length, $L_d$ (in) = \((12\”, \text{channel seat}) + (\text{joint opening @ 70 °F}) + \text{(creep & shrinkage)} + (\text{temp. drop}) + (\text{SEE (seismic) opening}) + 4”\) * \((1/\cos(\text{skew}))\),

Note that the Deck/Cover plates are made of a steel plate and are covered by a polyester concrete overlay.

Length of RMREJ: \((\text{MR (long)}) \times (1/\cos(\text{skew}))\); select a qualified RMREJ from the current list of qualified suppliers (Trelleborg, Watson Bowman Acme).

Support plate length, $L_s$ (in) = \(((\text{creep & shrinkage}) + (\text{temp. drop}) + (\text{SEE (seismic) opening}) + 4”\) * \((1/\cos(\text{skew}))\) + \((L_r, \text{RMREJ})\),

To account for the skew at the joint location, the joint capacity is increased by \((1/\cos(\text{skew}))\).

xs8-090-2 thru 4 and 6 should be adjusted to the joint skew and the geometry of the external modules of the project.

xs8-090-7 shall be edited to project specific geometry.

Xs8-090-9: at joint opening @ 70 °F, min overlap length (in) =\((\text{creep & shrinkage}) + (\text{temp. drop}) + 12”\)

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| Restrictions on Use of Standard Drawings | • The Seismic Joint Type II Full Channel may be used when the Service (non-seismic) Movement Rate (MR) demand is greater than 4 inches.  
• The access to the joint is performed by removing the Cover plate from the bridge deck. |
| Special Considerations | • Seismic joints must be completely assembled at the fabrication plant including painting, application and curing of the polyester concrete overlay.  
• Each joint module is assembled at rest position (70 °F)  
• The installation of the joint shall take place after 1) constructing concrete barriers or bike paths, 2) placing deck overlays and 3) installing utilities  
• Each joint module is assembled at the shop, shipped and installed as one unit. |
| Design Example | Given: skew = 25° at joint location, Temp. 3”/3”, Cr & Sh=2”, SEE=14”/18”, |
### Joint opening @ 70 °F, min α70 (in) = (SEE (seismic) closing + (temp. rise)) =

=14” + 3”=17”

Since a70<24” we select Td=1.5” and Tc=Td=1.5”

Deck plate length, Ld (in) = (12”, channel seat) + (joint opening @ 70 °F) +

(creep & shrinkage) + (temp. drop) + (SEE (seismic) opening) + 4”

(1/cos(skew)) = {12” + 17” + 2” + 3” + 18” +4”} * (1/cos(25°))= 61.8”

MR (long)) = (3” (temp. drop) + 3” (temp. opening) + 2” (creep & shrinkage)) =

8”;

Length of RMREJ: (MR (long)) * (1/cos (skew))= 8” * (1/cos (25°))= 8.827”

From the available supplier lists we select a RMREJ with MR =9”,

length Lr= 35.4” and thickness Tr = 3.75”.

The Deck/Cover plate are made of a 1.5” thick steel plate and are covered by a

(3.75”-1.5”) 2.25” thick polyester concrete overlay.

Support plate length, Ls (in) = [(creep & shrinkage) + (temp. drop) + (SEE

(seismic) opening) + 4”] * (1/cos (skew)) + (Lr, RMREJ)=

= { (2” + 3” + 18” + 4”} * (1/cos (25°)) + 35.4”}= 65.2”
**SEISMIC JOINT (TYPE II, HALF CHANNEL)**

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| **Design/General Notes** | • A minimum Deck Plate thickness $T_d$ equal to to 2 inches is required for joint openings from 2 to 4 feet at 70 °F. For larger openings contact the Joint Seals & Bearings Specialist  
• xs 8-100-8. The construction sequence is included. Any alternative construction sequence shall be reviewed and approved by the Engineer.  
• xs 8-100-9. An optional barrier detail is provided. The Engineer shall provide barrier details approved for the project.  
• Access to the Channel Assembly is provided from the joint opening. |
| **Additional Drawings Needed to Complete PS&E** | xs8-100-1 Joint information Table must be filled by the Engineer.  
Joint opening @ 70 °F, min $a_{70}(in) = \max(24", (\text{SEE (seismic) closing} + (\text{temp. rise}))$  
For $24" \leq a_{70} \leq 48"$ then min $T_d=2"$;  
Deck plate length, $L_d (\text{in}) =((13 5/8", \text{channel seat}) + (\text{joint opening @ 70 °F}) + (\text{creep & shrinkage}) + (\text{temp. drop}) + (\text{SEE (seismic) opening}) + 4") \times (1/\cos(\text{skew}))$,  
Note that the Deck plate is made of a steel plate and is covered by a polyester concrete overlay. |
Length of RMREJ: \((\text{MR (long)}) \times (1/\cos\text{skew})\); select a RMREJ from the current list of qualified suppliers (Trelleborg, Watson Bowman Acme).

Support plate length, \(L_s\) (in) = \([(\text{creep & shrinkage}) + (\text{temp. drop}) + (\text{SEE (seismic) opening}) + 4") \times (1/\cos\text{skew})\] + \((L_r, \text{RMREJ})\).

To account for the skew at the joint location, the joint capacity is increased by \((1/\cos\text{skew})\).

\(xs8-100\)-2 thru 4 and 6 should be adjusted to the joint skew and the geometry of the external modules of the project.

\(xs8-100\)-7 shall be edited to project specific geometry.

\(xs8-100\)-9: at joint opening @ 70 °F, min overlap length (in) = \([(\text{creep & shrinkage}) + (\text{temp. drop}) + 12"]\)

### Contract Specifications

Current Nonstandard Specifications are available from the Division of Engineering Services. If these are unavailable then you may contact the Senior Technical Specialist for Joint Seals & Bearings.

### Restrictions on Use of Standard Drawings

- The Seismic Joint Type II Half Channel may be used when the Service (non-seismic) Movement Rate (MR) demand is greater than 4 inches.
- The minimum joint opening available at 70 °F shall be 24 inches for access to the Channel/Box Assembly from the joint opening.

### Special Considerations

- Seismic joints must be completely assembled at the fabrication plant including painting, application and curing of the polyester concrete overlay.
- Each joint module is assembled at its rest position (70 °F)
- The installation of the joint shall take place after 1) constructing concrete barriers or bike paths, 2) placing deck overlays and 3) installing utilities
- Each joint module is assembled at the shop, shipped and installed as one unit.

### Design Example

Given: skew = 25° at joint location, Temp. 3”/3”, Cr & Sh=2”, SEE=14”/18”.

Joint opening @ 70 °F, min α70 (in) = \(\max(24", (\text{SEE (seismic) closing} + (\text{temp. rise})))\) = \(\max(24", (14" + 3")\) = 24"

Since 24” ≤ α70 < 48” then select \(T_d=2”\)

Deck plate length, \(L_d\) (in) = \([(13 5/8”, \text{channel seat}) + (\text{joint opening @ 70 °F}) + (\text{creep & shrinkage}) + (\text{temp. drop}) + (\text{SEE (seismic opening}) + 4") \times (1/\cos\text{skew}))\] = \(\{13 5/8” + 24” + 2” + 3” + 18" + 4"] \times (1/\cos(25°))\) = 71.3”
| | MR (long)) = (3” (temp. drop) + 3” (temp. opening) + 2” (creep & shrinkage)) = 8”;
| | Length of RMREJ: (MR (long)) * (1/cos (skew))= 8” * (1/cos (25˚))= 8.827”
| | From the available supplier lists we select a RMREJ with MR =9”, Length, Lr= 35.4” and thickness Tr = 3.75”.
| | The Deck plate is made of a 2” thick steel plate and is covered by a (3.75”-2”) 1.75” thick polyester concrete overlay.
| | Support plate length, Ls (in) =\{[(creep & shrinkage) + (temp. drop) + (SEE (seismic) opening) + 4”] * (1/cos(skelw)) + (Lr, RMREJ)\} = \{[(2” + 3” + 18” + 4”) * (1/cos (25˚)) + 35.4”] = 65.2”
|