Steelflex® Modular Expansion Joint Systems

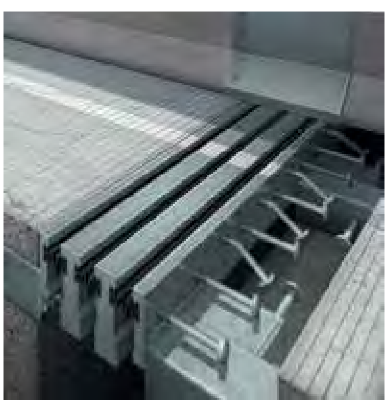
Typical Applications

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

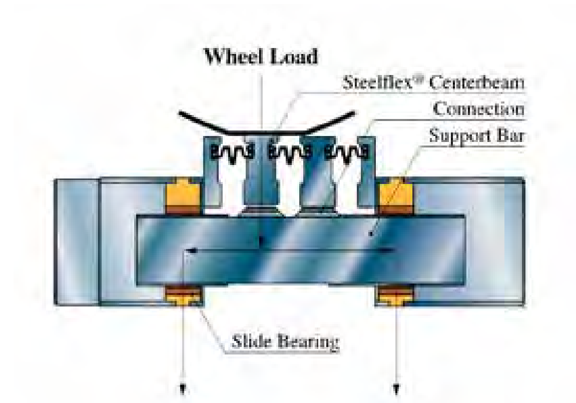
System Components

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®

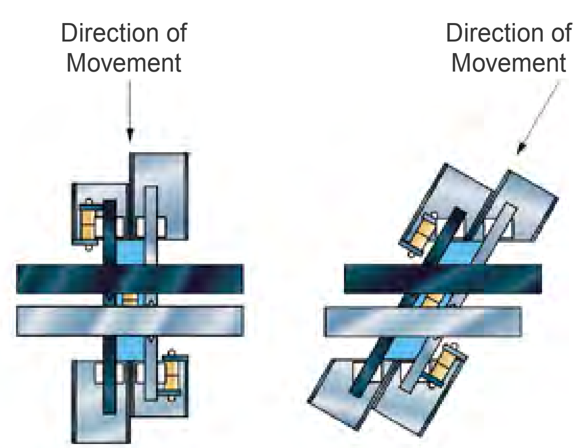


Steelflex® Modular Expansion Joint System

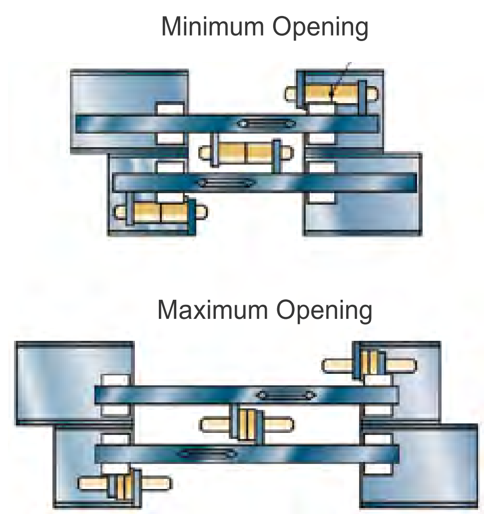
(cont on next page)



Wheel Load Transfer



Support Bar Principles



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.

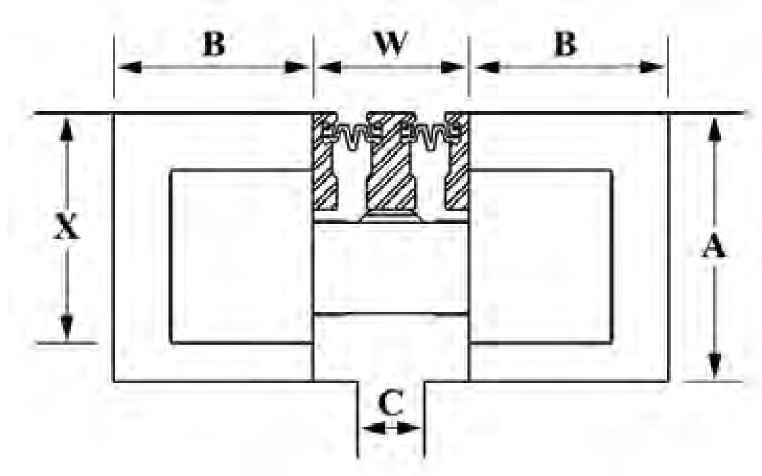
Confederation Bridge, Prince Edward Island, Canada

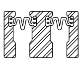
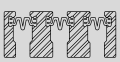
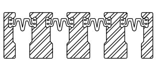
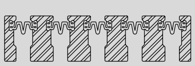
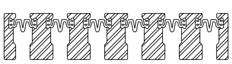
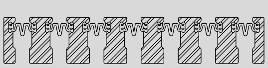
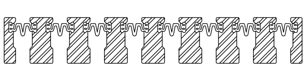
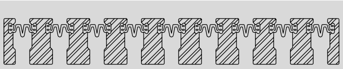
Steelflex® Modular Expansion Joint Systems

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