

## SECTION 461 MULTIROTATIONAL BEARINGS

### 461-1 Description.

Furnish and install multirotational bearings in accordance with the recommendations of the manufacturer and details shown in the Plans. ~~Submit for the Engineer's approval, shop drawings and design calculations prepared, signed and sealed by a Specialty Engineer prior to fabrication of bearings~~ *Obtain all multirotational bearings on each bridge from the same manufacturer. This Section covers the following types of multirotational bearings:*

- 1. pot bearings*
- 2. disc bearings.*

### 461-2 Materials.

Provide materials in accordance with the AASHTO LRFD Bridge Design Specifications and as follows. ~~Furnish structural steel conforming to ASTM A709 Grade 50W. Coat all exposed steel surfaces with a thermal sprayed coating (metalization). Blast clean surfaces with grit abrasive in accordance with Steel Structures Painting Council Surface Preparation Specification No. 10, SSPC-SP10, Near White Blast Cleaning, to a surface profile of .002-.004 inch. Use the electric arc spraying process. Provide wire material for the metalized primer consisting of 85% zinc and 15% aluminum, each being 99.9% pure metal. Apply the metalized primer to obtain a thickness of 0.01 inch minimum and 0.02 inch maximum. Do not apply when the surface temperature of the steel is less than 5°F above the dew point. Prepare a sample coupon using the same processes used to prepare the surface and apply the coating to the bearing. Test the coating bond strength on the coupon in accordance with ASTM D4541. The bond strength must be a minimum of 700 psi. If the bond strength of the coating on the coupon is deficient, test the coating on the bearing. If the required bond strength is achieved, repair the coating. Provide the Engineer with a certified statement that the coating applicator has performed successful thermal spray operations within the last 12 months.~~

~~Perform any required touchup repair and field metalizing after any field welding with materials and procedures in accordance with Section 975.~~

~~Use stainless steel sheet meeting ASTM A240, Type 316.~~

~~Use a stainless steel sheet in the expansion multirotational bearings at least 1/16 inch thick and polished to a surface finish of less than 10 micro inches root mean square on the side of contact with the PTFE.~~

~~Blast clean the surface of plates to which the stainless steel sheet is to be attached to near white, SSPC-SP10. Abrade the back of the stainless steel sheet that is to be in contact with the steel plate using emery cloth. Position the stainless steel sheet on the steel plate, clamp and bond firmly in place using a quick-set epoxy applied in the center portion only. Apply the stainless steel sheet to the blast cleaned surface of the steel plate as soon as possible after blasting and before any visible oxidation of the blast cleaned surface occurs. Ensure that the epoxy conforms to Federal Specification MMM-A-134 Type I. Weld the stainless steel sheet to the steel plate continuously around its perimeter using a tungsten inert gas welder. Weld in a controlled manner using multiple passes or stitch welding techniques to control heat build-up. As a mating surface for the stainless steel sheet, use an unfilled virgin PTFE sheet (recessed) or a glass fiber filled PTFE sheet (recessed). Obtain the PTFE sheet by skiving fillets formed under hydraulic pressure~~

~~and heat. The resin shall meet the requirements for ASTM D1457. Bond the PTFE and the piston using a heat cured, high temperature epoxy capable of withstanding temperatures of minus 40°F to 250°F.~~

**461-2.1 Structural Steel:**

*Furnish structural steel conforming to ASTM A709 Grade 50W.*

**461-2.2 Stainless Steel:**

*Furnish stainless steel conforming to ASTM- A240, Type 316, 16 gage minimum thickness.*

**461-2.3 Metalizing Wire:**

*Furnish metalizing wire in accordance with ASTM- B833, having an 85% zinc-/15% aluminum (Z30700) composition.*

**461-2.4 Anchor Rods, Nuts and Washers:**

*Furnish galvanized anchor rods, nuts and washers in accordance with Section 962.*

**461-3 Design.**

*Design bearings in accordance with the AASHTO LRFD Bridge Design Specifications.*

~~Design all bearings to be replaceable without removing the masonry plate or sole plate. Ensure that multirotational bearings are designed by the manufacturer for the loads and movements shown on the contract drawings. Obtain all multirotational bearings from the same manufacturer.~~

Design guided ~~multirotational~~ bearings for ~~at the~~ lateral load *shown in the Plans or equal to 10% of the vertical load capacity of the bearing shown or the lateral load indicated in the Plans, whichever is greater.*

~~For projects designed with the AASHTO LRFD Bridge Design Specifications, use multirotational pot or disc bearings designed and fabricated by the manufacturer in accordance with AASHTO LRFD Bridge Design Specifications for the loads and movements designated in the Plans.~~

~~For projects designed using the AASHTO Standard Specifications for Highway Bridges, use multirotational pot or disc bearings designed by the manufacturer in accordance with FHWA Structural Bearing Specification SBS-1010-93 for the loads and movements designated in the Plans and fabricated in accordance with this specification~~*For disc bearings, provide steel limiting rings around the top and bottom of the polyether urethane disc.*

**461-4 Shop Drawings.**

*Submit shop drawings in accordance with Section 5. Include design calculations, signed and sealed by a Specialty Engineer, confirming that all components are in conformance with the requirements of this Section. Include the following information on the shop drawings:*

- 1. The name and address of the bearing manufacturer, including the physical address where the fabrication will be performed.*
- 2. The bearing manufacturer's instructions for proper installation, including the proper positioning settings for a minimum 100°F temperature range.*
- 3. A list of all materials, project specific details and dimensions, the bearing model number and the movement range.*

#### **461-5 Fabrication.**

*Fabricate bearings in accordance with the AASHTO LRFD Bridge Construction Specifications and the following requirements.*

*Shop metalize and seal all steel surfaces, except PTFE-stainless steel sliding surfaces, the insides of pots and the bottoms of pistons in accordance with SSPC-CS23.00/AWS C2.23M/NACE No. 12, "Specification for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel". Prepare surfaces prior to metalizing to a "near white" metal condition in accordance with SSPC-SP10 using abrasives meeting the requirements of 560-2. Achieve a sharp angular blast anchor profile meeting the requirements of ASTM D4417, Method C, 3 mils plus or minus 1 mil (75  $\mu\text{m}$  plus or minus 25  $\mu\text{m}$ ). Provide a metalizing thickness of 10 mils minimum and 20 mils maximum. Prepare a sample coupon using the same processes used to prepare the surfaces and apply the coating to the bearing. Test the coating bond strength on the coupon in accordance with ASTM D4541. The bond strength must be a minimum of 700 psi. If the bond strength of the coating on the coupon is deficient, test the coating on the bearing. If the required bond strength is achieved, repair the coating on the bearing.*

#### **461-4-6 Testing and Certification.**

~~Ensure the manufacturer verifies the adequacy of the bearings by testing random samples manufactured for this project for the following conditions:~~

~~\_\_\_\_\_ (a) Test the bearings for a period of 24 hours under the maximum vertical load with the maximum rotational displacements applied. The maximum reactions, rotations and movements are shown in the Plans for each type of bearing.~~

~~\_\_\_\_\_ (b) In addition, test expansion bearings under maximum vertical load during six cycles of maximum longitudinal movement (One cycle shall consist of starting with the bearing elements centered, moving the maximum distance (half the total longitudinal movement) in one direction, then moving back through the center point to the maximum distance in the opposite direction and then back to the starting point).~~

~~\_\_\_\_\_ (c) In addition test the lateral capacity of bearings with laterally restricted movement by applying the maximum vertical load and the required lateral load. Apply and release the lateral load six times in a direction 90 degrees from the bearing's unrestricted longitudinal movement direction. Apply and release the required lateral load 6 times in a direction 180 degrees from the initial lateral load direction.~~

~~\_\_\_\_\_ Based on the maximum loads and movements shown in the Plans, group the bearings into common design types for both fixed and expansion bearings. Clearly indicate this grouping on the shop drawing for approval by the Engineer. One bearing of each type and size so designated must be tested. All test results must comply with the manufacturer's design data as shown in the approved shop drawings; the bearings tested must show no visible deficiencies including extrusion of the elastomer between the piston and the base plate cylinder and the PTFE surfaces shall show no deterioration. Prior to shipment to the project site, submit the test data for the bearings tested to the Engineer with the manufacturer's certification of specification compliance for all bearings. Unsatisfactory test results will be cause for rejection of all multirotational bearings represented by the test. Any observed separation between the rotational element and the bearing plate will be cause for rejection.~~

~~Provide written certification from the manufacturer that the multirotational bearings have been fabricated and installed in accordance with the specification requirements and manufacturer's requirements prior to acceptance by the Department.~~ *Test the materials used to fabricate the bearings and the completed bearings themselves in accordance with the AASHTO LRFD Bridge Construction Specifications using the reactions, rotations and movements shown in the Plans for each type of bearing. Conduct the long-term deterioration test and the long-term proof load test on full size bearings on a per LOT basis.*

**461-5-7 Construction Installation.**

Store multirotational bearings delivered to the bridge site under cover on a platform above the ground surface. Protect bearings at all times from damage and ensure they are clean, dry and free from dirt, oil, grease or other foreign substances before placement. Install the bearings in accordance with the recommendations of the manufacturer, contract drawings, and as may be directed by the Engineer. If there is any discrepancy between the recommendations of the manufacturer, these Specifications, and Contract ~~and~~ Drawings, the Engineer will be the sole judge in reconciling any such discrepancy.

Obtain the services of a qualified technical representative, employed by the manufacturer of the bearings, to supervise the first installation of each type of bearing (expansion pot, fixed pot, expansion disc, fixed disc or other type as defined by the Engineer) but for only one size of each type. Submit to the Engineer a certified statement from the manufacturer that its representative has the necessary technical experience and knowledge to supervise bearing installations and to train Contractor personnel about proper bearing installation procedures and methods. Do not install the bearings before the Engineer receives the certification and the representative is on the job site. Assume this responsibility at no further expense to the Department.

*Perform any required touchup repair and field metalizing as directed by the Engineer.*

**461-8 Method of Measurement.**

*Quantities for fixed and expansion bearings will be the plan quantity number of each type of bearing constructed and accepted.*

**461-6-9 Basis of Payment.**

~~Prices and payments will be full compensation for furnishing all labor, materials, tools, equipment, testing, manufacturer's installation supervision, and incidentals to complete the work in accordance with the Contract drawings, the manufacturer's requirements, and these Specifications.~~

**461-9.1 Basic Items of Bearings:** *The Contract unit price per each for bearings will be full compensation for all work and materials necessary for the complete installation. Such price and payment will include, but not limited to, the following specific incidental work:*

- ~~1.~~ *testing,*
- ~~2.~~ *tools and equipment required for installation,*
- ~~3.~~ *any work to replace and rejected bearings,*
- ~~4.~~ *any repairs to the metalized coating on the bearings,*
- ~~5.~~ *all costs associated with the manufacturer's installation technician.*

**461-9.2 Payment Items:**

Payment will be made under:

Item No. 461-113-     Multirotational Bearing Assembly - Fixed - each.

(REV 1-7-14) (FA 1-15-14) (7-14)

Item No. 461-114- Multirotational Bearing Assembly - Expansion - each.