MODULAR EXPANSION JOINT SYSTEM 10/2/20

**1.0 Description.** This work shall consist of furnishing materials, services, labor, tools, equipment, and incidentals necessary to design, fabricate, inspect, test and install the expansion joint system including the concrete and reinforcing steel in the blockouts as specified.

**1.1 General.** The modular expansion joint system shall consist of multiple strip seal joints that shall allow movements as shown on the plans. The configuration of the expansion joint system shall consist of neoprene strip seals mechanically held in place by steel edge and separation beams. Each separation beam shall be supported by independent multiple support bars welded to the separation beams, or by a single support bar system welded or bolted to the separation beams. The multiple support bars shall be suspended over the joint opening by sliding elastomeric bearings. Scissor type modular expansion joint systems will not be permitted. An equidistant control system shall be incorporated that develops its maximum compressive force when the joint is at its maximum opening. The final completed expansion joint system shall be continuous across the full width of the roadway and continue into the traffic barriers as shown on the plans.

**1.2 Qualified Manufacturers.** The qualified manufacturer shall have a minimum of 5 years experience in designing and fabricating modular expansion joint systems and be certified under the AISC certification program for either "Simple Bridge" or “Bridge and Highway Metal Component Manufacturers”. The following manufacturers are known suppliers of modular expansion joint systems:

D.S. Brown D.S. TechStar, Inc.

300 East Cherry Street 1219 West Main Cross Street

North Baltimore, OH 45872 Findlay, OH 45840

Telephone (419) 257-3561 Telephone: (419) 424 0888

[www.dsbrown.com](http://www.dsbrown.com) [www.techstar-inc.com](http://www.techstar-inc.com)

Watson-Bowman & Acme Corp Mageba USA

95 Pineview Drive 575 Lexington Avenue, 4th Floor

Amherst, NY 14120 New York, NY 10022

Phone (716) 691-7566 Phone (212) 644-3339

[www.wbacorp.com](http://www.wbacorp.com) [www.magebausa.com](http://www.magebausa.com)

**2.0 Design Requirements.**

**2.1 Truck and Impact Loading.** The modular expansion joint system shall be designed in accordance with the latest edition of AASHTO LRFD Bridge Design Specifications except that the LRFD truck loading shall be HS-20 Modified (HS-25) and impact being 100 percent. The modular expansion joint system shall be designed for the maximum number of lanes between the barrier curbs, and the lane width shall be considered as 10 feet. The modular expansion joint system shall be designed such that the joint system is designed to support a wheel load being 12 inches from the roadway face of the curb. The modular expansion joint system shall be designed for the staged traffic loading as shown on the plans.

**2.2 Field Splices.** The design and fabrication of the modular expansion joint system shall be one continuous unit without field splices except as required by stage construction requirements as shown on the plans. If the site and/or stage construction requirements require the need for field splices, the splices shall be located in areas outside the main traffic lanes or as shown on the plans and consist of a welded separation beam splice in which the weld is a full penetration weld, or another connection that is capable of developing the capacity of the spliced members. The contractor shall complete the field splices in accordance with the details and procedures included in the shop drawings.

**2.3 Movement.** The modular expansion joint system shall be designed to provide the minimum total movement as noted on the plans and 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 3.15 inches per seal.

**2.4 Fatigue.** The modular expansion joint system shall be tested and designed following the guidelines provided in the National Cooperative Highway Research Program (NCHRP), Report 402 “Fatigue Design of Modular Bridge Expansion Joints” as well as the provisions included in Chapter 14, “Joints and Bearings”, of the latest edition of AASHTO LRFD Bridge Design Specifications.

**2.5 Water Tightness.** After the modular expansion joint system has been completely installed, the joint shall be flooded for a minimum of one hour to a minimum depth of 3 inches. Testing shall be performed in stages with traffic flow maintained in accordance with the traffic control plans. If the engineer observes leakage, the expansion joint system shall be repaired at the contractor’s expense. The repair procedure shall be as recommended by the manufacturer and approved by the engineer.

**2.6 Corrosion Protection.** All steel surfaces, except as noted, shall be hot dip galvanized in accordance with AASHTO M111 (ASTM A123).

**2.7 Anchorage of Expansion System.** The modular expansion joint system anchorage shall be designed by the manufacturer and included in the design computations and shown in the shop drawings.

**3.0 Material.** All material shall be in accordance with Division 1000, Material Details, and specifically as follows.

**3.1 Structural Steel.** Structural steel shall be in accordance with AASHTO M270, Grade 50 (ASTM A709, Grade 50). All shop-welded connections that splice the horizontal separation beams and edge beams shall be full penetration welds. All separation beams to support bar connections shall be full penetration welds or bolted connections in accordance with NCHRP Report 402 requirements. Aluminum components will not be permitted. All fabrication of structural steel shall be in accordance with Sec 712 and 1080.

**3.2 Stainless Steel.** The stainless steel shall be in accordance with Sec 1038.4.2.

**3.3 Sliding Bearings.** The sliding bearings shall be fabricated as steel reinforced elastomeric pads with polytetraflourethylene (PTFE) in accordance with Sec 1038 or other proprietary material (with the engineer’s approval) as required by the manufacturer. The bearings shall be designed so that they are removable and replaceable.

**3.4 Strip Seals and Lubricant Adhesive.** Strip seals and lubricant adhesive shall be in accordance with Sec 717 and 1073. The strip seals shall not protrude above the top of the joint.

**3.5 Submittals.**

**3.5.1 Design Computations and Shop Drawings.** The contractor shall submit, for the engineer’s review, the design computations and shop drawings. All shall be signed, sealed and stamped by a registered professional engineer in the State of Missouri in accordance with Authentication of Certain Documents in Sec 107. The design computations shall include fatigue design and a strength design for all structural elements and connections. Shop drawings shall be prepared for the modular expansion joint system in accordance with Sec 1080. The shop drawings shall also include 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 support for shipping and handling.

(f) Details of blockout reinforcement and anchorage.

(g) Fatigue testing report.

(h) Details of adjustments to record drawings based on the selected modular joint system.

**3.5.2 Maintenance Manual.** The manufacturer shall submit to the engineer a written maintenance manual and part replacement plan at the time of the shop drawing submission. Included in the submission shall be list of parts to be inspected, acceptable wear tolerances and the method of part replacement. The manufacturer shall conduct a pre-installation meeting to train MoDOT’s construction inspectors and maintenance personnel on the installation and maintenance of the modular expansion joint system.

**3.5.3 Certificates of Compliance.** The manufacturer shall provide certification of the manufacturer’s experience, including a list of projects, and certificate of compliance with the AISC certification program, in accordance with Section 1.2 of this job special provision, to be submitted to the engineer.

**4.0 Construction Requirements.** The expansion joint system shall be stored at the job site in accordance with the manufacturer’s written recommendations. Damage to the joint system during shipping or handling will be cause for rejection of the joint system. Any damage to the corrosion protection system shall be repaired to the satisfaction of the engineer at the contractor’s expense. The support boxes shall rest on cast-in-place concrete or grout pads installed into a preformed blockout. The contractor shall coordinate the size and reinforcing of the blockout with the selected modular joint manufacturer. This includes reinforcement in the blockout, the adjacent and supporting concrete slab and other concrete and structural steel supporting elements. Modifications to the record drawings to accommodate the selected modular system shall be the contractor’s responsibility. The contractor shall provide details of any adjustments to the record drawings with the shop drawing submittal. Concrete shall be forced under and around support boxes, anchorage systems and supporting hardware. Proper consolidation shall be achieved by localized internal vibration. Installation of the modular expansion joint system shall be as recommended by the manufacturer. The contractor shall obtain the services of a qualified technical representative, approved by the manufacturer of the expansion joint system and acceptable to the engineer, to assist during the installation. The installation shall not occur without the qualified technical representative being present. The qualified technical representative shall have 3 years of experience working on installation of modular expansion joint systems on bridges. This experience shall also include modular joints that had field splices for staged construction.

**5.0 Method of Measurement.** Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, the modular expansion joint system will be measured to the nearest linear foot, based on measurement from the roadway face of curb to roadway face of curb along the centerline of the joint. Portions of the joint that extend past the roadway face of curbs will not be measured for payment. The revision or correction will be computed and added to or deducted from the contract quantity.

**6.0 Basis of Payment.** Modular expansion joint system, including all material, coating, equipment, labor, fabrication, installation, technical assistance and any other incidental work necessary to complete this work, will be paid for at the contract unit price for “Modular Expansion Joint System”.