



Expansion Joint Systems

Steelflex® Modular Expansion Joint Systems

SECTION I – General Requirements

1.01 Description

- A. This item of work shall consist of furnishing materials, services, labor, tools, equipment and incidentals necessary to design, fabricate, inspect, test and install the expansion joint system as specified.
- B. The expansion joint assembly consists of a modular, multiple seal joint system that will allow movements as shown and noted in the plans. The configuration of the expansion joint system shall consist of preformed neoprene strip seals mechanically held in place by steel edge and separation beams. Each separation beam shall be supported by an independent support bar which is welded to the separation beam. The support bars shall be suspended over the joint opening by sliding elastomeric bearings. An equidistant control system shall be incorporated which develops its maximum compressive force when the joint is at its maximum opening. The expansion joint system shall not incorporate any bolted connections between the separator beams and support bars.
- C. The expansion joint system shall be continuous across the full width of the roadway and continue into the traffic barriers as shown in the plans.

1.02 Acceptable Manufacturers

- A. Only manufacturers who have successfully completed the fatigue testing requirements described in Section 3.01 will be permitted to design and supply bridge modular expansion joint assemblies under this Special Provision. The following manufacturer has completed fatigue testing in accordance with the requirements of this Special Provision:
 - 1. The D.S. Brown Company
300 East Cherry Street
North Baltimore, Ohio 45872
Phone: (419) 257-3561 Fax: (419) 257-2200

- B. It is the contractor's responsibility to ensure that any other manufacturer being considered to provide the joint assembly has completed fatigue testing in accordance with the requirements of Section 3.01. The contractor is cautioned against selecting a modular expansion joint assembly manufacturer based solely on the lowest price. The contractor shall carefully review the expansion joint manufacturer's experience in designing, fabricating and installing modular expansion joint systems.
- C. Expansion joints shall be fabricated at facilities owned and operated by the manufacturer; the manufacturer being the single entity that designs, fabricates and installs (or supervises the installation of) the joint assemblies.

1.03 Submittals

- A. The manufacturer shall have a minimum of three years experience in designing and fabricating modular bridge expansion joint systems. The contractor shall provide written certification of the manufacturer's experience.

The shop plans and calculations shall be prepared, reviewed and approved by a registered professional engineer and shall carry his/her signature and seal. The registered professional engineer shall be a full-time employee of the manufacturer.
- B. Shop plans
 - 1. The contractor shall submit details of the expansion joint system to be used together with installation and waterproofing plans to the engineer for approval prior to fabrication of the joint assembly. These drawings shall include but not be limited to the following:
 - a. Plans, elevation and section of the joint system for each movement rating and roadway width showing dimensions and tolerances
 - b. All ASTM, AASHTO or other material designations
 - c. Method of installation including but not limited to sequence, setting relative to temperature, anchorage during setting and installation at curbs
 - d. Corrosion protection system
 - e. Details of temporary supports for shipping and handling

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- f. Design calculations shall include a fatigue design and a strength design (when appropriate) for all structural elements, connections and splices. All welded centerbeam splices shall be shown on the shop plans.
- g. Welding procedures shall be in accordance with AASHTO/AWS D1.5-95 Bridge Welding Code.

C. Certificates of Compliance

- 1. At the time of shop plan submittal, the contractor shall submit to the engineer the following certifications for review and approval:
 - a. Manufacturer's AISC Certification in accordance with the Standard for Bridge and Highway Metal component Manufacturers (CPT)
 - b. Certification that welding inspection personnel are qualified and certified as welding inspectors under AWS QC1, Standard for Qualification and Certification of Welding Inspectors

1.04 Shipping and Handling

- A. To avoid field splices in the modular expansion joint system, assemblies shall be designed, fabricated and delivered to the job site as a continuous unit whenever possible. The maximum length of completed expansion joint assemblies will be determined by practical shipping limitations. At the site, the expansion joint system shall be stored in accordance with the manufacturer's written recommendations and as approved by the engineer.
- B. Lifting locations and lifting mechanisms shall be shown in the shop plans.
- C. Damage to the joint system during shipping or handling will be cause for rejection of the joint system.
- D. Damage to the corrosion protection system shall be repaired to the satisfaction of the engineer.
- E. No seals shall be cut except as recommended by the manufacturer and approved by the engineer.

SECTION II – Material Specifications

2.01 Structural Steel

- A. Structural steel shall conform to the requirements of AASHTO M183, AASHTO M223 Grade 50 or AASHTO M222. Aluminum components shall not be used.

2.02 Stainless Steel

- A. Stainless steel shall conform to ASTM A240, Type 304, with 2B finish.

2.03 Polytetrafluorethylene (PTFE)

- A. PTFE shall be 100% virgin Teflon, woven PTFE fabric or dimpled PTFE conforming to the requirements of Section 18.4.3, Division II - Construction, AASHTO Standard Specifications for Highway Bridges, 16th Edition.

2.04 Expansion Joint Seals

The maximum movement range of the expansion joint strip seals shall be 80 mm (3.15 inches). "Box" seals or seals utilizing double webs will not be acceptable.

Property	Test Method	Range of Values
Hardness, Durometer A	ASTM D2240	55-70
Tensile Strength	ASTM D412	2000 psi (Min)
Elongation at break	ASTM D412	250% (Min)
Compression Set at 72 hr. at 212°F.	ASTM D395	40% (Max)

2.05 Bolts, Nuts, Washers

- A. Bolts and other hardware shall conform to the requirements of AASHTO M164 and shall be galvanized in accordance with AASHTO M298.

2.06 Slide Bearing and Precompressed Spring

- A. Slide bearings and precompressed springs shall be fabricated as steel reinforced elastomeric pads with a polytetrafluorethylene (PTFE) sliding surface. Components manufactured from polyurethane compounds will not be allowed.

2.07 Other Materials

- A. Other materials shall meet the requirements of the Standard Specifications and this Special Provision.

SECTION III – Design Requirements

3.01 General

- A. Preference shall be given to designing and fabricating expansion joint systems as one continuous unit without field splices. The maximum expansion joint assembly length will be controlled by practical shipping limits. If site and/or construction requirements dictate the need for field splices, the splices shall be located in areas outside the main traffic lanes. Field splices shall be

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completed by the contractor in accordance with the details and procedures included in the shop drawings.

- B. The expansion joint system shall be appropriately designed to accommodate all expected longitudinal movements (i.e. thermal, creep, shrinkage, elastic shortening, etc.) as well as vertical and horizontal rotations. This design shall incorporate strip seal glands with a maximum movement range of 80 mm (3.15 inches) per seal.
- C. The transverse separation beams, support bars, and other structural elements shall be fatigue tested and designed following the guidelines provided in NCHRP Report 402 – “Fatigue Design of Modular Bridge Expansion Joints” as well as the provisions included in Chapter 14 of the 3rd edition of the AASHTO LRFD Design Specification.
- D. The expansion joint assembly seals shall not protrude above the top of the joint.
- E. The elastomeric springs and bearings shall be designed so that they are removable and replaceable. The removal and reinstallation of the strip seal shall be easily accomplished from above the joint with a 1.25 inch (32 mm) minimum gap width. These operations shall be done with partial closure of the roadway.
- F. The expansion joint system shall be watertight.

SECTION IV – Fabrication

4.01 General

- A. The expansion joint system shall be fabricated in accordance with the dimensions, shapes, designs and details shown in the approved shop plans and in conformance with the Standard Specifications and the Special Provisions.
- B. All expansion joint assemblies shall be fabricated by the same AISC Certified manufacturer.

4.02 Corrosion Protection

- A. All steel surfaces, except where noted, shall be protected against corrosion by one of the following methods:
 1. Hot-dip galvanized per AASHTO M111, Zinc Coatings on Iron and Steel Products
 2. Painting of the expansion joint devices shall be performed in accordance with the Special Provision

APPLICATION OF PAINT. Surfaces under stainless steel or surfaces in direct contact with the seal do not require paint.

4.03 Installation

- A. To aid in ensuring proper installation of each expansion joint system in the field, the contractor shall have available the services of a qualified installation technician who is employed full-time by the manufacturer of the expansion system to be installed in this project. Recommendations made by the expansion joint manufacturer’s installation technician, on or off the job site, and approved by the engineer shall be adhered to by the contractor.

The expansion joint manufacturer’s installation technician shall advise the contractor and certify to the engineer that the proper installation procedures are being followed. All certifications to the engineer shall be in writing, signed and dated by the manufacturer’s installation technician.

- B. The modular expansion joint system shall be installed in strict accordance with the manufacturer’s instructions, and the advice of the manufacturer’s installation technician. Two weeks prior to the intended installation, the engineer shall be supplied with two copies of the written instructions. The permanently installed expansion joint system shall match the finished roadway profile and grades.

The expansion joint system shall be water tested after installation. Leaks shall be repaired to the satisfaction of the engineer.

- C. The contractor shall take precautions to protect the expansion joint system from damage. Special care shall be exercised at all times to ensure protection of the expansion joint system. Prior to installation of the expansion joint assembly, the blockout and supporting system shall be protected from damage and construction traffic. After installation of the joint system, construction loads shall not be allowed on the expansion joint device. The contractor will be required to bridge over the expansion joint assembly in a manner approved by the engineer.
- D. The modular expansion joint system shall be set to the proper width for the ambient temperature at the time of setting. This information is indicated in the shop plans.
- E. All forms and debris that tend to interfere with the free action of the expansion joint system shall be removed.

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4.04 Watertightness

A. After the expansion joint system has been completely installed, it shall be flooded for a minimum of one hour to a minimum depth of three inches. If leakage is observed, the expansion joint system shall be repaired at the contractor's expense. The repair procedure shall be recommended by the manufacturer and approved by the engineer.

SECTION V – Payment**5.01 Payment**

The lump sum contract price for "Modular Expansion Joint System" shall be full compensation for all materials, labor, tools, equipment, testing, inspection, services, and incidentals necessary to furnish and install the expansion joint systems as specified. The detailing and fabrication of any miscellaneous steel components (i.e., curb plates, barrier plates, and/or sidewalk plates) are excluded from this pay item.