

Main Roads Technical Standard

MRTS81

Bridge Bearings

June 09

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Bridge Bearings

1 INTRODUCTION

This Standard applies to the supply of bearings for support of bridge superstructures for normal installations. For aggressive installations, stainless steel bearings, in accordance with MRTS81A *Stainless Steel Bridge Bearings*, shall be used.

This Technical Standard shall be read in conjunction with MRTS01 *Introduction to Technical Standards*, MRTS50 *Specific Quality System Requirements* and other Technical Standards as appropriate.

This Technical Standard forms part of the Main Roads Specifications and Technical Standards Manual.

2 DEFINITION OF TERMS

The terms used in this Standard shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Standards*.

3 REFERENCED DOCUMENTS

Table 3 lists documents referenced in this Technical Standards.

Table 3 – Referenced Documents

Reference	Title
AS/NZS 1252	High strength steel bolts with associated nuts and washers for structural engineering
ASTM A 240M	Standard specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure vessels and for General Applications
ASTM A 480M	Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, sheet, and Strip
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 5100.4	Bridge design – Bearings and deck joints
ISO 13000-1	Plastics – Polytetrafluoroethylene (PTFE) semi-finished products – Part 1: Requirements and designation
AS 1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
ASTM D217	Standard Test Methods for Cone Penetration of Lubricating Grease
ASTM D972	Standard Test Method for Evaporation Loss of Lubricating Greases and Oils
ASTM D3294	Standard Specification for PTFE Resin Molded Sheet and Molded Basic Shapes
ASTM D4745	Standard Specification for Filled Compounds of Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials
BS 5350	Methods of test for adhesives
BS 6564-3	Polytetrafluoroethylene (PTFE) materials and products. Specification for E glass fibre filled polytetrafluoroethylene

4 QUALITY SYSTEM REQUIREMENTS

4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Standards*.

The Hold Points applicable to this Standard are summarised in Table 4.1. There are no Witness Points and Milestones defined.

Table 4.1 – Hold Points

Clause	Hold Point
5.2.1.1	1. Testing of laminated elastomeric bearings
5.2.1.2	2. NATA certification of calibration for laminated elastomeric bearings
5.3.1.1	3. Testing of laminated elastomeric bearings
5.3.1.2	4. Test machine is to be calibrated
6.1	5. Design of Guide slide Pot-type bearings
6.1	6. Suitability of proposed pot bearings
6.5.1	7. Testing of pot-type bearings
6.5.2	8. NATA certification of calibration for pot-type bearings
6.5.5	9. Load Testing Location and Date
6.5.5.3	10. Method of Friction Load Test

5 ELASTOMERIC BEARINGS

5.1 General

Elastomeric bearings shall conform to the requirements stated in AS 5100.4.

The specific requirements for structures to be constructed under the Contract are given in Clause 1 of Annexure MRTS81.1.

5.2 Single Layer Elastomeric Bearings and Strip Bearings

Single layer elastomeric bearings shall be manufactured from an elastomer of natural or synthetic rubber as per Clause 12.2 of AS 5100.4. The compound, when manufactured, shall be uniform and homogeneous throughout.

5.2.1 Testing of Single Layer Elastomeric Bearings

5.2.1.1 General

Properties of the elastomer shall comply with Category 1 tests stated in AS 5100.4. The Contractor shall include test certificates for each batch used in the manufacture in its Inspection and Test Plan.

Tolerances for dimensions of single layer elastomeric bearings are set out in Table 5.2.1.1.

Table 5.2.1.1 – Tolerances for Single Layer Bearings

Dimension	Tolerance (mm)
Plan dimensions	± 3
Bearing thickness	± 2
Out of parallel between top and bottom surfaces	1

Single sampling plans for normal inspection shall be adopted.

Testing shall be carried out by a laboratory accredited by NATA for the relevant tests.

All testing and inspection shall be carried out in the presence of the Administrator. **Hold Point 1** The Contractor shall give the Administrator seven days notice of the testing of bearings.

5.2.1.2 Test Machines

The accuracy of the load testing machine is to be grade A for the range of the test. The test machine shall be calibrated at least every 24 months. **Hold Point 2**

5.2.1.3 Testing of Single Layer Bearings

A minimum of one representative bearing selected from every ten identical bearings, or part thereof, shall be load tested. Representative bearings shall be tested in accordance with the following –

- a) Dimensional tolerances of Table 5.2.1.1;
- b) Durometer hardness; and
- c) The bearing shall be load tested to 3 times the working load.

5.2.1.4 Acceptance Criteria for Single Layer Elastomeric Bearings

The representative sample bearings shall satisfy the following –

- Any bearings (loaded or unloaded) shall not show surface splits, indentations or evidence of incomplete vulcanising of the rubber compound; and
- the bearing shall conform to the properties specified on AS 5100.4.

If any of the representative bearings fail to meet the acceptance requirements, then all the bearings shall be tested and any non-conforming bearings shall be rejected and replaced with new bearings which conform to the requirements of AS 5100.4.

5.2.1.5 Testing of Single Layer Strip Bearings

A minimum of one representative bearing selected from every ten identical bearings, or part thereof, shall be load tested. The representative bearings shall be tested in accordance with the following –

- a) dimensional tolerances of Table 5.2.1.1;
- b) durometer hardness (the durometer hardness shall be measured for each 1 m length); and
- c) the bearing shall be load tested to 3 times the working load.

5.2.1.6 Acceptance Criteria for Single Layer Strip Elastomeric Bearings

The representative sample bearings shall satisfy the following –

- the bearings (loaded or unloaded) shall not show surface splits, indentations, or evidence of incomplete vulcanising of the rubber compound; and
- the bearing shall conform to the properties specified on AS 5100.4.

If any of the representative bearings fail to meet the acceptance requirements, then all the bearings shall be tested and any non-conforming bearings shall be rejected and replaced with new bearings which conform to the requirements of AS 5100.4.

5.3 Laminated Elastomeric Bearings

Laminated elastomeric bearings shall be manufactured to the requirements specified in AS 5100.4, including tolerances.

5.3.1 Testing of Laminated Elastomeric Bearings

5.3.1.1 General

Bearings shall be tested in accordance with the method and requirements set out in AS 5100.4. Testing of laminated elastomeric bearings shall be carried out in the presence of the Administrator. **Hold Point 3** The Contractor shall give the Administrator seven days notice of the testing of the bearings.

The cost of testing shall be borne by the Contractor. Testing shall be carried out by a laboratory accredited by NATA for geometrical and load tests as per Clause 5.3.1.2 of this standard.

5.3.1.2 Test Machines

The accuracy of the load testing machine is to be grade A for the range of the test. The test machine shall be calibrated at least every 24 months. **Hold Point 4** The accuracy of the lateral load shall be within 1% of error.

5.3.1.3 Testing of Bearings

All bearings shall be load tested in accordance with the requirements of AS 5100.4 Appendix D to 1.5 times the rated serviceability load and the compressive stiffness.

A minimum representative sample of one bearing in every five or part thereof shall be selected for the Shear Stiffness testing.

5.3.1.4 Tolerances on Compressive Stiffness

The permissible tolerance on compressive stiffness of completed laminated elastomeric bearings shall be $\pm 25\%$ of the design value.

5.3.1.5 Acceptance Criteria for Laminated Elastomeric Bearings

The representative sample bearings shall satisfy the following –

- the bearings (loaded or unloaded) shall not show surface splits, indentations, or evidence of incomplete vulcanising of the rubber compound; and
- the bearing shall conform to the properties specified on AS 5100.4.

If any of the representative bearings fail to meet the acceptance requirements, then all the bearings shall be tested and any non-conforming bearings shall be rejected and replaced with new bearings which conform to the requirements of AS 5100.4.

The Contractor shall provide a test certificate showing details of test results, including hardness, stiffness in compression and shear in its Inspection and Test Plan.

5.4 Care of Bearings

Bearings shall, at all times be handled carefully, and protected from direct sunlight and from extremes of heat and cold. Bearings shall be stored under cover and, after installation, they shall be adequately protected from the elements until the superstructure has been placed.

5.5 Anchorage Details

Any details such as dowel pins or sockets, shown in the Drawings as necessary to provide anchorage in any direction, shall be incorporated in the bearing manufacture, with true alignment to the bearing surface.

6 POT-TYPE BEARINGS

6.1 General

The type and dimensions of bearings shall be as shown on the Drawings and MRTS81.1. Movement shall be provided in the drawings or Annexure MRS81.1.

Bearings shall be supplied by a manufacturer experienced in the design and construction of such bearings. Proprietary bearings shall be fitted with a name plate indicating the manufacturer's name, bearing model or type, year of manufacture, unique number ID and design vertical load. In the case of guide slide pot-bearing, it shall be designed with two parallel guide bars outside the cylinder but not one guide bar at the centre of the cylinder. **Hold Point 5**

All bearings shall be fitted with transit keep plates to firmly hold components together during transport and erection.

Before ordering pot bearings, the Contractor shall submit to the Administrator detailed working drawings of the bearings proposed to be used together with evidence as to the satisfactory performance in service of similar bearings. Manufacturing tolerances shall be included on the drawings. The Contractor shall allow 14 days for a direction from the Administrator as to suitability of the proposed bearings. **Hold Point 6**

6.2 Materials

6.2.1 Stainless Steel Plate Sliding Surface

Stainless steel plate sliding surfaces shall be mirror polished using automated machinery complying with the requirements of ASTM A 240M or ASTM A 480M, having a surface finish not rougher than 0.4 μm CLA in both directions and a Brinell hardness not less than 125.

6.2.2 Polytetrafluoroethylene

The resin used in the manufacture of polytetrafluoroethylene (PTFE) sheets shall be 100% virgin PTFE, complying with ISO 13000-1 or AS 5100.4 as appropriate.

The following shall apply for PTFE to be permanently lubricated –

- a) The PTFE shall be dimpled or grooved to form lubrication reservoirs in the PTFE surface;
- b) The lubrication reservoirs shall cover between 10% and 30% of the total plan area of the PTFE;
- c) The volume of the reservoirs shall form between 3% and 20% of the total volume of the PTFE or the unconfined portion if the PTFE is recessed;
- d) The depth of the reservoirs shall not be greater than half the thickness of the PTFE, or the height of the PTFE above the backing plate if the PTFE is recessed; and
- e) With the exception of uplift bearings, the lubrication reservoirs shall be filled with long-life silicone grease, under factory conditions. After filling the lubrication reservoirs, the contact surface of the PTFE and the stainless steel shall not be allowed to separate at any time.

The PTFE pad for sliding bearings shall have a minimum thickness of 6 mm for pads with any dimension larger than 650 mm, and 4 mm for smaller dimensions. The pad shall be restrained by adhesive bonding; and it shall recess into the backing material to a depth of half the thickness of the PTFE, to prevent its extrusion.

The PTFE pad shall be permanently lubricated in accordance with Clause 14.2 of AS 5100.4. The lubricant used shall meet the requirements of Clause 6.2.6 of this Standard.

6.2.3 Pot and Piston

The cylinder and base plate of the pot shall be fabricated from one piece of steel. Welding of a separate base plate to the cylinder shall be approved if supporting design calculations and experimental evidence are submitted showing that the strength of the welded component is equivalent to that made from a single piece of steel.

The piston shall be machine-cut from a single piece of steel.

The piston rim shall have a nominal diameter not less than the internal diameter of the pot minus 1.0 mm. The vertical contact rim of the piston, which bears against the cylinder wall, shall be flat in cross-section only where SLS rotation angle is less than or equal to 0.025 radians and where its thickness is less than or equal to 15 mm. Bevel or curve the vertical contact rim of the piston if its thickness is greater than 15 mm or if the SLS rotation is greater than 0.025 radians.

Internal surfaces of the bearing to flatness shall be finished with not more than 0.005 times the nominal dimension and to a maximum surface roughness RA of 6.3 μm .

The gap between the pot and the piston shall be sealed against dust and moisture using either a small compression seal supplied and installed using a neutral cure silicon sealant with at least 50% movement accommodation factor. The seal shall remain effective at the maximum serviceability rotation (SLS rotation) and shall not be damaged at this rotation.

6.2.4 Guide Bars

Each guide bar shall be manufactured from a single piece of steel. Guide bars shall be recessed into the sliding plate and shall be able to withstand the lateral forces shown in the Drawings. The two contact surfaces of the guide bars shall be parallel and flat to within 0.001 of the nominal dimension.

The maximum gap between a guide and its corresponding sliding surface shall not exceed 3 mm when the other side is in full contact.

6.2.5 Internal Seal

The internal seal shall consist of a number of split rings formed to fit snugly in recesses in the elastomeric disc and within the inside surface of the pot. Each ring shall have one vertical cut at 45 degrees to the tangent, with a maximum gap of 1 mm. These cuts shall be staggered a minimum of 90 degrees relative to one another when the rings are fitted to the elastomeric disc.

The rings shall have a minimum thickness of 1.5 mm, with a minimum width of 6 mm for ring diameters less than or equal to 300 mm and 10 mm for ring diameters greater than 300 mm. The minimum number of rings shall be two, except where the outside diameter of the ring is greater than 700 mm or the specified rotational capacity is greater than 0.025 radians, then it shall be three.

6.2.6 Lubricant

Lubricant shall be silicone compounds used for filling the lubrication reservoirs in the dimpled face of the PTFE sliding pad and for lubrication of the top and bottom surfaces of the elastomeric disc. It shall retain its consistency at room temperature over a temperature range of - 40°C to + 200°C. The lubricant shall be compatible with all components in contact with it. It shall also comply with the requirements of Table 6.2.6.

Table 6.2.6 – Properties of Lubricant

Properties	Requirements	Method of Test
Penetration worked 60 stroke	< 260	ASTM D217
Evaporation – 24 h at 200°C	< 2%	ASTM D972

6.2.7 Elastomeric Disc

Each elastomeric disc shall be made from a single piece of elastomer, individually moulded or machine-cut from the moulded rubber slab. No discs shall be layered or stacked.

The disc shall be lubricated with a silicone compound complying with the requirements of Clause 6.2.6 of this Standard.

In the unloaded condition the lateral clearance between the pot and the elastomeric disc shall not exceed 0.2% of the diameter of the pad or 0.5 mm, whichever is greater.

6.2.8 Holding-Down Bolts

Holding-down bolts and sockets for pot-type bearings shall be high strength complying with the requirements of AS/NZS 1252 and shall be hot-dipped galvanised in accordance with AS 1214. Secondary coatings may be applied to achieve the design life.

6.3 Design Requirements

6.3.1 Design Life

All components of bearings shall be formulated to have a service life of not less than 100 years in Exposure Classification B1 of the Australian Bridge Design Code. For Exposure Classifications B2, C and U of the Australian Bridge Design Code, additional requirements may be stated in the Drawings.

6.3.2 Design Loads

The Ultimate Design Load, Tested Axial Load and Combined Axial and Lateral Loads for each type of bearing shall be as stated in Clause 2 of Annexure MRTS81.1 or shown on Bridge Design Drawings.

6.3.3 Rotation

Bearings shall be capable of a rotation of at least 0.02 radians unless shown otherwise in the Drawings. In the rotated position, no part of a bearing shall be in contact with the holding-down bolts irrespective of the displacement of the sliding plate.

6.3.4 Movement

The required movement of sliding bearings is stated in Clause 2 of Annexure MRTS81.1.

Directions of any presets shall be clearly identified by markings on the Bridge Design Drawings.

6.3.5 Coefficient of Friction

The coefficient of friction of sliding surfaces shall not exceed 0.04.

6.3.6 Centre of Rotation

Shifts in the centre of pressure due to rotation, not considering uplift bearings, shall be limited so as not to exceed $\frac{D}{6}$ where D is the diameter of the elastomer. Calculations of rotational movement and the value of the centre of pressure shall be in accordance with the AS 5100.4.

6.3.7 Compressive Stress on Elastomer

The ultimate compressive stress in the elastomer shall be 50 MPa. The initial compression of bearings under the design loads shall not exceed 1.5 mm and 3 mm at Serviceability Limit State and Ultimate Limit State respectively.

6.3.8 Shape of Elastomer

The thickness and formulation of the elastomer shall depend on the required rotational capacity and the smoothness of the inner surface of the pot.

However, in no case shall the total pad thickness be less than the larger of one fifteenth of the diameter of the elastomeric pad or 10 mm.

6.3.9 Internal Seal

The rings shall have a maximum surface roughness Ra of 6.3 µm.

6.3.10 Extrusion of Elastomer

The elastomer shall be prevented from extrusion from the pot in accordance with the requirements of AS 5100.4.

6.3.11 Sliding Surface

The horizontal sliding surface of sliding bearings shall consist of a confined pad of pure PTFE in contact with a polished stainless steel plate.

The stainless steel plate shall be not less than 1.5 mm thick and shall be secured to a backing plate by continuous edge welding, stainless steel countersunk screws, or similar method.

The stainless steel plate shall be sufficiently large so that, under the ultimate limit state movement range, the PTFE does not extend over the edge of the stainless steel plate.

The minimum thickness of unfilled (pure) PTFE shall be 4 mm, restrained by recessing it into a metal backing plate to a depth of half of the thickness of the PTFE. The PTFE shall normally be bonded under factory controlled conditions to the backing plate. However, provided that the backing plate does not deform under load and the recess satisfactorily resists the shearing forces, recessing only may be permitted.

For guides, filled PTFE to ASTM D4745 or BS6564 or other approved low friction material sliding on polished stainless steel shall be used. Filled PTFE shall consist of pure PTFE filled with no more than 25% glass filler. Test method and requirements shall comply with ASTM D3294.

Filled PTFE may be located by bonding only, provided that the bond to the backing plate is made with a proven adhesive and achieves a minimum peel strength of 4 N/mm width when tested in accordance with BS 5350, Part C9. Alternatively, the filled PTFE may be fixed using countersunk fasteners.

The compressive stress on pure PTFE at the ultimate limit state shall not exceed the values stated in Table 6.3.11. Values for filled PTFE may be 50% greater where this can be verified by test data.

Table 6.3.11 – Compressive Stress on Pure PTFE

Load Combination	Ultimate Compressive Stress (MPa)	
	Confined	
	Mean	Peak
Total Loads	50	60

The overall clear dimension between runner bar sliding surfaces shall not be more than 3 mm greater than the overall width of the plate that slides between them.

Sliding bearings shall have the larger of the sliding surfaces positioned above the smaller, so that the sliding surfaces are kept clean. Where shown in the Drawings, sliding bearings shall be fitted with a clearly visible movement scale and pointer.

6.4 Protective Coatings

After all welding and preliminary machining have been carried out, bearings shall be hot-dipped galvanised or hot zinc metal sprayed in accordance with the requirements of AS/NZS 4680.

After galvanising, the inside surfaces of the pot and side faces of the piston shall be machined or hand finished to the manufacturer’s normal tolerance. All internal surfaces shall have a minimum 10 µm thickness of galvanising after machining. A full 1 mm difference on diameter between piston and cylinder shall be allowed. Machined recesses for the PTFE disc shall be finished to specified flatness. All threads shall be tapped clean.

6.5 Testing

6.5.1 General

The testing operations shall be performed in an accredited NATA laboratory under the supervision of a competent person provided by the Contractor.

All testing and inspection shall be carried out in the presence of the Administrator. **Hold Point 7** The Contractor shall give the Administrator seven days notice of the testing of bearings.

6.5.2 Test Machines

Accuracy of load testing machine grade A is to be calibrated minimum every 24 months. **Hold Point 8** Accuracy of friction load and lateral load shall be within 1% of error.

Resolution of peak load for friction load and lateral load shall be within 2% of error.

6.5.3 Testing of Pot-type Bearings

A minimum of one representative bearing selected from every five identical bearings, or part thereof, shall be load tested. Representative bearings shall be tested in accordance with the Clauses 6.5.3 and 6.5.4. The direction of loads or rotations applied in all tests shall replicate the in-service conditions; and the bearings shall be tested as fabricated, excluding the seal between the pot and the piston.

6.5.4 Geometrical Testing

Geometrical parameters to be tested shall be flatness, surface roughness, and clearances. These parameters shall comply with the requirements of Clause 6.2.

Flatness shall be measured in all directions using a precision straight edge sliding on the surface and feeler gauges.

6.5.5 Load Tests

The Contractor shall give the Administrator at least seven (7) working days notice for the date and location of the first load test for each pot bearing type. **Hold Point 9**

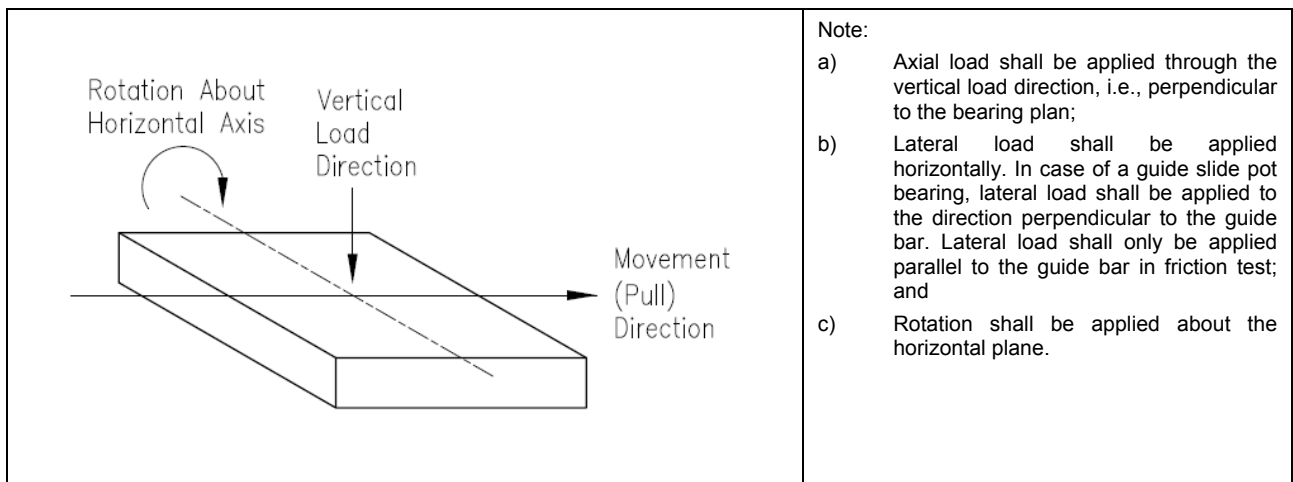
Required Load tests for different type of pot bearings are summarised in Table 6.5.5.

Table 6.5.5 – Load Tests Requirement

Bearing Type	Vertical	Lateral	Friction	Rotation
Fixed	Required	Required	Not Required	Required
Free Sliding	Required	Not Required	Required	Required
Guided Sliding	Required	Required	Required	Required

Rotation, vertical and horizontal loads shall be applied as the axis defined below in Figure 6.5.5.

Figure 6.5.5 – Definition of Loads Directions in Bearing Elevation



6.5.5.1 Vertical Load Test

Each bearing shall be individually loaded in compression to the value stated in Clause 2 of Annexure MRTS81.1 given in column "Maximum Ultimate Vertical Load". The Load shall be maintained for one minute, then released, reapplied and maintained for a minimum of three minutes. The test is invalid if the test load is less than 95% of the test load during the 3 minutes of the test. The bearing shall be visually inspected whilst under the second loading.

6.5.5.2 Combined Vertical and Lateral Load Test

Bearing shall be loaded in shear and compression to the value stated in Clause 2 of Annexure MRTS81.1 given in columns "Maximum Ultimate Lateral Load", "Maximum Ultimate Vertical Load" and "Concurrent Minimum Ultimate Vertical Load for Lateral Test". Bearings shall be tested as follows –

- Apply the maximum ultimate lateral load in conjunction with the concurrent minimum ultimate vertical load; and
- Apply the maximum ultimate lateral load in conjunction with the concurrent maximum ultimate vertical load.

In both cases the vertical load shall be applied first, followed by gradual application of the lateral loads. Lateral load shall be applied in the direction perpendicular to the guide bar; and the line of action of the force shall be horizontal. The test loads shall be maintained for a minimum of three minutes during which visual inspection of the bearing shall be carried out.

6.5.5.3 Coefficient of Friction Test

The coefficient of friction shall be determined using a vertical load corresponding to the factored down permanent vertical load on the bearing, at an ambient air temperature between 5°C and 35°C. Friction and lateral load shall be applied horizontally. **Hold Point 10**

The test displacement shall be equal to the design displacement value but in no case shall the test displacement be more than 50 mm but not exceed the design movement of the bearing. The vertical load shall be applied and maintained for duration of three minutes before commencing the test. The test sliding speed shall be in the range of 2.5 to 25 mm per minute as appropriate.

The maximum measured coefficient of friction shall not be greater than the values specified in Table 6.5.5.3 for the relevant stresses on PTFE.

Table 6.5.5.3 – Maximum Allowable Coefficient of Friction for Sliding Surface

Bearing Pressure	5 MPa	15 MPa	20 MPa	≥ 30 MPa
Coefficient of Friction	0.04	0.025	0.02	0.015

Note: Friction values for other bearing pressures shall be linearly interpolated from the above values.

6.5.5.4 Rotation Test

The bearing shall be tested at the design rotation specified in Clause 2 of Annexure MRTS81.1 given in column "Design Rotation" to 0.7 times the maximum ultimate vertical load specified in Clause 2 of Annexure MRTS81.1 given in column "Maximum Ultimate Vertical Load".

The applied test load and rotation shall be maintained for a minimum duration of three minutes. The direction of rotation is as shown on Figure 6.5.5.

6.5.6 Failure to Meet Requirements

After load testing, the bearing shall be dismantled and examined for rubber extrusion, PTFE damage, warping, scoring or other effects that may affect the durability of the bearing. Critical bearing dimensions and tolerances shall be measured.

If all the sampled bearings pass the load test, check of rubber extrusion, PTFE damage, warping, scoring or other effects that may affect the durability of the bearing, the bearings shall be accepted.

If any of the sampled bearings fail the load test, check of rubber extrusion, PTFE damage, warping, scoring or other effects that may affect the durability of the bearing, all the bearings shall be subjected to load testing and individual approval or rejection. If any of these defects exist, the individual bearing shall be rejected.

Bearings failing to meet the dimensional requirements of Clause 6.5.3 and the loading requirements of Clause 6.5.4 shall be rejected.

Bearings tested shall be rejected if they exhibit any signs of damage visible to the naked eye such as, but not restricted to –

- a) splitting, extrusion or permanent deformation of the elastomer;
- b) opening, extrusion or permanent deformation of the external seal;
- c) tearing, cracking or permanent deformation of the PTFE sliding surfaces;
- d) cracking, indentation or permanent deformation of the internal seal or other part of the bearing;
- e) abrasive marks indicating abnormal contact between the metal surfaces of the bearing plates or piston, and the pot;
- f) failure or permanent deformations of guide bars; or
- g) flow of elastomers.

If a bearing is rejected, two additional bearings from the batch it represents shall be tested. If both bearings meet the requirements of this Standard, the remaining bearings in the lot shall be accepted. Otherwise each bearing remaining in the lot shall be tested for compliance.

7 BEARING REPORT

At least ten working days prior to delivery of bearings to site, the Contractor shall forward to the Administrator a bearing report with test results demonstrating that all bearings supplied comply with the requirements of this Standard.

8 IDENTIFICATION AND DELIVERY

All bearings shall be clearly marked in order to identify their type and location in the bridge.

Mating parts of bearings shall be supplied in sets held together at the correct preset and skewed with metal transit clips and/or bolts to prevent misalignment and/or damage of the components during transport and erection. No transit clips and/or bolts shall be removed until after completion of installation in the bridge. Bearings shall be protected in dust and moisture resistant wrappings until after assembly and during transport to site.

The Contractor shall submit to the Administrator the bearing report in accordance with Clause 5 at least ten working days before the proposed deliver bearings to the site.

9 SUPPLEMENTARY REQUIREMENTS

The requirements of MRTS81 *Bridge Bearings* are varied by the Supplementary Requirements given in Clause 3 of Annexure MRTS81.1.