



SECTION 1038

BEARING PADS FOR STRUCTURES

1038.1 Scope. These specifications cover elastomeric bearing pads of neoprene, of rubber and fabric and of rubber and fiber. Elastomeric bearing pads shall include plain bearings, consisting of elastomer only, and laminated bearings, consisting of layers of elastomer restrained at their interfaces by bonded laminates.

1038.2 Acceptance. All material will be accepted on the basis of the required certification and testing required by the engineer.

1038.3 Elastomeric Bearing Pads.

1038.3.1 Material. The elastomer shall be 100 percent virgin chloroprene (neoprene) compound meeting the requirements shown below. The pads shall be of the Durometer Grade specified on the plans. If test specimens are cut from the finished product, a 10 percent variation in "Physical Properties" will be allowed.

ASTM Standard	Property	Durometer Grade		
		50	60	70
D 2240	Hardness	50 ± 5	60 ± 5	70 ± 5
D 412	Tensile Strength, psi (MPa), minimum	2500 (17.2)	2500 (17.2)	2500 (17.2)
D 412	Ultimate Elongation, percent, min	400	350	300
D 573 70 hrs @ 212 F (100 C)	Heat Resistance Change in Durometer Hardness, points, max Change in Tensile Strength, percent, max Change in Ultimate Elongation, percent, max	+15 -15 -40	+15 -15 -40	+15 -15 -40
D 395, Method B	Compressive Set 22 hrs at 212 F (100 C), %, max	35	35	35
D 1149	Ozone 100 pphm ozone in air by volume, 20 % strain 100 ± 2 F (37.7 ± 1 C), 100 hrs, mounting procedure ASTM D 518 Procedure A	No Cracks	No Cracks	No Cracks
D 429, Method B	Adhesion Bond made during vulcanization, lbs/inch (N/m)	40 (7.010)	40 (7.010)	40 (7.010)
D 746, Procedure B	Low Temperature Test Brittleness at -40 F (-40 C)	No Failure	No Failure	No Failure

1038.3.2 Laminates. Laminates shall be cold rolled sheets in accordance with ASTM A 1008 or hot rolled steel sheets in accordance with ASTM A 1011 with a minimum grade of 36 (250).

1038.3.3 Manufacturing Requirements. Shop drawings for laminated neoprene bearings pad assemblies shall be prepared and submitted to Bridge for approval in accordance with [Sec 1080.3.2](#). Shop drawings will not be required for plain neoprene bearing pads or laminated neoprene bearing pads without a steel sole plate. Cut edges shall be at least as smooth as ANSI 250 (6 µm) finish. Unless otherwise shown on the plans, all components of a laminated bearing shall be molded together into an integral unit, and all edges of the laminations shall be covered by a minimum of 1/8 inch (3 mm) of elastomer except at laminate restraining devices and around holes that will be entirely closed on the finished structure. The laminated neoprene bearings pad assembly steel sole plate shall be bonded by vulcanization to the laminated neoprene pad to provide a homogenous bond free of air and moisture pockets. The following values shall be met under laboratory testing conditions of full size bearings:

(a) Compressive strain of any layer of an elastomeric bearing shall not exceed seven percent at 800 psi (5.5 MPa) average unit pressure or at the design dead load plus live load pressure, if so indicated on the plans.

(b) Shear resistance of the bearing shall not exceed 50 psi (345 kPa) for 50 durometer, 75 psi (520 kPa) for 60 durometer or 110 psi (760 kPa) for 70 durometer compounds at 25 percent strain of the total effective elastomer thickness after an extended 4-day ambient temperature of -20 F (-29C).

1038.3.4 The manufacturer shall proof load each laminated neoprene bearing with a compressive load of 1,500 psi (10.34 MPa) on the bearing area. The bulging pattern shall not indicate improper laminate placement or poor laminate bond. No more than two separate surface cracks with a width of 0.08 inches [2 mm] and a depth of 0.08 inches (2 mm) will be permitted.

1038.4 Type “N” Polytetrafluoroethylene (PTFE) Bearings.

1038.4.1 Type “N” PTFE bearings shall be either fixed units or expansion units having sliding surfaces of mirror stainless steel against PTFE material. Shop drawings for type “N” PTFE bearings shall be prepared and submitted to Bridge for approval in accordance with [Sec 1080.3.2](#). The PTFE sliding bearings shall consist of a steel sole plate with a welded upper element of stainless steel bearing on a lower element consisting of a layer of PTFE material bonded to a stainless steel plate that shall be bonded to the neoprene elastomeric pad. The surface of the stainless steel plate shall be protected from weld splatter during the welding procedure.

1038.4.2 The stainless steel sheet for the top and bottom elements of sliding bearings shall be Type 304 in accordance with ASTM A 240. The finished stainless surface of the top element shall be a plane within a tolerance of 1/32 inch (0.8 mm), polished sufficiently to meet the friction requirement in [Sec 1038.4.6.1](#), and shall be comparable to a No. 8 mirror finish as established by the American Iron and Steel Institute Committee of Stainless Steel Producers “Finishes for Stainless Steel” at the completion of fabrication.

1038.4.3 Neoprene elastomeric pads shall be in accordance with [Sec 1038.3](#).

1038.4.4 The PTFE material shall be 100 percent virgin PTFE fluorocarbon resin, unfilled or filled with fiberglass reinforcement to minimize the cold flow tendencies while maintaining the friction properties of the PTFE fluorocarbon resin. The amount of filler by weight of filled PTFE sheet shall be no more than 15 percent. The finished material shall exhibit the following physical properties:

Requirement	Test Method	Filled Value	Unfilled Value
Tensile Strength, psi (MPa)	ASTM D 638	2000 (13.8), min	-
	ASTM D 2256	-	2800 (19.3), min
Elongation, Percent	ASTM D 638	150, min	-
	ASTM D 2256	-	200, min
Melting Point	ASTM D 4895	621 ± 18 F (327 ± 10 C)	623 ± 2 F (328 ± 1 C)
Specific Gravity	ASTM D 4895	2.20 ± 0.03	2.16 ± 0.03

1038.4.5 The PTFE sheet shall be bonded to the stainless steel with epoxy bonding material designated by the manufacture as compatible with the PTFE sheet and stainless steel and be able to withstand the temperatures of vulcanization. The stainless steel shall then be bonded by vulcanization to the neoprene elastomer to provide a homogenous bond free of air and moisture pockets.

1038.4.6 One load specimen from the sliding bearing, consisting of a bottom element and a compatible top element no less than the smaller of the bearing area or 7 x 7 inches (178 mm x 178 mm) shall be tested by the manufacturer.

1038.4.6.1 The specimen shall be loaded to 800 psi (5.51 MPa) compression at 68 F ± 2 F (20 C ± 1 C) and subjected to 100 cycles of one inch (25 mm) of horizontal movement each way from center at a rate of 2.5 inches (63 mm) per minute. The breakaway friction coefficient shall be computed for each direction of each cycle, and the breakaway friction coefficient mean and standard deviation shall be computed for the sixth through twelfth cycles. The initial static breakaway coefficient of friction for the first cycle shall not exceed twice the design coefficient of friction. The maximum coefficient of friction for all subsequent cycles shall not exceed the design coefficient of friction. Failure of a single sample shall result in rejection of the entire lot. Following the test, the breakaway coefficient of friction shall be determined again and shall not exceed the initial value. The bearing shall show no signs of bond failure or other defect.

1038.4.6.2 A minimum of one test for sliding bearings shall be performed for each lot of bearings.

1038.5 Rubber and Fabric Pads.

1038.5.1 Rubber and fabric bearings pads shall be manufactured of new material and be composed of multiple layers of prestressed cotton duck material weighing no less than 8.1 ounces per square yard (0.2746 kg/m²). The duck warp count shall be 50 threads plus or minus one thread per inch (25 mm) and filing count 40 threads plus or minus two threads per inch (25 mm), each with two yarns per thread. The finished pads shall have 64 plies per inch (25 mm) of thickness. The duck material shall be impregnated and bound with a high quality rubber compound containing rot and mildew inhibitors and anti-oxidants, compounded into resilient pads of uniform thickness.

1038.5.2 The pads shall withstand compressive loads perpendicular to the plane of laminations of no less than 10,000 psi (69 MPa) without separation of bond or detrimental deformation. Load deflection properties, determined in accordance with procedures of Military Specifications MIL-C-882B, shall not exceed 10 percent of total pad thickness at 1000 psi (6.9 MPa) and 15 percent of total pad thickness at 2000 psi (14 MPa). When loaded to 1500 psi (10 MPa), permanent set as load shall be removed in accordance with procedures of MIL-C-882B and shall be no more than 2.5 percent of the original "zero point" thickness. Type A Durometer hardness shall be 87 to 95. The ratio of lateral expansion to vertical

deflection shall not exceed 0.25 when loaded to 1500 psi (10 MPa). The material shall not lose effectiveness throughout a temperature range of -65 F to 150 F (-54 to 66 C). The thickness shall vary no more than five percent from that shown on the plans. There shall be no visible evidence of damage or deterioration resulting from environmental effects of sunshine, humidity, salt spray, fungus or dust in accordance with MIL-E-5272.

1038.6 Rubber and Fiber Pads.

1038.6.1 Rubber and fiber bearing pads shall consist of a rubber body and fabric fibers for insulation under aluminum rail posts. The bearing pads shall be made from new unvulcanized rubber and unused fabric fibers. Fibers and rubber shall be in proper proportion to maintain specified strength and stability.

1038.6.2 Type A durometer surface hardness of the pads shall be 70 to 90. Pads of the specified thickness shall be capable of withstanding compressive loads of no less than 7000 psi (48 MPa) without excessive extrusion or detrimental reduction in thickness.

1038.7 Tolerances. For both plain and laminated bearings, the permissible variation from the dimensions and configuration shown on the plans shall be as follows:

	Inch (mm)
Overall Vertical Dimensions	
Average total thickness 1 1/4 inches (32 mm) or less	-0, +1/8 (-0, +3)
Average total thickness over 1 1/4 inches (32 mm)	-0, +1/4 (-0, +6)
Overall Horizontal Dimensions	
36 inches (914 mm) and less	-0, +1/4 (-0, +6)
Over 36 inches (914 mm)	-0, +1/2 (-0, +12)
Thickness of Individual Layers of Elastomer (Laminated bearings only)	± 1/8 (± 3)
Variation from a Plane Parallel to the Theoretical Surface (as determined by measurements at the edges of bearings)	
Top	1/8 (3)
Sides	1/4 (6)
Individual non-elastic laminates	1/8 (3)
Position of Exposed Connection Members	1/8 (3)
Edge Cover of Embedded Laminates or Connection Members	-0, +1/8 (-0, +3)
Size of Holes, Slots or Inserts	-0, +1/8 (-0, +3)
Position of Holes, Slots or Inserts	± 1/8 (± 3)

1038.8 Certification. The manufacturer shall furnish certification of all material. The certification shall indicate that the components are in accordance with this specification and shall include typical test results representative of the material, except for bearings meeting 1038.3 and 1038.4 which will require test results for the material actually used in the bearing. The certification shall indicate the results of the proof loading, when required.