**Wabo®Trident Finger Expansion Joint Assembly**

Patented multi-directional finger technology

for structures requiring thermal movements 6 inches or greater

1. **GENERAL**

The work specified in this section consists of fabricating, furnishing and installing a multi-directional finger expansion joint assembly of the type, for the total expansion and at the locations indicated in the contract plans in accordance with this specification and the joint system Manufacturer’s instructions.

1. **PRODUCT**

Provide a finger type expansion joint system that accommodates structure movements and rotations as shown on the contract plans. System shall be supplied in full length, fully shop assembled systems, or in segments to suit staged/phased construction. System length(s) shall be shown on plans. The expansion joint Manufacturer shall be certified to an AISC Bridge Fabrication standard, and ISO 9001 Quality Management System.

The Wabo®Trident Finger Joint system shall be designed in accordance with the latest edition AASHTO LRFD Bridge Design Specifications, or as required per special provisions. Manufacturer shall submit design calculations and shop drawings, stamped by a registered engineer, confirming all load bearing components are in conformance to requirements contained in this specification.

Each trident shaped finger plate shall be cut with a machine guided plasma or gas torch, or waterjet cut from one plate. The plurality and length of fingers for each trident shaped finger plate shall be designed such that no binding of the system shall occur during entire design movement and rotation ranges. When requested by the Engineer, validation of movement shall be provided through use of a to-scale animation using exact geometry taken from the finite element design model.

Urethane bearings capable of transferring all imposed loads to the structure shall be included on the bottom of each trident shaped finger plate and allow the finger plates to freely move within the limits of the expansion joint. Bottom surface of each finger plate shall be machined to accept bearings, and allowance for proper connection of the bearing to finger plate shall be accommodated. At the end of each finger, the bearings shall extend outward in each transverse direction to stabilize the adjacent finger plate.

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The Wabo®Trident Finger Joint system shall include a restoring force mechanism. This mechanism shall be developed from a torsion spring, acting when the rotation Manufacturer shall submit design calculations and shop drawings, of the finger plate deviates from it’s mid-range position.

The Wabo®Trident Finger expansion joint assembly shall be supplied by:

Watson Bowman Acme

95 Pineview Drive,

Amherst, New York 14228

(800) 677-4922

[www.watsonbowmanacme.com](http://www.watsonbowmanacme.com)

1. **SUBMITTALS**

Submittals shall comply with the following:

1. Shop drawings of all structural steel fabrication, including:
	1. Complete details of system and shop assembly of all structural components.
	2. Details and procedures with associated diagrams indicating sequence of construction and installation.
	3. Manufacturer instructions for proper installation of the expansion joint system shall be described on the shop drawings. Shop drawings that lack Manufacturer installation instructions, may be returned without approval
2. Certified copies of mill reports describing the chemical and physical properties of all structural steel components of system.
3. Certificates for welding electrodes used in fabrication and assembly.
4. Weld procedures
5. Quality Control Program - Manufacturer shall be ISO-9001:2015 certified and shall provide written confirmation that a formal Quality Management System and Quality Processes have been adopted in the areas of (but not limited to) Engineering, Manufacturing, Quality Control and Customer Service for all processes, products, and their components.

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 The contractor shall submit a written Quality Control program for review and approval by

 the engineer. Fabrication of finger joint assembly shall not be started until the quality

 control program has been approved.

1. **COMPONENTS AND MATERIALS**

The finger joint system and all its component parts shall be supplied by the Manufacturer. The Manufacturer shall certify that the following components meet the requirements of Buy America. The Contractor shall furnish a manufacturer’s certification that the materials proposed will meet the requirements as set forth in the specification

1. Trident Finger, Removable and Fixed Support Plates, and Shapes

All structural steel shall meet the requirements of ASTM A 36, A 572, Grade 50, or A 588. Manufacturer shall identify material grade on shop drawings, or within submitted calculations, for review and approval by the Engineer.

1. Trident Finger Plate Bearings

All finger plates shall contain a machined cut on the bottom surface at each end to accept a high-density urethane material that is hot poured or epoxy adhered into the recesses. Use of rubber sheet, dowels, blocks, or cross section of any kind is prohibited.

1. Steel castings

All steel castings shall meet the requirements of ASTM A 27 or A 148 per Manufacturer’s recommendation.

1. Torsion Springs

Manufacturer shall specify material properties, geometry, and compression deflection criteria required for pre-compression to ensure the finger plates are in complete and constant contact throughout a wheel load cycle, and develop Manufacturer recommended minimum force under maximum transverse movement. Material shall be designed to minimize compression set for a design life of at least one million vehicles. Use of steel materials is prohibited.

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1. Anchorage

Provide concrete anchor studs factory welded to steel plates as detailed on Manufacturer drawings for cast in-place conditions. Material shall meet the requirements of ASTM A108 with a maximum spacing of 12” on center unless project requirements govern otherwise. Provide alternate anchorage as recommended by Manufacturer for special conditions as detailed in the contract plans.

1. Elastomeric Drainage Trough Edge Rails (Wabo®FingerPlus trough design)

Material utilized to produce shape suitable to mechanically lock the flexible elastomeric drainage trough material shall conform to properties of ASTM A 36 or A 588.

Edge rails, which retain the flexible elastomeric drainage trough material, shall consist of a monolithic steel shape with a machined or extruded retainer cavity. A machined retainer cavity cut into support plate materials for the finger joint system shall be allowed, and per Manufacturer’s recommendation. Multiple component welded steel shapes with rolled steel to achieve a final member cross section or seal retainer cavity shall not be permitted.

All shop welds shall be fillet welds unless otherwise specified by the Manufacturer, and welders shall be qualified in all procedures incorporated into the work

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1. Elastomeric Drainage Trough Material (Wabo®FingerPlus trough design)

The design of the flexible elastomeric drainage trough material shall accommodate all required design movements as specified in the contract plans. Material shall be a flexible, non-reinforced extruded neoprene compound, with a minimum thickness of 1/4 inch (6 mm).

Elastomeric drainage trough locking lugs shall exhibit the physical properties listed in the table below, and lugs shall mechanically snap into a corresponding machined shape cavity and meet ASTM D5973

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|  |  |  |
| --- | --- | --- |
| PHYSICAL PROPERTIES | TEST METHODS | REQUIREMENTS |
| Tensile Strength  | ASTM D412 | 2000 psi |
| Elongation @ break | ASTM D412 | 250%, min |
| Hardness, Type A Durometer | ASTM D2240 modified | 60 +/-5 |
| Oven Aging 70 hrs @ 212°F Tensile Strength Elongation Hardness | ASTM D573 | 20% loss max20% loss max0 to +10 points |
| Oil Swell, 70 hrs @ 104°F | ASTM D471 | 45% |
| Ozone Resistance, 70 hrs @ 104°F 20% strain, 3000 pphm, in air | ASTM D1149 Method B | No cracks |
| Low Temperature Stiffening 7 days @ 14oF Hardness (Type A durometer) | ASTM D2240 | 0 to +15 |
| Compression Set, 70 hrs @ 212°F | ASTM D395 Method B | 35 max % |

 Flexible elastomeric drainage trough shall be installed utilizing a one part moisture curing

polyurethane and aromatic hydrocarbon solvent lubricant adhesive which complies with ASTM D4070.

The gutter and corresponding locking lugs shall be supplied as a continuous cross section, and shall be fused using heat vulcanization through use of a lap seam. Glue or any mechanical means of attaching gutter material to lugs shall be prohibited. The gutter shall be installed in one continuous length.

1. **CONSTRUCTION REQUIREMENTS**

The Contractor shall submit product information and shop drawings after award of contract. At the discretion of the Engineer, the Manufacturer may be required to submit calculations as described in this specification.

The expansion joint system shall be accurately set and securely supported at the correct grade and elevation at the correct joint opening as shown on the plans and shop drawings.

Manufacturer instructions for proper installation of the expansion joint system shall be described on the shop drawings. Shop drawings that lack Manufacturer installation instructions, may be returned without approval. Wabo®Trident Finger Joint system shall be installed in strict accordance with the Manufacturer’s written instructions along with the advice of their qualified representative.

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Manufacturer instructions for proper installation of the expansion joint system shall be described on the shop drawings. Shop drawings that lack Manufacturer installation instructions, may be returned without approval. Wabo®Trident Finger Joint system shall be installed in strict accordance with the Manufacturer’s written instructions along with the advice of their qualified representative.

Manufacturer shall shop prepare all stage/phase construction locations to be field welded.

Wabo®Trident Finger Joint system shall be supplied with connection pin prestressing information. Manufacturer shall provide factory attached lifting devices and brackets to facilitate field handling and grade adjustments.

It is recommended that finger joints be cleaned and flushed including the drainage trough on an annual basis.

A site inspection of the Wabo®Trident Finger Expansion Joint Assembly after 1 year of service or within a time as stated in the special provisions should be conducted.  This inspection should be done at the cost of the owner and/or contractor.   The inspection should cover system components and surrounding substrate and include owners relevant field performance of the expansion joint system.

1. **PAYMENT**

The accepted quantity of Wabo®Trident Finger Expansion Joint Assembly shall be paid for at the contract unit price per linear foot. Measurement of the system shall be taken horizontally and vertically along the centerline of the joint system between the outer limits indicated on the contract plans. Payment will be made under:

PAY ITEM PAY UNIT

Wabo®Trident Expansion Joint Assembly Linear Foot

Payment shall be full compensation for all work necessary to complete the items including furnishing and installing the Finger Joint system.

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