

Structures

Master Specification

ST-BF-C1 Bearings

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ST-BF-C1 Bearings

1 General

- 1.1 This Part specifies the requirements for the supply, delivery and installation of elastomeric and pot bridge bearings. If the Principal has not provided a design of the bearings, the Contractor shall design the bearings in accordance with AS 5100.
- 1.2 Elastomeric bearings shall be supplied in accordance with the requirements of AS 5100.4 and as shown on the Drawings. Neoprene strip bearings, detailed on the Drawings, shall comply with the material requirements of AS 5100.4 Appendix B with a durometer hardness of 53.
- 1.3 Pot bearings shall be manufactured in accordance with AS 5100.4: 2004.
- 1.4 Sliding contact surfaces shall be manufactured in accordance with AS 5100.4: 2004 Clause 14: "Sliding Contact Surfaces," except where amended or added to by this Part. Materials in sliding contact surfaces shall consist of PTFE (polytetrafluoroethylene) sliding on stainless steel.
- 1.5 The following standards, documents and guidelines (including the most recent revisions and amendments) are referenced in this Part:
 - a) AS 1196 Polytetrafluoroethylene (PTFE) Moulded Sheet.
 - b) AS 1523 Elastomeric bearings for use in structures.
 - c) AS 1554 Structural Steel Welding.
 - d) AS 3678 Structural Steel - Hot-rolled Plates, Floor-plates and Slabs.
 - e) AS 3679 Structural Steel.
 - f) AS 5100 Bridge Design.
 - g) ASTM A240M-03b Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - h) Transport for NSW QA Bridgeworks specifications
- 1.6 Where a bearing, or part of a bearing, is required that is not covered by this Part, compliance is required to the relevant Part(s) of the Transport for NSW QA Bridgework specifications.

2 Quality Requirements

- 2.1 At a minimum, the Contractor's Quality Plan shall include the following documents, procedures and / or instructions:
 - a) Method of bearing installation.
- 2.2 If not provided beforehand, the procedures shall be submitted at least 28 days prior to the commencement of site work.
- 2.3 Provision of the documents listed in this Clause shall constitute a **Hold Point**.

3 Properties of Materials

PTFE

- 3.1 The PTFE sliding pad shall consist of unfilled PTFE sheets. PTFE sheets shall be permanently lubricated in accordance with the conditions specified in AS 5100.4, Clause 11.2 "Frictional Restraint of Sliding Surfaces."
- 3.2 The resin used in the manufacture of PTFE sliding pads shall be 100% virgin material complying with AS 1196, Grade A, with a relative density of 2.13 to 2.23 and durometer hardness of 50 to 65.

Steel other than Stainless Steel

- 3.3 The steel, other than stainless steel, used in the manufacture of the bearings shall conform to AS 3678 and AS 3679 and welding shall conform to AS 1554.

Stainless Steel

- 3.4 The stainless steel plate mating with the PTFE shall be to ASTM A240M-03b, Type 304. The sliding surface shall be polished to a bright mirror finish, less than 0.4 μm Ra (CLA) in both directions and having a Brinell hardness not less than 125.

4 Protective Treatment of Bearings, Fixing Plates and Shim Plates

- 4.1 Stainless steel sliding surfaces of expansion bearings shall receive no protective treatment and care shall be taken to protect these surfaces from being damaged or coated during the application of the protective treatment.
- 4.2 Remaining surfaces shall be treated in accordance with ST-SS-S2 "Protective Treatment of Structural Steelwork".

5 Inspection of Bearings

- 5.1 The Contractor shall arrange for each pot bearing to be dismantled by the manufacturer and visually inspected by a nominated third party at the manufacturer's works prior to delivery. No bearing shall be separated or dismantled on site.

6 Testing of Bearings

General

- 6.1 Where a third party is required for inspection or testing purposes, an appropriately qualified person(s) shall be nominated by the Contractor for approval at least 2 weeks prior to the inspection / testing being required.
- 6.2 One representative bearing from every 10 bearings, or part thereof, of each size and type, shall be selected by the Contractor for testing. The cost of this testing shall be borne by the Contractor.

Testing

- 6.3 Testing shall be carried out at a NATA approved laboratory and the method of testing the bearings shall be subject to approval. The equipment for testing bearings shall be capable of determining loads to an accuracy of $\pm 3\%$ and deflections to $\pm 1\%$. Where necessary, to achieve the specified accuracy for testing, equipment shall be calibrated and test results corrected accordingly.
- 6.4 All testing shall be carried out in the presence of the nominated third party who shall be given at least 2 weeks prior notice of the testing.
- 6.5 After load testing, pot bearing(s) shall be dismantled and examined.

Test Loads

- 6.6 Testing of elastomeric bearings for compression, compression stiffness and shear stiffness shall be carried out as per Appendix D of AS5100.4.
- 6.7 Elastomeric bearings which are required to resist horizontal forces shall be further tested to 1.5 times the rated serviceability state lateral capacity for the bearings specified on the Drawings while loaded in compression to the concurrent serviceability state vertical load specified on the Drawings. The load shall be maintained for 3 minutes.

6.8 Load testing of pot bearings shall be in accordance with AS5100.4 Clause 13.2.

Test for Coefficient of Friction

6.9 The coefficient of friction of sliding surfaces of expansion bearings shall be determined. The value of the coefficient of friction shall be taken as the average result of 5 tests and shall be determined for both minimum and maximum vertical serviceability state loads but the bearings may be given 2 preliminary sliding runs under load prior to taking the test readings.

6.10 The friction coefficient of the sliding surfaces shall not exceed the values given in Table ST-BF-C1 6-1 for the relevant stresses on the PTFE surface. Values shall be interpolated for intermediate bearing pressures.

Table ST-BF-C1 6-1 Friction Coefficient of Sliding Surfaces

Bearing Pressure (MPa)	Friction Coefficient
5	0.08
10	0.06
20	0.04
30 or greater	0.03

Failure to Meet Requirements

6.11 A bearing will be considered as non-conforming if it exhibits any signs of failure such as:

- a) splitting or permanent deformation of the elastomer;
- b) for elastomeric bearings, signs of misplaced steel plates, bond failure or surface defects, such as tears or splits;
- c) tearing, cracking or permanent deformation of the PTFE sliding surface;
- d) for pot bearings, cracking or permanent deformation of the sealing ring or other part of the bearing;
- e) for pot bearings, abrasive marks indicating abnormal contact between the metal surfaces of the bearing plates or piston, and the pot; or
- f) for pot bearings, any other form of distress, warping, scoring, rubber extrusion or other effect which could affect the durability of the bearing.

6.12 If a bearing is non-conforming, 2 additional bearings from the batch it represented shall be tested. If both bearings meet the requirements of this Specification, the remaining bearings in the batch shall be accepted. Otherwise each remaining bearing in the batch shall be tested to determine its compliance with the Specification.

7 Test Certificates

7.1 At least 7 days prior to delivery to the bridge site, the Contractor shall supply NATA endorsed test reports of the bearings tested. The Contractor shall supply copies of the test certificates showing details of each bearing tested and the test results of each sample of elastomer. The test certificates shall show whether any tolerances have been exceeded or whether any faults have been observed.

7.2 Submission of this information shall constitute a **Hold Point**.

8 Marking and Delivery

8.1 Bearings shall be supplied in sets held together to prevent damage to components during transport. Pot bearings shall be held together with metal erection straps to prevent misalignment or separation. The erection straps shall not be removed until the time specified on the Drawings or manufacturer's instructions.

8.2 Pot expansion bearings shall be supplied with the sliding plate set to the correct offset. All set screws that cannot be installed with the temporary erection straps in place shall be in place when the bearing is supplied.

- 8.3 The Contractor shall inspect the bearings upon delivery to verify that dimensions, bolt sizes, hole sizes, and offsets are correct. The Contractor shall also verify that he is able to install each pot bearing and its components without disassembling or separating the bearing.

9 Installation

- 9.1 Installation of bearings shall be in accordance with instructions on the Drawings and with the manufacturer's instructions. Pot bearings shall not be disassembled or separated once delivered to site under any circumstances. Any action that causes separation of a pot bearing at any time is not to be permitted. Any action that causes a shift in the lateral position and alignment of a bearing or bearing component at any time is not to be permitted.

10 Hold Points

- 10.1 The following is a summary of Hold Points referenced in this Part:

Document Ref.	Hold Point	Response Time
2.3	Submission of Procedures	7 days
7.2	Submission of NATA endorsed test reports and AS 1523, Appendix B information if appropriate	2 working days