Structural Bearing Assemblies

Versiflex™ HLMR Pot Bearing Assemblies

SECTION I – General Requirements

A. **Description.** This work shall consist of designing, manufacturing and installing pot style bearings in accordance with, and at the locations shown, on the plans. The pot bearings shall be Versiflex™ HLMR Bearings supplied by:

The D.S. Brown Company
300 East Cherry Street
North Baltimore, Ohio 45872
Phone: (419) 257-3561 Fax: (419) 257-2200

The manufacturer shall demonstrate a minimum of five (5) years experience in the design and manufacture of pot style bearings and show AISC certification in accordance with the Standard for Bridge and Highway Metal component Manufacturers (CPT) with endorsement "P" (sophisticated paint system). Bearings shall be fabricated at facilities owned and operated by the manufacturer; the manufacturer being the single entity that designs, fabricates and supervises the installation of the bearing assemblies.

B. **Submittals.** Prior to fabrication of the bearing assemblies, the manufacturer shall submit the following items to the design engineer for review and approval:

1. Shop drawings for all components and assemblies, including general arrangements and large scale details. The shop drawings shall include tables showing load capacity and movement rating, if applicable, of each bearing, including initial offset required at various ambient temperatures.
2. Calculations showing conformance of the bearings to the design loadings, movements and other specified requirements
3. Weld procedures

C. **Shop Inspection.** The engineer reserves the right to visit the manufacturer's fabrication shop for purposes of inspecting the manufacturing, assembly, testing and painting of the bearings.

SECTION II – Materials

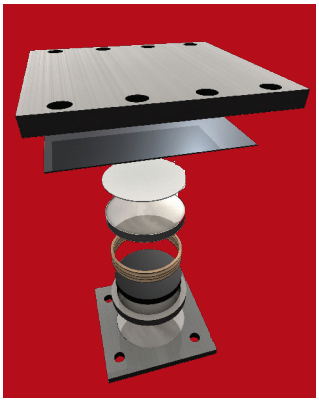
Materials shall conform to the following standards:

A. **Steel Plate:** ASTM A36, A588 or A572

B. **Stainless Steel:** ASTM A240, Type 304, No. 8 finish

C. **Brass for Sealing Rings:** ASTM B36, half-hard alloy

D. **Polytetrafluoroethylene** (PTFE). PTFE sheet shall be manufactured from pure virgin unfilled TFE resin conforming to the material requirements of AASHTO LRFD Bridge Construction Specification, Section 18.8.2. PTFE shall be resistant to acids, alkalis and petroleum products, non-absorbing of water, stable from -360°F to +500°F and non-flammable.



E. **Adhesive.** Adhesive used for bonding sheet PTFE shall be an epoxy material stable from -100°F to +250°F.

F. **Elastomer.** The pot bearing elastomer shall conform to AASHTO LRFD Bridge Construction Specification, Section 18.3.2.4. The elastomer shall be plain, not laminated or fiber-reinforced.

SECTION III – Design Requirements

Bearings shall be designed based on the current AASHTO LRFD Bridge Design Specification using the loads, rotations and movements given on the project plans. Designs shall assume that vertical and horizontal loads occur simultaneously.

The design of the bearings shall meet the following additional requirements:

A. The pot shall be machined from a single piece of steel. The inside diameter of the pot cavity shall be nominally equal to the diameter of the elastomeric pad. The pot shall be deep enough to permit the seal and piston rim to remain in full contact with the vertical face of the pot wall

under all design loads, movements and rotations. Contact between metal components shall not prevent further displacements or rotation.

B. The piston shall be machined from a single piece of steel. When at maximum rotation, the piston thickness shall be sufficient to provide at least 0.125 inch vertical clearance between rotating and non-rotating components of the bearing assembly.

C. The sole and masonry plates shall be designed to distribute the bearing loads into the surrounding substructure and/or superstructure. Service or installation considerations specified by the design engineer, such as weldability and bearing height, may require thicker masonry and sole plates than are required due to strength considerations alone.

D. When necessary, guide bars shall be welded to the slide plates or integrally machined into a larger plate. Guide bars shall be designed for the specified horizontal loads, but not less than 10% of the vertical capacity of the bearing. Guided members must have their contact area within the guide bars in all operating positions. The total clearance between guide bars and the guided member shall be 1/16 inch, ±1/32 inch.

E. All steel surfaces in contact with elastomer, PTFE or other steel surfaces shall be finished to a smoothness of 125 micro-inches (rms) or less.

F. Stainless steel sheets shall be of 16 gauge minimum thickness and shall be attached to their backing plates by continuous fillet welding along their edges. Bonding and/or mechanical fastening of sheets will not be permitted. The attachment of stainless steel sheets to their backing plates shall be capable of resisting the frictional force set up in the bearing. Welding shall be in accordance with AWS D1.6. The backing plates shall extend beyond the edge of the stainless steel sheets to accommodate the welds and the welds shall not protrude above the stainless steel sheets.

The stainless steel sheets shall face downward and shall completely cover the PTFE sheets in all operating positions, plus two additional inches in the direction(s) of movement. The surfaces in contact with the PTFE shall be finished to a smoothness of 20 micro-inches (rms) or less.

G. Flat brass sealing rings shall have a minimum width of 0.375 inch. The thickness of the rings shall be a minimum of 0.09375 inches. The number of rings shall be a minimum of 3 and a maximum of 4, depending on the design load of the bearing. The rings shall be finished to a smoothness of 63 micro-inches (rms) or less and the gaps shall be aligned on radii staggered to one another.

The gap between the ring and the wall shall nowhere exceed 0.01 inches. Each ring shall have one vertical cut at 45° to the tangent with a maximum gap of 0.05 inches. The gaps shall be staggered a minimum of 90° relative to one another when the rings are in place.

H. PTFE sheets shall be a minimum of 0.125 inch thick, epoxy-bonded into a square-edged recess of a depth equal to one-half the PTFE sheet thickness. The shoulders of the recesses shall be sharp and square. After completion of the bonding operation, the PTFE surfaces shall be smooth and free from blisters and bubbles. Alternative low coefficient of friction materials shall be considered for use on both the guide bars and horizontal sliding surface. Materials used on the horizontal sliding surfaces shall be more durable than PTFE with a coefficient of friction similar to PTFE.

I. Elastomeric discs shall be individually molded in one piece. No layering or stacking of discs will be permitted. Cuts, gouges or nicks from machine cutting or flash trimming will be cause for rejection. The sealing groove shall be molded integrally. It shall be square to the pad top surface and the same nominal dimensions as the brass sealing rings.

SECTION IV – Fabrication Tolerances

A. **Determination of Flatness and Tolerances**

Flatness of bearings after welding and fabrication shall be determined by the following method:

1. A precision straight edge that is longer than the nominal dimension to be measured shall be placed in contact with the plate surface to be measured.
2. Select a feeler gauge with a thickness corresponding to the flatness tolerances in item 4 below, and having a tolerance of ±0.001” and attempt to insert it under the straight edge.
3. Flatness is acceptable if the feeler does not pass under the straight edge.
4. Flatness tolerances are arranged in the following classes:
   - **Class A:** 0.0005” x “Nominal Dimension”
   - **Class B:** 0.001” x “Nominal Dimension”
   - **Class C:** 0.002” x “Nominal Dimension”

300 East Cherry Street • North Baltimore, OH 45872 | Telephone: 419.257.3561 • Fax: 419.257.2200 | www.dsbrown.com

B. **Rotational Elements**

1. The inside diameter of pots shall be machined to a tolerance of ±0.005" up to 20" I.D. and ±0.007" over 20" I.D. The tolerance on the depth of pot cavity shall be +0.025", -0". The tolerance on the thickness of the pot base shall be ±0.010".
2. The underside of pots shall be machined parallel to the inside and to a class "A" tolerance.
3. Elastomeric disc tolerances shall be:
   - Diameters greater than 20": -3/32", +3/32"
   - Diameters less than 20": -1/16", +1/8"
   - Thickness: -0", +1/8
4. Piston tolerances shall be:
   - Diameters greater than 20": ±0.007"
   - Diameters less than 20": ±0.005"
   - Thickness: +0.025", -0"
   - Sliding side, Class "A" tolerance; elastomer side, Class "B" tolerance

C. **Non-Rotational Elements**

1. Masonry and distribution plate tolerances shall be:
   - Plan dimensions under 30": -0", +3/16"
   - Plan dimensions over 30": -0", +1/4"
   - Thickness tolerance shall be: –1/32", +1/16"
   - Class "C" tolerance for the underside and Class "A" tolerance for the upper side in contact with other bearing components
2. Sole plates shall conform to:
   - Plan dimensions under 30": -0", +3/16"
   - Plan dimensions over 30": -0", +1/4"
   - Centerline thickness: -1/32", +1/8"
   - Bevel (if required): ±0.002 radians
   - Class "B" tolerance for the upper side and Class "A" tolerance for underside (i.e., side contacting stainless sliding surface) in contact with other bearing components
3. Guide bar tolerances shall be:
   - Length: ±1/8"
   - Section dimensions: ±1/16"
   - Center line thickness: -1/32", +1/8"
   - Flatness where it bears on another plate Class "A"
   - Bar-to-bar, nominal dimension, ±1/16" and not more than 1/16" out of parallel
4. Overall bearing height shall not vary from nominal height dimension by more than +1/4" or less than -1/16".

SECTION V – Painting or Metalizing

A. The bearing assemblies shall be shop painted in accordance with the paint manufacturer's recommendations or zinc metalized in accordance with AWS C2.18-93. Galvanizing and field painting will not be permitted. The surfaces to be painted or metalized are shown in the working drawings. The pot cavity, piston face width and all surfaces covered by stainless steel or PTFE sheet are not painted or metalized.

SECTION VI – Sampling, Testing and Inspection

A. Sampling, testing and inspection shall be performed on a number of bearings consistent with the applicable governing agency's sampling requirements. All testing shall be performed in the presence of a representative of the applicable governing agency or its designated inspection agency in accordance with Section 18.1.5 of the AASHTO LRFD Bridge Construction Specification. Five separate tests can be performed depending on the type of bearings required for the project. The first three tests shall be conducted on all bearing types (fixed, mobile and guided) and include a dimensional check (Section 18.1.5.2.4), clearance test (Section 18.1.5.2.5) and a short-term compressive proof load test. The short-term compressive proof load test shall consist of loading the bearing to 150 percent of the vertical design capacity at the design rotation. During the test or upon disassembly, the bearing shall show no signs of permanent deformation of the elastomer or PTFE. The fourth test will measure the coefficient of friction on a representative sliding bearing (mobile and guided) following the provisions in Section 18.1.5.2.6. The fifth test will be conducted on fixed and guided bearing assemblies to verify the horizontal load carrying capacity following the provisions in Section 18.1.5.2.8. Long-term deterioration tests are not required for sampled bearings.

SECTION VII – Identification, Storage and Handling

A. **Identification** - Each bearing shall be stamped with the manufacturer's name, bearing type or model number, bearing number and the installed location. The stamp shall be on a surface visible after installation.

300 East Cherry Street • North Baltimore, OH 45872 | Telephone: 419.257.3561 • Fax: 419.257.2200 | www.dsbrown.com

B. **Storage** - When in storage the bearings will be kept banded, wrapped and secured in a condition suitable for shipment.

SECTION VIII – Installation

A. Bearings shall be installed in strict accordance with the manufacturer's instructions, as approved by the design engineer.

B. Bearing devices shall not be disassembled unless otherwise permitted by the engineer or manufacturer.

C. Caution shall be taken to ensure that the steel temperature directly adjacent to the rotational element does not exceed 200°F. In addition, no weld current shall pass between bearing plates on either side of the elastomeric disc.

300 East Cherry Street • North Baltimore, OH 45872 | Telephone: 419.257.3561 • Fax: 419.257.2200 | www.dsbrown.com