GRANOR
RUBBER & ENGINEERING

GRANOR® ELASTOMERIC BEARINGS
PADS & STRIP, SERIES BS

Generically referred to as "unreinforced" Bearing Pads or Bearing Strip, they are pressure moulded from a high quality 60 IRHD hardness Natural Rubber compound to AS5100.4.

NATA and NATA MRA Certification on Hardness, Tensile Strength, Compression Set and Ozone resistance is available.

DESIGN PARAMETERS

The design of Elastomeric Bearing Strip & Bearing Pads is largely empirical. In the determination of the shape factor used in the computation process, a safety factor is incorporated in order to ensure a reasonable correlation between the calculated compressive stiffness value and the actual test value. This is largely an attempt to compensate for variations of compressive stiffness as will be experienced in practice, due to the friction that will occur when different surfaces are in contact with the rubber.

MATERIAL LENGTHS

Standard segment lengths are 1.85 metre with some sizes also available in 2 metre lengths. By placement "end to end" on the headstock / corbel the support conditions become referred to as "continuous".

HOLES

Holes can be provided. Alternatively, many contractors prefer to "match mark" and drill on site.

Specially moulded modules with countersunk or counterbored holes are also available on special request. These are sometimes used as a means to hold vertically orientated buffer bearing pads in position.

If requiring holes in bearings please clearly dimension these on the project drawings.

TOLERANCES

Hardness 60 IRHD Duro	+/- 5 Points
Length	+/- 5mm
Width	+/- 3mm
Thickness	+/- 1mm

Standard Thicknesses

Standard thicknesses are – 3, 6, 10, 13, 20, & 25mm. Other thicknesses are available but by special order only.

DESIGN LIFE

Natural rubber elastomeric bearings have a reliable proven design life of at least 100 years with zero maintenance.

COMPOUND CHARACTERISTICS SERIES "BS" BEARING STRIP & PADS

Specification	Result
Hardness	60 IRHD Duro +/- 5
Elongation	475% min.
Ultimate Tensile Strength	17.0 MPa min
Elastic Modulus (E)	3.8 MPa.
Shear Modulus (G)	0.9 MPa.
Bulk Modulus	2000
Compression Set	30% max.
Ozone resistance	No cracking after 100 hours at 20% strain, 40°C. and 100pphm.
Accelerated aging	Max. permissible change in properties; Hardness + 4, Tensile +/- 10%, Ultimate tensile strain - 15%
QA Certificate	AS5100.4 Type 60H

FRICTION CO-EFFICIENT VALUES RUBBER AGAINST INTERFACE (INDICATIVE)

Interface	Characteristic friction co-efficient of rubber against nominated μ (indicative)
Wood floated concrete	0.35
Steel floated concrete	0.30
Concrete cast in situ against elastomer	0.25
Hot-dipped galvanized surfaces	0.08

GRANOR® ELASTOMERIC BEARINGS PADS & STRIP, SERIES "BS"

Granor Part Number	Cross Section (mm)	Maximum Working load (kN/m) SLS	Maximum Shear Deformation (mm)	Compressive Stiffness (kN/mm per metre of strip)	Shear Stiffness (kN/mm per metre of strip)	Rotation (Rads.) Maximum #
BS-50-3/. . . .*	50 x 3	250	1.5	1278	15.0	0.011
BS-75-3/. . . .*	75 x 3	375	1.5	2750	22.5	0.005
BS-100-3/. . . .*	100 x 3	500	1.5	4778	30.0	0.003
BS-125-3/. . . .*	125 x 3	625	1.5	7361	37.5	0.002
BS-150-3/. . . .*	150 x 3	750	1.5	10500	45.0	0.001
BS-50-6/. . . .*	50 x 6	200	3	347	7.5	0.036
BS-75-6/. . . .*	75 x 6	375	3	750	11.3	0.020
BS-100-6/. . . .*	100 x 6	500	3	1278	15.0	0.011
BS-125-6/. . . .*	125 x 6	625	3	1944	18.8	0.007
BS-150-6/. . . .*	150 x 6	750	3	2750	22.5	0.005
BS-75-10/. . . .*	75 x 10	280	5	281	6.8	0.040
BS-100-10/. . . .*	100 x 10	500	5	500	9.0	0.030
BS-125-10/. . . .*	125 x 10	625	5	750	11.3	0.020
BS-150-10/. . . .*	150 x 10	750	5	1050	13.5	0.014
BS-200-10/. . . .*	200 x 10	1000	5	1800	18.0	0.008
BS-75-13/. . . .*	75 x 13	215	6.5	166	5.2	0.052
BS-100-13/. . . .*	100 x 13	385	6.5	296	6.9	0.039
BS-125-13/. . . .*	125 x 13	600	6.5	462	8.7	0.031
BS-150-13/. . . .*	150 x 13	750	6.5	648	10.4	0.023
BS-200-13/. . . .*	200 x 13	1000	6.5	1101	13.8	0.013
BS-100-20/. . . .*	100 x 20	250	10	125	4.5	0.060
BS-125-20/. . . .*	125 x 20	390	10	195	5.6	0.048
BS-150-20/. . . .*	150 x 20	560	10	281	6.8	0.040
BS-200-20/. . . .*	200 x 20	1000	10	500	9.0	0.030
BS-250-20/. . . .*	250 x 20	1250	10	750	11.3	0.020
BS-100-25/. . . .*	100 x 25	200	12.5	80	3.6	0.075
BS-125-25/. . . .*	125 x 25	310	12.5	125	4.5	0.060
BS-150-25/. . . .*	150 x 25	450	12.5	180	5.4	0.050
BS-200-25/. . . .*	200 x 25	800	12.5	320	7.2	0.037
BS-250-25/. . . .*	250 x 25	1250	12.5	500	9.0	0.030
BS-300-25/. . . .*	300 x 25	1500	12.5	696	10.8	0.021

Properties for bearing pads and strips are derived from AS 5100.4. Design is based on AS.5100.4.

Compressive Stiffness's are indicative only. Refer later notes.

This is the maximum rotation capacity when bearing strip is under maximum working load.

* Total length of strip (or pad) required – to be inserted in part number after the forward slash.

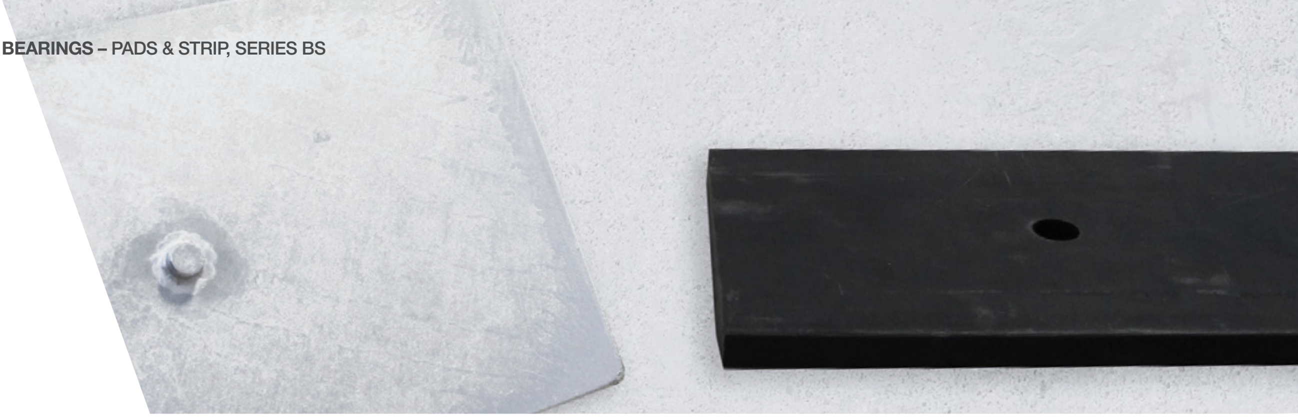
Part No. Examples:

BS-300-25/8000 = 8 metre long run of 300mm wide x 25mm thick elastomeric bearing strip segments placed end to end.

BS-250-20/638 = single elastomeric bearing pad 638mm long x 250mm wide x 20mm thick.

Plan sizes outside of the table dimensions are also in most cases readily available, for example:

BS-400-13/400 = single elastomeric bearing pad 400mm long x 400mm wide x 13mm thick.



VERTICAL LOADS

Loads shown in table are the maximum recommended working / serviceability loads, at the maximum shear deformation shown. Elastomeric bearings are selected based on serviceability loads rather than ultimate design loads. Elastomeric bearings can tolerate significant overloading during ultimate limit state cases without harm hence this criteria does not govern.

COMPRESSIVE STIFFNESS

Values shown in table are theoretical calculated values. They are considered as reasonable average values for the determination of rotational capacity. Actual values achieved in service will be influenced by the frictional characteristics of the contact surfaces against which the pad or strip is placed, eg. rough concrete, galvanised steel etc.

The addition of a hole(s) into the pad or strips will cause a significant increase in compressive deflection at the rated load together with a corresponding decrease in load capacity, ie. The strip/pad will be softer, and thus, to keep within the design code for total strains, load carrying capacity is reduced. Consult with AS5100.4 for detailed calculation methods. A factor of 25% reduction would be a reasonable assumption in many cases.

SHEAR DEFORMATION / MOVEMENT

Shear stiffness values shown are +/- from neutral position. It may be assumed that a strip / pad with dowel pin holes and thus not subject to shear deformation, has a load carrying capacity in order of values shown in table for bearing strip / pad bearing considered.

ROTATION

Tilting of the load bearing surfaces relative to one another, is referred to as "rotation". The criteria for rotational capacity is that the trailing edge of the pad does not go into tension, ie. No gap, but that it is always under a degree of compression. Rotational capacity listed in the table is that applicable at recommended maximum load.

The relationship LOAD / ROTATIONAL CAPACITY is reasonably linear.

Additionally, constructional errors of the seating and / or camber, hog etc., of beams should be considered in determining the required rotational capacity of the strip / pad.

Whilst with laminated elastomeric bearings it is undesirable to have "lift-off" or loss of full contact due to rotational effects, with plain elastomeric bearings a degree of "lift-off", provided it is minimal, will not damage the product.

SLIPPAGE

Non reinforced strips / pads will spread when loaded. This is referred to as a "squirming". The type of seating, steel, concrete, wood float / steel trowel finish rough / smooth, dry or wet, will all have an influence on the degree of squirming of the strip / pads under a compressive load. Part recessing of the strip / pad or the use of an adhesive can reduce this problem, but not eliminate it. However, it is recommended that adhesives not be used as if they are used and fail, then the squirming and slippage could get worse. Slippage is the term used to describe the actual displacement of the strip / pad from its initial placement. This can occur at one or both faces. It is also referred to as "walking out" of the strip / pad.

NOTE – Where mechanical devices such as dowel studs are used to restrain the bearing, these devices may limit the depth of the elastomer available to accommodate shear deformation movement.

INSTALLATION

Non-reinforced strips / pads will spread when loaded. Thus, the support area must be greater than the nominal plan size of the strip / pad. We would recommend a minimum value of 25mm on all edges of the strips / pads, particularly if the structure is steel. If concrete, then the recommendation is 25mm all around. If a mortar pad is used, then minimum thickness is suggested as 10mm together with a 45° chamfer on the mortar pad sides. If the mortar pedestal is greater than 25mm, reinforcement may be necessary. Surfaces should be flat, free from cavities / projections, and preferably rough "wood float finish" in texture.

Use of adhesives is not recommended.

PROPERTIES OF ELASTOMER

"Temperature Effect" - Within the range of -20°C to +80°C no significant variation in performance will occur.

"Ozone" - Ozone cracking in any elastomer will occur where there are surface tensile forces. If cracking does occur, it is frequently harmless. It is simply relieving the surface tensions and further, deeper, cracking is unlikely.

"Longevity" - Due partly to their small surface area to volume ratio, and in particular the small surface area exposed to the atmosphere during service, plus the location where such strips / pads are used, bearing strips / pads of high quality natural rubber will give an extremely long life - typically longer than the structure.

"Fire Resistance" - Blocks of natural rubber do not burn easily. However, if fire resistance is considered essential, then in order to eliminate softening problems, sheathing with a suitable fire retardant, or insulating material, foam etc, is suggested. Alternatively, design to minimise any settlement if destruction by fire would cause structural problems.

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