D.S. BROWN®
A GIBRALTAR INDUSTRIES COMPANY

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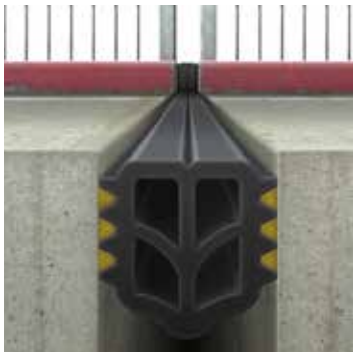
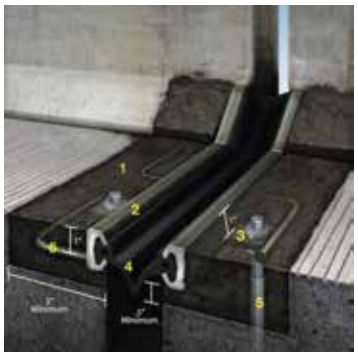
New Construction Expansion Joint Systems

Bridges

REV 03/21





AISC CERTIFIED FABRICATOR

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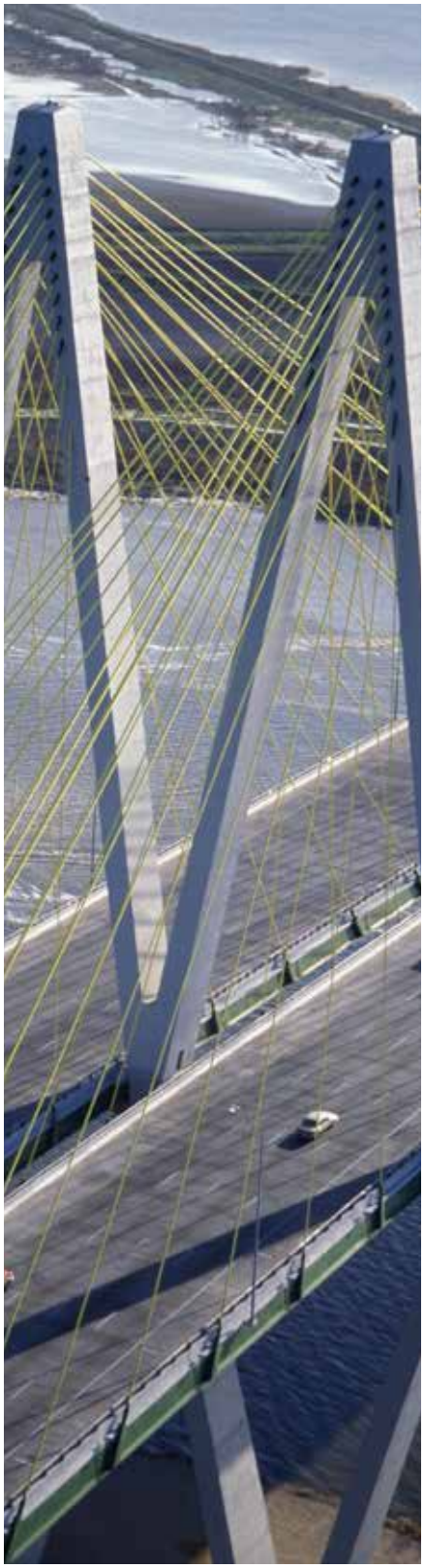
Expansion Joint Systems

Since the early 1960s The D.S. Brown Company has provided expansion joint systems and structural bearing assemblies for bridges around the globe. Bridge expansion joint systems are directly exposed to vehicular wheel loads and, therefore, must resist dynamic forces causing fatigue and wear. In addition, these expansion joint systems must remain watertight to protect the bridge superstructure and substructure from corrosion.

To satisfy the demanding needs of bridge expansion joint systems, D.S. Brown is committed to product research and development, supported by world-renowned, independent testing laboratories. For example, D.S. Brown pioneered processing improvements of its Steelflex® rail profiles from the traditional extrusion method to the innovative hot-rolled/machined and hot-rolled/non-machined technology. Quality is further improved through in-house neoprene sealing element extrusion capabilities. Together, these initiatives have allowed D.S. Brown to improve the watertight integrity of its expansion joint systems while reducing the cost of these assemblies to the owner/agency. Use the design guide below to select and specify the appropriate D.S. Brown bridge product.

Fred Hartman Bridge, TX, USA

Steelflex® Modular Expansion Joint Systems



Design Guide / Table of Contents

Delastic® Preformed Polychloroprene Compression Seals

In 1960 The D.S. Brown Company began designing and extruding the first generation of Delastic® Preformed Polychloroprene Compression Seals. Since that time continuous improvements have been made to this versatile, cost-effective joint sealing solution. To withstand the demanding requirements of bridge/highway installations, all Delastic® Preformed Polychloroprene Compression Seals are extruded from polychloroprene compounds which satisfy the ASTM standard specification D3542 for Preformed Polychloroprene Elastomeric Joint Seals for Bridges.

In addition to highway and bridge applications, Delastic® Preformed Polychloroprene Compression Seals have also been used in spillways, dams, parking structures, stadium ramps and pedestrian overpasses. Information on additional seal designs is available.

Installation

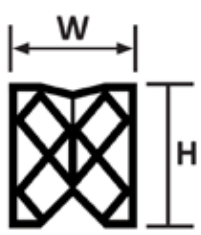
In all installation applications, the joint width must be properly set for the specified Delastic® seal. Also, the vertical faces of the joint must be clean and free of spalled concrete. Desirable installation temperatures range from 35ºF (2ºC) to 80ºF (27ºC). At temperatures below this range the lubricant/adhesive has limited effectiveness, while at temperatures above this range the seals become difficult to compress for installation.

Manual and automatic tools are available to facilitate installation. DSB 1516 or DSB 1520 Lubricant/Adhesive is used primarily to lubricate the seal for installation purposes. These products meet ASTM D2835 and D4070 standards.

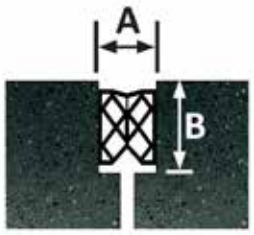
Design Data

The table below can be used to select the appropriate Delastic® Preformed Polychloroprene Compression Seal for your project. In addition to accommodating perpendicular movements (summarized in the table), Delastic® seals are also capable of accepting approximately 15-20% lateral shear, vertical shear and rotational movements.

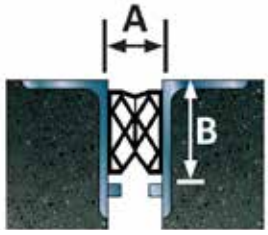
Delastic® Seal Catalog No.	Delastic® Seal Characteristics			Joint Design Criteria		
	Nominal Width (W)	Nominal Height (H)	Maximum Movement	Narrowest Opening[A]	Widest Opening[A]	Minimum Depth[B]
CV-1250	**1.25** (32)	**1.25** (32)	**0.50** (13)	**0.56** (14)	**1.06** (27)	**2.00** (51)
CV-1625	**1.63** (41)	**1.88** (40)	**0.66** (17)	**0.72** (18)	**1.38** (35)	**2.50** (64)
CV-1752	**1.75** (44)	**1.75** (44)	**0.68** (17)	**0.81** (21)	**1.49** (38)	**2.75** (70)
CV-2000	**2.00** (51)	**2.00** (51)	**0.82** (21)	**0.88** (22)	**1.70** (43)	**2.95** (75)
CV-2250	**2.25** (57)	**2.33** (59)	**0.85** (22)	**1.06** (27)	**1.91** (49)	**3.25** (83)
CV-2502	**2.50** (64)	**2.50** (64)	**1.00** (25)	**1.13** (29)	**2.13** (54)	**3.50** (89)
CV-3000	**3.00** (76)	**3.25** (83)	**1.30** (33)	**1.25** (32)	**2.55** (65)	**4.25** (108)
CV-3500	**3.50** (89)	**3.50** (89)	**1.60** (41)	**1.38** (35)	**2.98** (76)	**5.25** (133)
CV-4000	**4.00** (102)	**4.00** (102)	**1.83** (46)	**1.57** (40)	**3.40** (86)	**5.75** (146)
CA-4500	**4.50** (114)	**4.50** (114)	**2.27** (58)	**1.56** (40)	**3.83** (97)	**6.25** (159)
CA-5001	**5.00** (127)	**5.00** (127)	**2.41** (61)	**1.84** (47)	**4.25** (108)	**6.75** (171)
CA-6000	**6.00** (152)	**6.00** (152)	**3.10** (79)	**2.00** (51)	**5.10** (129)	**8.50** (216)



Delastic® Seal



Sawcut Blockout



Armored Joint

Bold numbers represent inches; metric (mm) shown in parentheses.

Joint opening dimensions (A) are based on minimum and maximum pressured allowed in ASTM D3542.

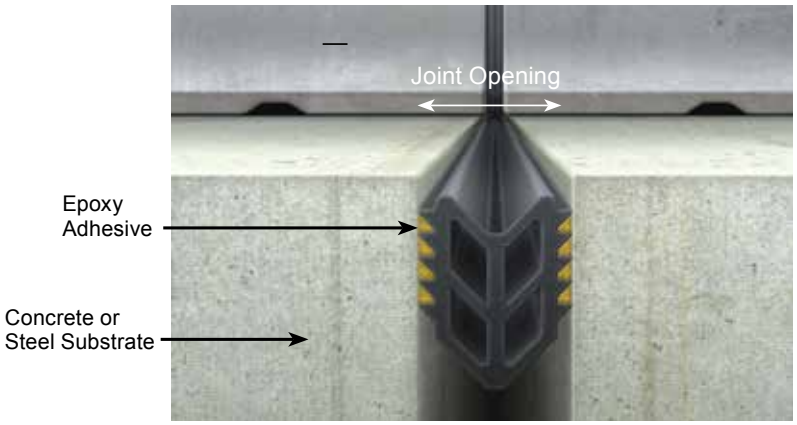
Minimum depth dimensions (B) include a 0.25 inch (6mm) recess below the roadway surface.

Compression seals are not recommended on skewed angles over 15 degrees. Consult with a D.S. Brown Sales Representative on joint options for higher skews.

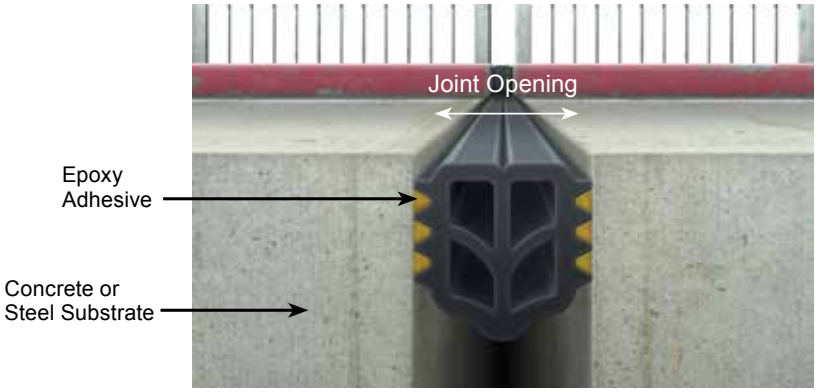
J & JP-Series Sealing Systems

The J & JP-Series Sealing Systems include an extruded elastomeric profile and a high-strength, two-part epoxy-based structural adhesive. When bonded in the expansion joint, the product will seal the opening from the intrusion of water and debris. This unique design allows the seal to function under compression and in tension, allowing for a larger range of movement than alternate joint systems.

The J-Series is specifically designed for applications requiring +/-50% movement to accommodate thermal change and 25% longitudinal movement in skewed conditions. The JP-Series is designed for applications that are required to meet ADA guidelines and provide a smooth walking surface for pedestrians. In addition to Bridge and Highway applications, the J & JP-Series can also be used for architectural and parking garage projects.



J-Series Profile



J-Series Profile

Product Size and Movement

Product Name	Seal Width in (mm)	Min. Width in (mm) -50%	Mid-Range @70°F in (mm)	Max. Width in (mm) +50%	Total Movement in (mm)	Min. Blockout Depth in (mm)
J-100	**1.00** (25)	**0.50** (13)	**1.00** (25)	**1.50** (38)	**1.00** (25)	**2.00** (51)
J-150	**1.50** (38)	**0.75** (19)	**1.50** (38)	**2.38** (60)	**1.63** (41)	**2.63** (67)
J-200	**2.00** (51)	**1.00** (25)	**2.00** (51)	**3.00** (76)	**2.00** (51)	**3.25** (83)
J-250	**2.50** (64)	**1.25** (32)	**2.50** (64)	**3.88** (98)	**2.63** (67)	**3.75** (95)
J-300	**3.00** (76)	**1.50** (38)	**3.00** (76)	**4.50** (114)	**3.00** (76)	**4.75** (121)
J-350	**3.50** (89)	**1.75** (44)	**3.38** (86)	**5.00** (127)	**3.25** (83)	**5.38** (137)
J-400	**4.00** (102)	**2.00** (51)	**3.88** (99)	**5.88** (149)	**3.88** (98)	**6.00** (152)
J-500	**5.00** (127)	**2.50** (64)	**4.75** (121)	**7.26** (184)	**4.76** (121)	**7.50** (191)

Product Name	Seal Width in (mm)	Min. Width in (mm) -35%	Mid-Range @70°F in (mm)	Max. Width in (mm) +35%	Total Movement in (mm)	Min. Blockout Depth in (mm)
JP-100	**1.00** (25)	**0.65** (17)	**1.00** (25)	**1.35** (34)	**0.70** (18)	**1.88** (48)
JP-150	**1.50** (38)	**0.98** (25)	**1.50** (38)	**2.02** (51)	**1.04** (26)	**2.75** (70)
JP-200	**2.00** (51)	**1.30** (33)	**2.00** (51)	**2.70** (69)	**1.40** (36)	**3.25** (83)
JP-250	**2.50** (64)	**1.63** (41)	**2.50** (64)	**3.38** (86)	**1.75** (45)	**4.00** (102)
JP-300	**3.00** (76)	**1.95** (50)	**3.00** (76)	**4.02** (102)	**2.07** (53)	**5.00**(127)
JP-350	**3.50** (89)	**2.30** (58)	**3.50** (89)	**4.75** (121)	**2.45** (62)	**5.50** (140)
JP-400	**4.00** (102)	**2.60** (66)	**4.00** (102)	**5.40** (137)	**2.80** (71)	**5.88** (149)
JP-500	**5.00** (127)	**3.25** (64)	**5.00** (127)	**6.75** (172)	**3.50** (89)	**7.75** (197)

First numbers represent inches; metric (mm) shown in parentheses.

J & JP-Series Sealing Systems
Continued

Features and Benefits

- **Ease of Installation** – J & JP-Series Seals have specially designed internal webbing to facilitate installation and do not require the use of a vacuum to collapse or inflate the seal for purpose of installation.
- **Concrete and Steel Adhesive** is VOC Compliant – The adhesive has a zero VOC rating. The material resists humidity, salt spray and extreme temperature ranges.
- **Fatigue Tested for One Million Cycles –** The profiles were cyclically opened and closed in tension and compression for one million cycles. The seals were stretched to 200% of their original width with no bond failure.
- **No Blockout Recess Required** – The J & JP-Series Seals are a solid choice with the precast concrete industry in that no blockout recess is required. The seal profile can be installed directly between the joint interfaces.

Physical Properties

The seal profile is available in two specific designs. The profiles are extruded from high-quality polychloroprene (neoprene) material meeting ASTM D3542 with physical requirements as shown in Table 1.

The adhesive is a high-strength, two-part modified epoxy-based material. It is 100% reactive and will develop a strong bond in approximately 24 hours at room temperature. For typical physical properties, see Table 2 below.

Table 1

Physical Properties of the Neoprene Seal	ASTM Test Method	Requirement
Tensile strength, min.	D412	2000 psi
Elongation at break, min.	D412	250%
Hardness, Type A durometer	D2240	60±-5
Oven aging, 70h @ 212°F	D573	
Tensile strength, max.		20% loss
Elongation, max.		20% loss
Hardness, Type A duro.		0 to +10 pts
Oil swell, ASTM Oil No. 3, 70h @ 212°F		
Weight change, max.	D471	45%
Ozone resistance, 20% strain	D1149	
70H aging, D573, 3ppm in air		No cracks

Table 2

Physical Properties of the High-Strength Adhesive
ASTM C-881, AASHTO M-235 Types I, II, IV, V Grade 3, Classes B & C
Gel Time 60 gm mass 35 minutes at 75°F (24°C)
Compressive Strength ASTM D-695:10270 psi (70.8 MPa) at 7 days
Concrete Bond Strength ASTM C-882: 2660 psi (18.34 MPa) at 2 days
4650 psi (32.06 MPa) at 14 days
Modulus of Elasticity 287,250 psi (1980.6 MPa)
Water Absorption ASTM D-570 0.10%
Mixed Color - gray

Delivery

The J & JP-Series Seals are delivered to the jobsite in continuous lengths.

Limitations

The J & JP-Series Seals waterproofing capabilities are dependent on the internal forces generated while the seal is under compression. For this reason, it is very important that the proper seal size be selected from the Product Size and Movement Table found in this brochure, and that manufacturer installation guidelines are followed.

Steelflex® Strip Seal Expansion Joint Systems

For decades, cast-in-place Steelflex® Strip Seal Expansion Joint Systems have provided superior watertight performance and longevity over bolt-down, segmental bonded and pourable expansion joint systems. Steelflex® Strip Seal Expansion Joint Systems have become the overwhelming choice of owners and specifying engineers around the world for accommodating up to 4 inches (102mm) of total structural movement in the direction of travel per AASHTO guidelines. A variety of glands are available for applications with wider movement ranges, debris reducing, seismic and other extreme events. Consult D.S. Brown for design considerations.

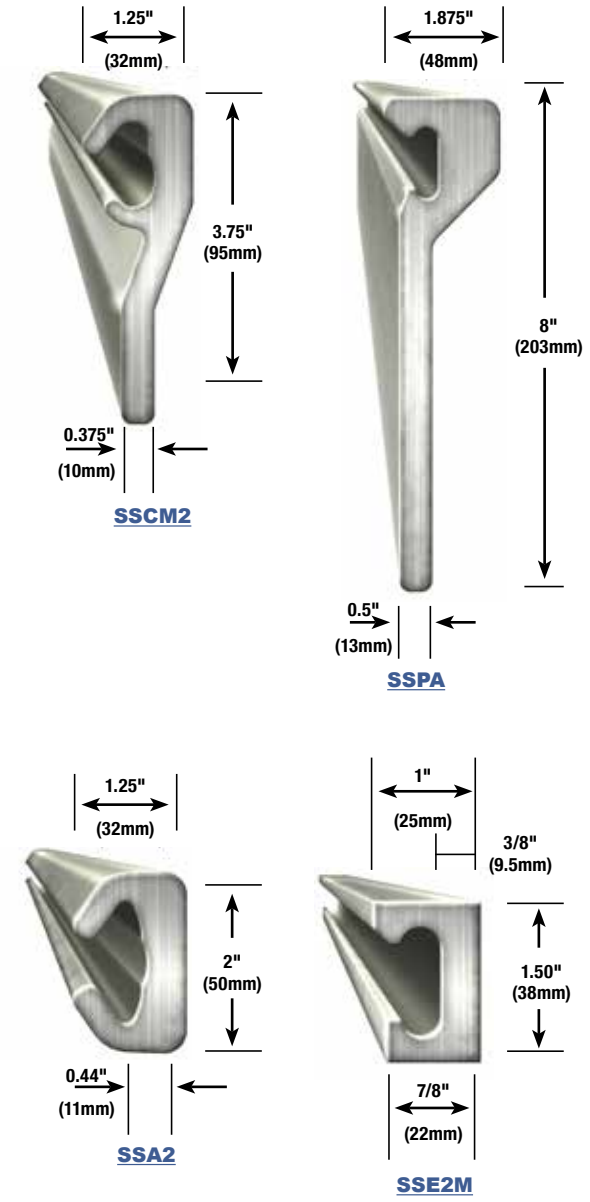
System Components

Cast-in-place Steelflex® Strip Seal Expansion Joint Systems consist of two proprietary components: steel rail profiles and a matching polychloroprene sealing element.

Steel Rail Profile

Steelflex® rail profiles are one-piece construction, manufactured using innovative hot rolled/non-machined and hot rolled/machined technology. SSA2, SSCM2, and SSPA steel rails are available in ASTM A36 or ASTM A588 steel grades. SSE2M rail profile is only available in ASTM A36 grade.

Steelflex® SSPA Strip Seal Expansion Joint System



Recent design improvements have eliminated all horizontal “legs” on the steel rail profiles to facilitate proper concrete placement during installation. Independent field and laboratory testing has demonstrated that improperly consolidated concrete around the steel rail, anchorage, and/or reinforcement could lead to performance issues. Anchorage of the steel rail profile into the deck concrete is the primary load carrying mechanism and, therefore, is critical to ensure long-term performance. Research has confirmed that properly sized and spaced shot-on studs provide an economical, field-proven anchorage method.

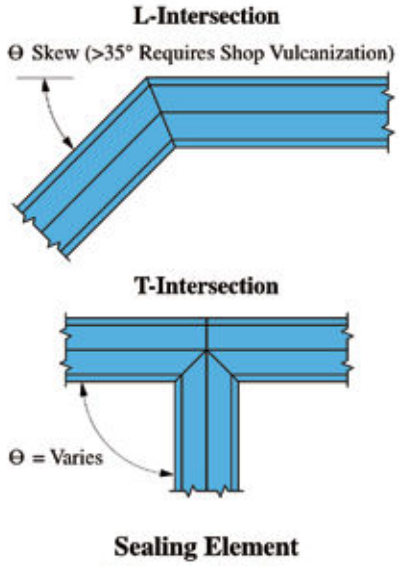
Because it is field-proven, the Steelflex® SSCM2 rail profile has become widely accepted worldwide as an economical standard in the industry. Other steel profiles (SSCM and SSA) are also available to satisfy your specific project need.

Steelflex® Strip Seal Expansion Joint Systems

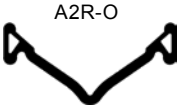
Continued

Polychloroprene Sealing Elements

Selection of a polychloroprene strip seal sealing element is based on the maximum movement either perpendicular (MR_L) or parallel (MR_T) to the Steelflex® Strip Seal Joint Assembly. To assist in your selection, the following table provides movement ranges for each sealing element type and the corresponding proprietary steel rail profile. Information is also provided on the range of joint opening dimensions. The preferred joint opening dimensions for sealing element installation is approximately 2.0 inches (51mm). However, the preferred joint opening dimension for A2R-O and L2R-O seals is approximately 3.0 inches (76mm). Polychloroprene strip seal sealing elements are installed in a continuous piece, without vulcanization, up to a 35 degree angle. All D.S. Brown polychloroprene sealing elements are in-house designed and tested to provide a watertight seal at the connection to the Steelflex® rail profile. Factory molded polychloroprene sealing element splices can also be produced to accommodate your specific project needs.



Sealing Element
Vulcanized Splices

Sealing Element Cross-Section	Sealing Element	Movement Range MR_L	Movement Range MR_T	Joint Opening	Corresponding Steelflex Rail
 A2R	A2R-400	**4.0** (102)	**±2.0** (51)	**0.5 - 4.5** (13) (114)	SSCM2 SSA2
	A2R-XTRA	**5.0** (127)	**±2.0** (51)	**0.5 - 7.5** (13) (191)	
 A2R-O	A2R-0	**4.0** (102)	**±0.5** (13)	**1.0 - 5.0** (25) (127)	
 E2M-Seal	E2M-Seal	**4.0** (102)	**±2.0** (51)	**05 - 4.5** (13) (114)	SSE2M
 L2	L2-400	**4.0** (102)	**±2.0** (51)	**0 - 4.0** (0) (102)	SSA SSPA SSCM
 L2-O	L2-500	**5.0** (127)	**±2.0** (51)	**0 - 5.0** (0) (127)	
	L2-0	**4.0** (102)	**±0.5** (13)	**1.0 - 5.0** (25) (127)	

Bold numbers represent inches; metric (mm) in parentheses.
Cold weather natural strip seal glands are available upon request.
D.S. Brown manufactures strip seal glands capable of opening up to 7"; for safety reasons, AASHTO stipulates 4" as the maximum gap in the direction of travel.

Steelflex® Strip Seal Expansion Joint Systems

Continued

Design Considerations

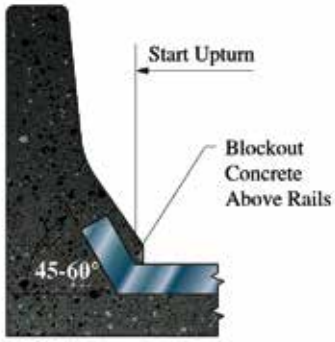
Anchorage: Anchorage type, size and spacing for the Steelflex® SSCM2 joint system is illustrated. Anchorage details for other Steelflex® rail profiles are available upon request.

Upturn Details: A watertight joint system is maintained through a simple upturn detail into the concrete barrier. The upturn angle varies depending on the barrier detail, joint skew and Steelflex® rail profile.

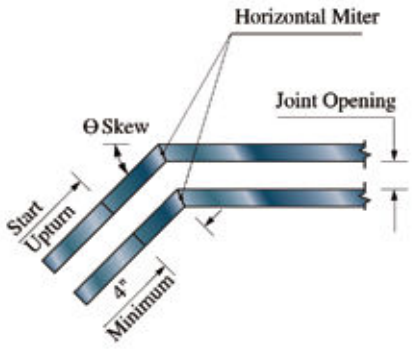
Horizontal Miter Details: Highly skewed structures often require fabrication of a horizontal break in the joint system to orient the steel rail 90 degrees to the face of the concrete barrier.

Leonard P. Zakim Bridge, Boston, MA, USA

Anchorage Illustration



Typical Upturn Detail



Typical Horizontal Miter Detail

Delcrete® Strip Seal Expansion Joint Systems

Since its introduction in 1983, the Delcrete® Elastomeric Concrete/Steelflex® Strip Seal Expansion Joint System has been utilized on hundreds of bridges worldwide as an alternative to more labor intensive, cast-in-place expansion joint rehabilitation solutions. This expansion joint system also offers superior long-term performance when compared to various pourable joint solutions. Components to this system include: low profile SSA2 or SSE2M Steelflex® rail profiles and Delcrete® Elastomeric Concrete. Delcrete® Elastomeric Concrete is a pour-in-place, free-flowing, two-part polyurethane-based elastomeric concrete. Delcrete® has been compounded to bond to a variety of surfaces including steel and concrete.

Following are the design features of the industry's premier elastomeric concrete:

- Polyurethane chemistry
- Non-brittle over extreme temperature ranges
- Resistant to nearly all chemicals
- Two hour cure time
- Permanent, long-term repair solution

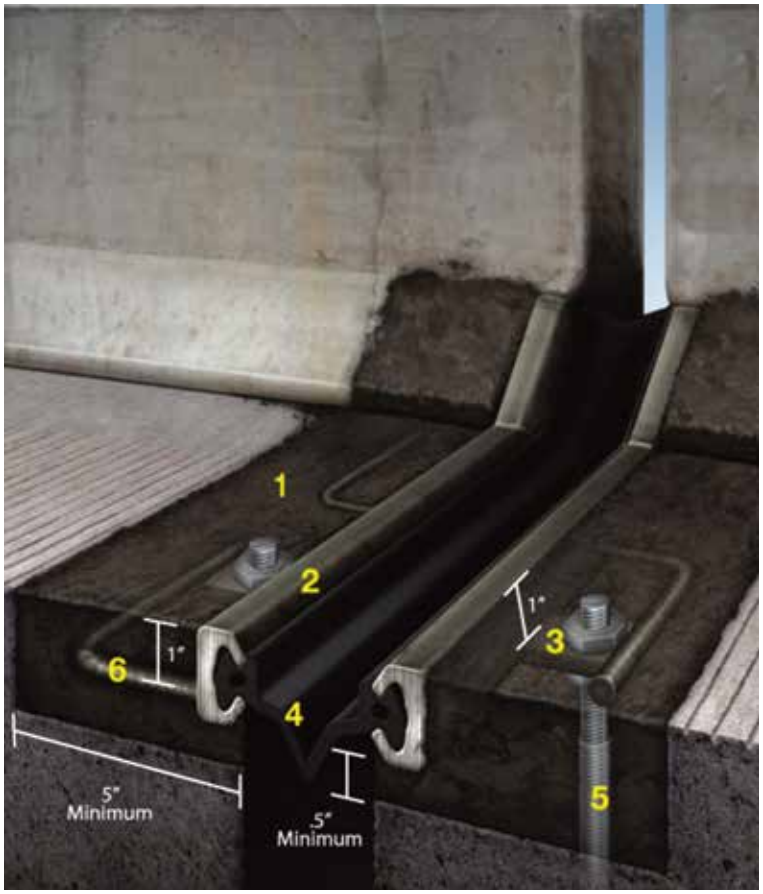
Although initially developed for the bridge rehabilitation market, the outstanding performance record of Delcrete® has resulted in bridge owners specifying Delcrete® Strip Seal Expansion Joint Systems for new bridge construction projects as well.

Installation

Proper installation of Delcrete® is essential to ensure long-term performance. Therefore, a D.S. Brown technical representative or a representative of its licensed applicator shall be present on the job site during all phases of the installation. Basic installation considerations include:

- Minimum ambient and concrete substrate temperature: 45ºF (7ºC)
- Sandblast entire blockout, including steel rail profile, followed by a compressed air sweep
- Blockout area must be completely dry before installation

A comprehensive list of installation procedures is found in The D.S. Brown Delcrete® Strip Seal Expansion Joint System Installation Datasheet, located on our website: www.dsbrown.com.



Delcrete® Strip Seal Expansion Joint

System Details

1. Delcrete® Elastomeric Concrete
2. Steelflex® SSE2M or SSA2 Rail Profiles
3. 0.25" x 2" Leveling Tab
4. Polychloroprene Sealing Element
5. 0.5" Expansion Anchor with Threaded Rod and Hex Jam Nuts "Leveling Method"
6. 0.5" Diameter x 9" Stud Anchor at 9" Spacing (Bent 90º at 3") "Anchor Method"

Steelflex® Modular Expansion Joint Systems

Typical Applications

D.S. Brown Steelflex® Modular Expansion Joint Systems have gained overwhelming worldwide acceptance for accommodating and sealing large joint movements on bridge structures. By incorporating the results of research activities, each joint system is designed to provide watertight, fatigue-resistant, long-term maintenance-free performance.

Steelflex® Modular Expansion Joint Systems

Continued

System Components

Steelflex® Modular Expansion Joint Systems are highly engineered assemblies which consist of Steelflex® centerbeams and edge beams. The centerbeams and edge beams not only carry the dynamic wheel loads but also accept the series of strip seal style sealing elements that create a watertight joint. All Steelflex® Modular Expansion Joint Systems are designed to accommodate up to 80mm of movement per neoprene sealing element and, thus, the joint designation is presented in multiples of 80mm (i.e. D-160, D-240, etc.). Each Steelflex® centerbeam is rigidly supported by its own support bar using a full-penetration welded connection. Support bars span the joint opening and are arranged below the centerbeams in a direction parallel to the structural movement. Stainless steel slide plates are attached to each end of the support bars (both top and bottom surfaces) to provide a low coefficient-of-friction surface. Movements up to ±0.79 inches (20mm) transverse to the support bars (for D-320 joint assemblies and larger) can be accommodated by a Steelflex® Modular Expansion Joint System. For large longitudinal movements and transverse movements beyond the allowable limits, the Maurer System™ Swivel Expansion Joint Assembly by The D.S. Brown Company should be considered (see page 14). Elastomeric springs and bearings containing a PTFE sliding surface are utilized to accommodate all longitudinal, transverse, and rotational movements. The precompressed springs and slide bearings are located directly above and below the support bar, respectively. The precompressed spring is designed to have a specific compression force on the support bar which, in turn, produces a downward force on the slide bearing. This arrangement allows the spring and bearing to work together and resist uplift of the support bar as vehicular loads travel across the assembly. Closed-cell polyurethane control springs are installed in all Steelflex®

Steelflex® Modular Expansion Joint System

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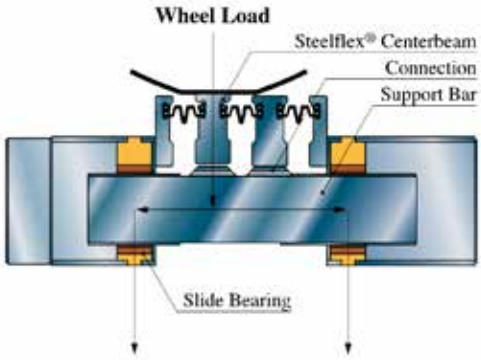
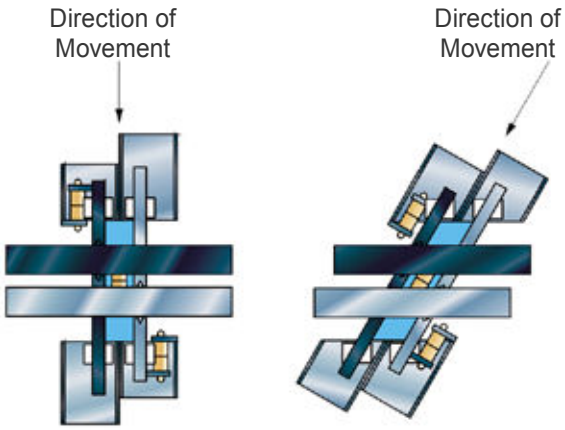
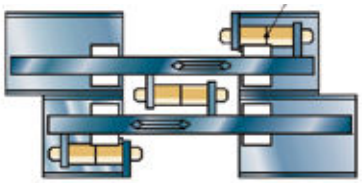


Wheel Load Transfer

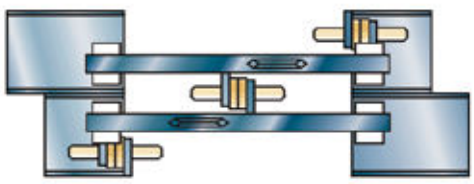


Support Bar Principles

Minimum Opening



Maximum Opening



Equidistant Control

Steelflex® Modular Expansion Joint Systems

Continued

Modular Expansion Joint systems to provide equidistant spacing between centerbeams throughout the joint system's complete movement range. The control spring orientation is such that the maximum compressive force is generated on the centerbeams when the modular expansion joint assembly is at its maximum opening.

Fatigue Resistance

Modular expansion joint assemblies are subjected to millions of high dynamic stress cycles due to passing vehicle loads. Recognizing the significance of these dynamic loads on the long-term performance of expansion joint systems, D.S. Brown became the first North American company to introduce fatigue-resistant design principles to modular expansion joint assemblies. It is strongly recommended that a specification which includes fatigue design provisions be included in the contract documents. The results of extensive field and laboratory research have been utilized to achieve a fatigue-resistant expansion joint system. All primary members have been fatigue tested to determine the fatigue design category of each component (i.e. Steelflex® centerbeam, centerbeam/support connection and support bar). Using these test results, a fatigue-resistant joint assembly can be detailed to satisfy the contract specifications and ensure the owner of a minimal maintenance expansion joint system solution.

Watertight Integrity

In the past, unsealed fabricated steel joint systems have been specified on structures with large movements. Unfortunately, these older joint system solutions have not been effective in preventing water and debris from passing through the deck joint to the underlying superstructure. This accumulation of water and debris corrodes steel components, deteriorates concrete and results in unnecessary rehabilitation costs. Even when these unsealed, fabricated joint systems utilize a trough to collect drainage, in most cases problems develop as they become filled with debris.

Steelflex® Modular Expansion Joint Systems solve these problems with their excellent watertight design characteristics. Each system not only bridges the joint gap but also protects the structure from premature corrosion. Design of the strip seal sealing element is based on compression of the polychloroprene seal lug into the gland recess of the centerbeam and edge beam. This mechanically locked polychloroprene seal not only provides excellent watertight characteristics but also achieves high pullout resistance. The strip seal sealing element has superior performance characteristics over the box seal design, including improved watertight capabilities, pullout strength and replaceability.

Fatigue Testing, Lehigh University, ATLSS Laboratory, Bethlehem, PA, USA

Installation Considerations

As in all other expansion joint system solutions, a proper installation is required to ensure long-term, maintenance-free performance of modular expansion joint systems. Special attention is directed to installation considerations such as:

- Joint lifting and handling
- Setting proper joint opening
- Field splices (when necessary)
- Blockout reinforcement
- Setting to line and grade
- Concrete consolidation

Guidelines on recommended installation practices can be found in The D.S. Brown Modular Expansion Joint Assembly Installation Datasheet, available at www.dsbrown.com. It is also suggested that the contractor/owner utilize the services of a trained D.S. Brown technical representative to review proper installation techniques and be on-site during the initial installation of a Steelflex® Modular Expansion Joint System.

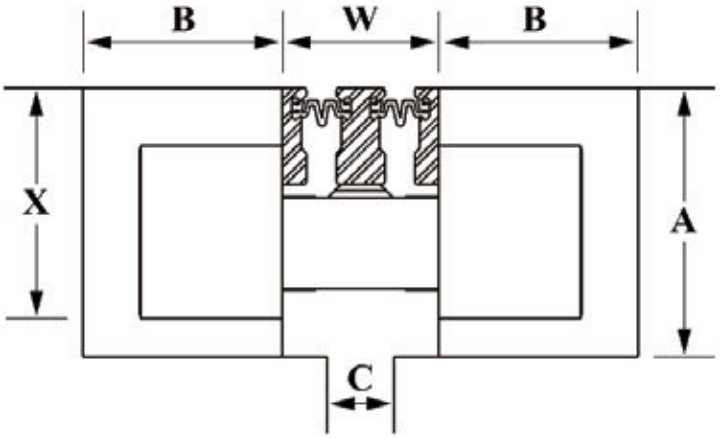
Confederation Bridge, Prince Edward Island, Canada

Steelflex® Modular Expansion Joint Systems

Continued

Joint Selection & Design Data

Selection of the proper Steelflex® Modular Expansion Joint System is based primarily on the anticipated structural movement at the joint location. For joint assemblies oriented perpendicular to the structural movement, simply select the Steelflex® Modular Expansion Joint System with a total movement range larger than the anticipated structural movement. Joint assemblies installed on curved or skewed structures require the calculation of structural movements parallel and perpendicular to the joint assembly. The largest of these two movements should be used to select the appropriate Steelflex® Modular Expansion Joint System. The table below provides expansion joint assembly and blockout dimensions for a wide range of Steelflex® Modular Expansion Joint Sizes.



Joint Device Symbol	Model Number	Total Movement	Cells	"A" Blockout Depth	"B" Blockout Width	"C" @ Mid Temp	"W" @ Mid Temp	"X"
	D-160	6.30 (160)	2	14 (356)	14 (356)	3.35-8.17 (85)-(208)	8.17 (208)	12.2 (310)
	D-240	9.45 (240)	3	14 (356)	17 (432)	4.92-12.24 (125)-(311)	12.24 (311)	12.2 (310)
	D-320	12.60 (320)	4	14 (356)	20 (508)	6.50-16.32 (165)-(415)	16.32 (415)	12.2 (310)
	D-400	15.75 (400)	5	14 (356)	23 (584)	8.07-20.39 (205)-(519)	20.39 (519)	12.2 (310)
	D-480	18.90 (480)	6	14 (356)	27 (686)	9.65-24.47 (245)-(622)	24.47 (622)	12.2 (310)
	D-560	22.05 (560)	7	14 (356)	30 (762)	11.22-28.54 (285)-(725)	28.54 (725)	12.2 (310)
	D-640	25.20 (640)	8	14.5 (368)	33 (838)	12.80-32.62 (325)-(829)	32.62 (829)	12.5 (318)
	D-720	28.35 (720)	9	15 (381)	37 (940)	14.37-36.69 (365)-(932)	36.69 (932)	12.9 (328)

Dimensions are based on design provisions in NCHRP Report 402
Dimensions are based on 0 degree skew
Bold numbers represent inches; metric (mm) shown in parentheses
Shallower depths (X) may be possible upon special request

Maurer System™ Swivel Expansion Joint Assembly by The D.S. Brown Company

Conventional large movement expansion joint devices, such as D.S. Brown's Steelflex® Modular Expansion Joint System, are limited to primarily longitudinal movements and/or less than ±0.79 inches (20mm) transverse displacement. For joint locations which produce more demanding structural movements, the Maurer System™ Swivel Expansion Joint Assembly by The D.S. Brown Company is provided in the U.S.A. through an exclusive license agreement with Maurer Söhne, Munich, Germany. Typical applications include:

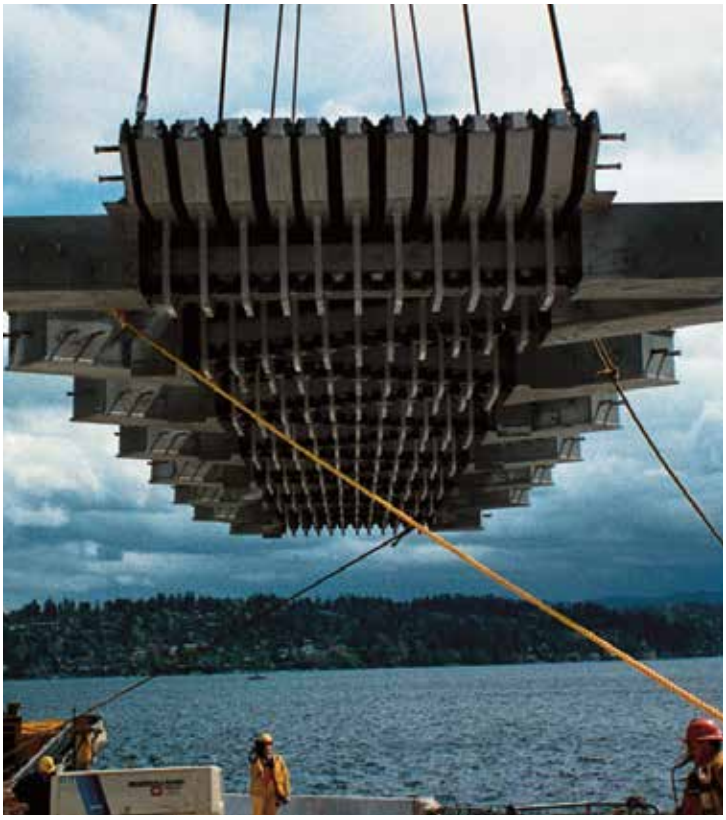
- Long-span structures
- Structures located in seismic zones
- Curved structures
- Structures with differential longitudinal movements or differential vertical movements
- Structures with anticipated substructure settlement

Performance Features

By utilizing a common-to-all centerbeam swiveling support bar, the Maurer System™ Swivel Expansion Joint Assembly is able to accommodate large longitudinal displacements (X), extensive transverse displacements (Y), and vertical displacements (Z), as well as vertical rotations (Φ_x, Φ_y) of up to 10 degrees. The centerbeams are free to slide on swiveling support bars, which provide equidistant control for centerbeams without the limitations of typical mechanical control devices. To ensure long-term performance, all Maurer System™ Swivel Expansion Joint Assemblies are designed and fabricated using fatigue-resistant connection details. For assistance with selecting the appropriate size patented Maurer System™ Swivel Expansion Joint Assembly by The D.S. Brown Company, please contact D.S. Brown.

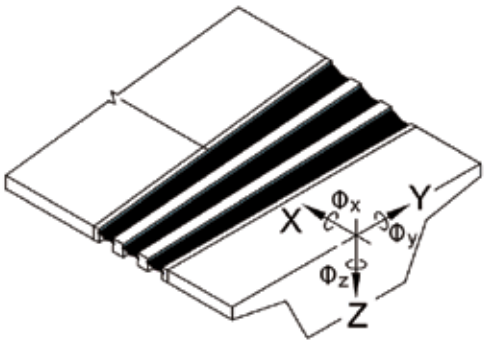
Seismic Movement Capability

Dynamic tests conducted at the University of California at Berkeley subjected the Maurer System™ Swivel Expansion Joint Assembly to high-velocity seismic displacements. This first-of-its-kind test program included velocities of more than 40 inches per second (1015mm/sec) in both longitudinal and transverse directions. The successful test results proved the unique capabilities of this patented device in seismic applications.



Lacey V. Murrow Floating Bridge,Seattle, WA, USA

Dynamic Testing, University of California, Berkeley, CA, USA



Multi-Directional Movement Capabilities

Maurer System™ Swivel Expansion Joint Systems

Continued

New Tacoma Narrows Bridge
Tacoma, Washington, USA

Owner: Washington State Department of Transportation
Product Provided: Maurer Systems™ Swivel Expansion Joint Assemblies by The D.S. Brown Company
Quantity: 143 LF
Joint Size(s): DS-1520
Longest Span: 2,800 FT
Total Span Length: 5,979 FT

San Francisco Oakland Bay Bridge
San Francisco, California, USA

Owner: California Department of Transportation
Product Provided: Maurer Systems™ Swivel Expansion Joint Assemblies by The D.S. Brown Company
Quantity: 1042 LF
Joint Size(s):
DS-560 (MR=775mm)
DS-800 (MR=1220mm)
DS-960 (MR=1275mm)
DS-1040 (MR=1125mm)

Homer M. Hadley Memorial Floating Bridge (I-90)
Seattle, Washington, USA

Owner: Washington State Department of Transportation
Product Provided: Maurer Systems™ Swivel Expansion Joint Assemblies by The D.S. Brown Company
Quantity: 215 LF
Joint Size(s): DS-1200
Longest Span:
Total Span Length: 5,811 FT

Steel Fabricated Solutions

Fabricated steel plate expansion joint systems, such as finger joint assemblies and sliding plate and armor joint systems, are still specified on many bridge projects due to proven long-term structural performance. These joint systems are also convenient to install on bridge rehabilitation projects requiring a shallow joint depth and/or staged construction.

Finger Joint Assembly

Fulton County Bridge
OH, USA

Steelflex® Modular
Expansion Joint Systems

D.S. Brown Signature Projects

The following list highlights some signature projects by The D.S. Brown Company.

San Francisco Oakland Bay Bridge San Francisco, CA

Homer M. Hadley Memorial Floating Bridge (I-90) Seattle, WA

New Tacoma Narrows Bridge Tacoma, WA

Confederation Bridge Prince Edward Island, Canada

Blennerhassett Bridge Parkersburg, WV

Fred Hartman Bridge Houston, TX

I-35W Street Anthony Falls Bridge Minneapolis, MN

Veterans' Glass City Skyway Bridge Toledo, OH

Leonard P. Zakim Bridge Boston, MA

Lacey V. Murrow Bridge Seattle, WA

Dulles Corridor Metro Rail Project Virginia

Carquinez Strait Bridge San Francisco, CA

High Five Interchange Dallas, TX

Corredor Sur Bridge, Panama

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