

INTEROFFICE MEMORANDUM

DATE: November 23, 1994

TO: BRIDGE DESIGNERS
FROM: Dale F. Loe, Bridge Engineer
SUBJECT: Design of Elastomeric Bearing

Effective 11-23-94 use the following to design elastomeric bearings on all new jobs:

1. Method B - AASHTO Standard Specifications, 15th edition, with current interims.
2. Harness 50.
3. Minimum 0.015 radians for dead load rotation about transverse axis.
4. Maximum and minimum live load reaction with corresponding rotation.
5. Figure 14.4.1.2A for compressive stress, strain and shape factor.
6. Minimum 0.25 inches thickness for internal elastomer layer.
7. Minimum 30 ksi yield strength for internal reinforcement.
8. If anchorage requirement is met, attachment of elastomeric bearing to concrete cap with epoxy not required. See Section 14.5 Anchorage.

On elastomeric design drawing show:

- (1) Maximum dead plus live load reaction for bearing.
- (2) Elastomeric bearing vulcanized to external load plates.

Use Special Provision, Elastomeric Bearing - Method B, in jog.

DFL:bw

ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT

SPECIAL PROVISION

JOB NO.

ELASTOMERIC BEARINGS - METHOD B

Section 808 of the Standard Specifications, Edition of 1993, is hereby amended as follows:

Subsection 808.02 is deleted and the following substituted therefore:

808.02 Materials. The elastomer compound shall be of 100% virgin polychloroprene (neoprene) and shall meet the minimum requirements shown in Table 808-1. The testing methods given in Table 808-1 shall be used when determining material properties. When test specimens are cut from the finished product, a 10% variation in the physical properties indicated will be allowed.

Elastomers for steel reinforced bearings shall be 50-durometer hardness. Elastomers in unreinforced pads may be 50, 60, or 70-durometer hardness.

Steel lamina shall be rolled mild steel conforming to ASTM A36, A570, or equivalent shall have a minimum yield strength for 30,000 psi, and shall be ordered to the minimum nominal thickness specified on the plans. Gauge thicknesses shown on the plans are U.S. Standard Gauge.

External load plates shall conform to the requirements of ASTM A36, A588, or A572-Gr. 50 as noted on the plans.

The vulcanized bond in reinforced bearings shall develop a minimum peel strength of 40 lb/in. Peel strength tests shall be performed in accordance with ASTM D429 Method B.

Table 808-1 is deleted and the following table is substituted therefor:

**TABLE 808-1
ELASTOMER MATERIAL PROPERTIES**

MATERIAL PROPERTY	ASTM STD. TEST	TEST REQUIREMENTS	TEST 50 Durometer	VALUES 60 Durometer	FOR: 70 Durometer
Physical Properties	D 2240	Hardness (Shore A Durometer)	50 ± 5	60 ± 5	70 ± 5
	D 412	Tensile Strength, Minimum psi	2250	2250	2250
		Ultimate Elongation, Minimum %	400	350	300
Heat Resistance	D 573 70 Hours at 212°F.	Change in Durometer Hardness, Maximum Points	15	15	15
		Change in Tensile Strength, Max. %	- 15	- 15	- 15
		Change in Ultimate Elongation, Max. %	- 40	- 40	- 40
Compression Set	D 395 Method B	22 Hours @ 212°F. Max. %	35	35	35
Ozone	D 1149	100 pphm ozone in air by volume, 20% strain 100°F. $\pm 2^\circ$ F.			
		100 hours mounting procedure D518, Procedure A	No Cracks	No Cracks	No Cracks
Instantaneous Thermal Stiffening	D 1043	Tested @ - 25 ° F.	Stiffness at Test Temperature shall not exceed 4 times the stiffness measured at 73° F.		
Shear Modulus	D 4014	Using apparatus and procedures described in Annex A, Range, psi	95-130	130-200	200-300

Note: All tests to be carried out at 73° F. $\pm 4^\circ$ F. unless otherwise noted. Shear modulus test is not required for unreinforced bearings.

Subsection 808.03 is deleted and the following substituted therefore:

808.03 Fabrication. Bearings shall be furnished with the dimensions shown on the plans unless otherwise approved by the Engineer. Shop drawings for reinforced bearings shall be submitted to the Bridge Engineer and approval secured before fabrication is begun. Such drawings shall show the materials and fabrication procedures to be used; any changes from plan dimensions to conform to available molds, **and the bearing orientation and manner of marking the orientation when tapered external load plates are required.** Unreinforced pads may be fabricated without submission or approval of shop drawings. Changes from plan dimensions proposed by the Contractor and approved by the Engineer shall be at no additional cost to the State.

Reinforced bearings shall be cast as a unit in a mold and shall be bonded and vulcanized under heat and pressure. The mold finish shall conform to standard shop practice. Internal steel lamina shall be sandblasted and cleaned of all surface coatings, rust, mill scale, and dirt before bonding. They must be free of sharp edges and burrs and shall be sized to provide a minimum edge cover of 1/8 inch. **External load plates** (sole plates and masonry plates) shall be protected from rusting by the manufacturer and **shall be vulcanized to the bearing pad** during the primary molding process. Reinforced bearings shall be manufactured as a single unit.

Unreinforced pads may be molded or extruded, and vulcanized in large sheets and cut to size. Cutting shall not heat the materials, and shall produce a smooth finish to ANSI B46.1, 250 micro inches. Unreinforced pads shall be molded or extruded to the finished thickness. Plying pads of lesser thickness together to make pads of finished thickness will not be allowed.

Flash tolerance, finish, and appearance shall meet the requirements of the latest edition of the Rubber Handbook as published by the Rubber Manufacturers Association, Inc., RMA F3 and T.063 for molded bearings and RMA F2 for extruded bearings.

Subsection 808.04 is modified as follows:

In the first sentence of the first paragraph of Subsection 808.04 the words "Plain pads and laminated bearings" are deleted and the words "Unreinforced pads and reinforced bearings" are substituted therefore.

Add the following to Subsection 808.04: External load plates shall be built to the design dimensions and these specifications with the following tolerances:

- 1) Overall Dimensions

Thickness	± 0.063 in.
Length and Width	± 0.250 in.
Flatness	0.001 x Nominal dimension
Surface Finish (for surface in contact with the bearing)	125 μ - in.

- 2) Bevel Slope ± 0.002 radians

Subsections 808.05 thru 808.08 are deleted and the following substituted therefore:

808.05 Visual Inspection and proof loading of Finished Bearings. Every bearing shall be inspected for compliance with dimensional tolerances and for overall quality of manufacture. In reinforced bearings, the edges of the internal steel lamina shall be protected everywhere from corrosion.

The manufacturer shall proof load each reinforced bearing with a compressive load equal to 1.5 times its maximum design load shown on the plans. The load shall be held constant for five minutes, removed, and reapplied for another five minutes. The bearing shall be examined visually while under the second loading. If the bulging pattern suggests lamina parallelism or a layer thickness that is outside the specified tolerances, or poor lamina bond, the bearing shall be rejected. If there are three or more separate surface cracks that are greater than 0.08 inches wide and 0.08 inches deep, the bearing shall be rejected.

808.06 Testing and Acceptance Criteria. Testing for meeting the requirements of Subsection 808.02 shall be performed on each production lot of bearings. Such testing may require the destruction of one or more bearings from a lot; therefore, the manufacturer should make provisions to provide additional bearings for testing purposes at no additional cost to the State.

Additionally, for each lot of reinforced bearings, a randomly selected sample comprising at least 10 percent of the lot shall be compression tested by the manufacturer. Each sample shall be loaded to 1.5 times its maximum design load shown on the plans for a minimum period of 15 hours. If, during the test, the load falls below 1.3 times the maximum design load, the test duration shall be increased by the period of time for which the load is below this limit. The bearing shall be examined visually at the end of the test while it is still under load. If the bulging pattern suggests lamina parallelism or a layer thickness that is outside the specified tolerances, or poor lamina bond, the bearing shall be rejected. If

there are three or more surface cracks that are greater than 0.08 inches wide and 0.08 inches deep, the bearing shall be rejected.

If a sample fails any test required by this subsection, all of the bearings of that lot will be rejected, unless the manufacturer elects to test each bearing at his expense.

A lot is defined as a group of no more than 100 bearings which are manufactured from the same batch of elastomer, cured under the same conditions and are all the same size.

808.07 Certification and Marking. The manufacturer shall certify that each bearing satisfies these specifications. He shall supply a certified copy of all test results, including the number of reinforced pads that failed the proof load test. Certified mill certificates for internal steel lamina and external load plates shall also be supplied.

Each reinforced bearing shall be marked in indelible ink or flexible paint. **The marking shall consist of the orientation, the order number, lot number, bearing identification number, and elastomer type and grade number. Unless otherwise specified, the marking shall be on a face that is visible after erection of the bridge.**

808.08 Installation. **Bearings shall be placed on level, uniform surfaces.** Any misalignment in the support shall be corrected to form a level surface. In no case shall the elastomer or the bond be subjected to temperatures higher than 400° F.

808.09 Method of Measurement. Reinforced elastomeric bearings will be measured by the cubic inch of elastomer material, including required lamina. No deductions will be made for boltholes. External load plates will not be paid for directly but will be considered as part of the item Elastomeric Bearings.

Unreinforced pads will not be measured separately, but will be considered subsidiary to "Class S Concrete - Bridge."

The quantities shown on the plans will be considered as the final quantities and no further measurement will be made unless, in the opinion of the Engineer or upon evidence furnished by the Contractor, substantial variations exist between quantities shown on the plans and actual quantities due to changes in alignment, dimensions or apparent errors.

Subsection 808.09 Basis of Payment is renumbered Subsection **808.10**.