October 27, 1983

SPECIAL PROVISION
SECTION 523
POT BEARINGS

Description. This work shall consist of furnishing and installing Pot Bearings in accordance with this Special Provision, the Standard Specifications, and in reasonable conformity with the configuration and details shown on the plans.

Design. The Pot Bearings shall be designed for the loads and movements given on the plans. Configurations and dimensions other than those given on the plans may be accepted subject to the approval of the Engineer.

Except where indicated on the plans, the design shall also include the connections between the bearings and the superstructure and the bearings and the substructure.

Shop drawings of the bearings shall be submitted in accordance with Subsection 105.02 of the Standard Specifications. Design calculations of the bearings shall also be submitted to the Engineer for review along with the shop drawing submittal.

The bearings shall be designed to accommodate a rotation of not less than .015 radians.

The coefficient of friction between the polytetrafluoroethylene (TFE) and the stainless steel surface shall not exceed 0.03, unless otherwise specified on the plans, at the average unit bearing pressure for the minimum vertical load indicated on the plans.

The bearings shall be designed for a horizontal force at least equal to 10 percent of the vertical capacity of the bearing. No more than two bearings, with guide bars, per bearing line, shall be considered to be carrying the total maximum horizontal load as indicated on the plans.

Bearing friction shall not be considered when the horizontal load capacity of guided or fixed bearings is calculated.

The elastomeric discs shall be designed to meet the following:

1. The minimum thickness shall be 1/15 of the diameter.

2. The average unit pressure shall be 3500 psi + 5 percent for the maximum vertical load indicated on the plans.

3. The average unit pressure shall not be less than 700 psi for the minimum vertical load indicated on the plans.

4. When utilizing flat brass sealing rings, the upper edge of the discs shall be recessed to receive the brass rings.

5. Polytetrafluoroethylene (TFE) sheets, 15 mil minimum thickness and the same diameter as the inside of the pot, shall be placed above and below the discs.

The pot shall be designed to meet the following:

1. The depth of the cavity shall be equal to or greater than the sum of the design rotation plus .02 radians plus 0.1 inch in addition to the thickness of the elastomeric disks and the TFE sheets.

2. The inside diameter shall be the same as the elastomeric disc.

3. Connections to steel masonry plates or distribution plates shall be by filet welds around the entire perimeter.

The piston shall be designed to meet the following:

1. The outside diameter shall not be greater than .03 inch less than the inside diameter of the pot.

2. The minimum thickness shall be .08 times the inside diameter.

3. When utilizing round brass sealing rings, the lower outside edge shall be beveled to accept and retain the brass ring and to permit full design rotation.

4. With laterally restrained pot bearings having a keyway in the piston, the top surface shall have a keyway slot and a cold finished steel bar press fitted into it and welded at the ends.

The elastomer sealing rings shall be brass and shall be designed to meet the following:

1. Flat brass sealing rings, if utilized, shall:

   a. Have a width of 3/8 inch minimum with bearings up to a 1000 kip capacity and a 1/2 inch width with bearings over a 1000 kip capacity.

   b. Have a minimum thickness of .050 inch.

c. Have two rings with a bearing capacity up to 1000 kips, three rings with a bearing capacity over 1000 kips but less than 3000 kips, and four rings with a bearing capacity of over 3000 kips.

d. Have the ends cut at 45° with a minimum gap in the installed position of .050 inch and shall fit the inside diameter of the pot snugly.

e. Have the ring gaps staggered 180° apart.

2. Round brass sealing rings, if utilized, shall:

a. Be of one piece with the ends brazed to make a solid ring.

b. Have the outside of the ring fit snug in the inside diameter of the pot.

The TFE sliding surface shall be designed to meet the following:

1. The average unit pressure shall be 3500 psi for the maximum vertical load indicated on the plans.

2. Unfilled TFE shall have a minimum thickness of:

a. 1/8 inch with half of its thickness recessed into the piston, or

b. 1/16 inch with the TFE bonded to the surface of the piston.

3. Filled TFE shall be a minimum of 1/16 inch thick and shall be bonded to the surface of the piston.

4. The maximum thickness of the TFE, filled or unfilled, shall be 3/32 inch, except, if recessed it shall be 3/16 inch.

The stainless steel sliding surface shall be designed to meet the following:

1. The stainless steel shall cover the TFE in all operating positions such that the stainless steel will have a minimum of one inch edge clearance beyond the TFE.

2. The thickness shall be not less than .040 inch nor greater than .090 inch.

3. When a center guided key is utilized, a recess shall be machined in the sole plate 1/8 inch wider than the shear key.

The guide bars shall be designed to meet the following:

1. Guide bars may be connected to the sole plate by either welding or high tensile screws. The high tensile screws shall be designed for an allowable stress of 0.2 times Fu in single shear.

2. The guide bars and their connections shall be designed for the maximum horizontal load, as indicated on the plans, but not less than 10 percent of the vertical capacity of the bearing.

3. The guided member shall be within the guide bars at all operating positions.

4. The space between the guide bar and the guided member shall be 1/8 inch unless otherwise indicated on the plans.

Materials. Structural steel for the bearings and plates shall conform to the requirements of AASHTO M183 (ASTM A36), M223 (ASTM A572), or M222 (ASTM A588).

The elastomer shall be either chloroprene or natural polyisoprene of 50 $\pm$ 5 Shore A durometer hardness and shall conform to the requirements of Section 2.25.2 and 2.25.3 of AASHTO Standard Specifications for Highway Bridges, where applicable.

The sealing rings shall be brass, and if flat, shall conform to the requirements of ASTM B36, half hard. If round sealing rings are utilized, they shall conform to the requirements of Federal Specification QQB626, Composition 22, half hard.

The TFE shall conform to the requirements of Section 2.27.2 of AASHTO Standard Specifications for Highway Bridges.

Stainless steel shall conform to the requirements of ASTM A240, Type 304.

Fabrication. Bonding of TFE sheets to the piston shall be under factory controlled conditions and in accordance with written instructions of the manufacturer of the adhesive. After completion of the bonding operation, the TFE surface shall be smooth and free from bubbles. Filled TFE surfaces shall then be polished.

The stainless steel sliding surface shall be seal welded around the entire perimeter. The surface shall be smooth and flat and the back shall remain in contact with the sole plate. The surface finish shall be less than 10 micro inches root mean square (rms).

Pots shall be machined from a solid plate or fabricated by welding a flame cut shape to a plate. Fabricated pots shall be 100 percent ultrasonically tested at the inside weld and magnetic particle tested at the exterior weld. The internal finish shall be less than 125 micro inches rms.

The elastomeric discs shall be manufactured from no more than three pieces.

The piston shall have finished surfaces of less than 125 micro inches rms.

Fabrication tolerances of the bearings shall be as follows:

1. Pots - inside diameter - ±.005"
   underside flatness - Class "A"

2. Elastomeric Discs - diameters 20" - +3/32"
   diameters 20" - ±1/16"
   Thickness - -0", +1/8"

3. Piston - diameters 20" - ±.005"
   diameters 20" - ±.007"
   upper side flatness - Class "A"
   under side flatness - Class "B"

4. Masonry and Distribution Plates -
   plan dimensions 30" - -0", +3/16"
   plan dimensions 30" - -0", +1/8"
   flatness - Class "B"

5. TFE - plan dimensions - -0", +5%
   flatness - Class "A"

6. Stainless Steel - flatness - Class "A"

7. Sole Plate - plan dimensions 30" - -0", +3/32"
   plan dimensions 30" - -0", +1/8"
   thickness - -1/32", +1/8"
   upper side flatness - Class "B"
   minimum beveled edge thickness - 5/8"

8. Guide Bars - length - ±1/8"
   section dimension - ±1/16"
   bar to bar - ±1/32"
   parallelism - 1/32"
   bearing side flatness - Class "A"

The flatness of the bearing surfaces shall be determined as follows:

Place a precision straight edge, longer than the nominal dimension to be measured, on the surface to be measured. The plate will be acceptable if a feeler gage, with an accuracy of ±.001", will not pass under the straight edge.

The acceptable flatness tolerances for the designated classes are:

Class "A" - .0005" times the nominal dimension.
Class "B" - .001" times the nominal dimension.

The nominal dimension being the actual dimension of the plate under the straight edge.

All structural steel, except stainless steel, shall be zinc metalized in accordance with AWS C2.2 with a dry coating thickness of 8 mils on exterior surfaces and 2 mils on interior surfaces.

Each bearing shall be assembled at the plant, marked for identification, and delivered to the site of construction as a complete unit. The bearings shall have permanent match marks to indicate the normal position of the bearing. The bearings shall be shipped and stored in moisture-proof and dust-proof covers.

Testing and Certification. The manufacturer of the pot bearings shall furnish test facilities for test and inspection of the completed bearings in his plant or at an independent test facility approved by the Engineer. The Engineer or his authorized representative shall be allowed free access to the manufacturer's plant and test facility. As soon as all bearings have been manufactured, notification shall be given to the Engineer. The Engineer will select two completed bearings from the lot for testing. The test must be arranged so that the static coefficient of friction on the first movement can be determined. The test shall first be conducted at an average bearing pressure of 3500 psi with the test load applied continuously for 12 hours prior to measuring the friction. The first movement static coefficient of friction shall be determined and the dynamic coefficient of friction at a sliding speed of less than one inch per minute shall be determined. The above test shall then be repeated with the designed average unit bearing pressure for the minimum vertical load indicated on the plans for the bearings selected. The results shall not exceed that specified for the design.

The bearings shall then be subjected to 100 movements of at least one inch of relative movement and if the test facility permits, the full design movement at a speed of less than one foot per minute. Following this, the static and kinetic coefficient of friction shall be determined as specified above and shall not exceed the value specified in the design. The bearings shall show no appreciable sign of bond failure, cold flow of the TFE, or other defects.

A proof load test shall also be performed on each test bearing by applying a load equal to 150 percent of the maximum vertical load indicated on the plans for the bearings selected for a period of one hour. The test bearings shall show no sign of failure or other defects while under load or subsequently upon disassembly and inspection.

Along with the notice of fabrication completion, the manufacturer shall submit a certificate which states that all materials conform to the requirements of this specification. The certification shall be on the manufacturer's letterhead and shall be signed by an officer of the company having legal authority to bind the company.

Installation. When the bearings are to be set directly on the concrete bridge seats, as indicated on the plans, the bridge seats shall be dressed one inch larger all around than the masonry plates and to the exact elevations shown on the plans or as determined by the Engineer. If dressed areas are lower than the surface of the surrounding bridge seat, a small channel shall be cut to the edge of the bridge seat for drainage.

Masonry plates shall be set level in their exact position and shall have a full and even bearing upon the masonry. They shall be placed on a preformed pad, the same size and shape as the masonry plate with holes to match the masonry plate. The Contractor shall drill the holes and set the anchor bolts. The bolts shall be accurately set with an approved non-shrink grout. The grout shall completely fill the holes.

When the bearings are to be set on a grout pad, the grout shall be composed of one part of Portland Cement, Type I or II, to two parts fine aggregate by weight with an approved non-shrink admixture well mixed with sufficient water to produce proper consistency.

The grout shall have a minimum compressive strength of 4000 psi at 28 days. A sufficient quantity of the grout materials, including admixtures, and the design composition shall be submitted to the Engineer for testing 60 days prior to placement.

The grout shall be well bonded to the adjacent concrete and shall be placed under pressure to ensure that all anchor holes and the entire area under the masonry plate is free of voids.

The sliding surfaces of bearings shall be installed level. Special care shall be exercised at all times to insure protection of the stainless steel and the TFE surfaces from coming in contact with any foreign matter.

All forms and debris that tend to interfere with the free action of the bearing assemblies shall be removed at the time of removal of the falsework and forms.

Method of Measurement. Pot Bearings will be measured for payment by each unit, complete in place and accepted.

Basis of Payment. Pot Bearings will be paid for at the contract unit price each, which price shall be full compensation for the design, fabrication, delivery, and installation, including all materials, equipment, labor and incidentals necessary for furnishing and installing the bearings in accordance with the plans and this Special Provision.

Payment will be made under:

Pay Item		Pay Unit
523.10	Pot Bearings	Each

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