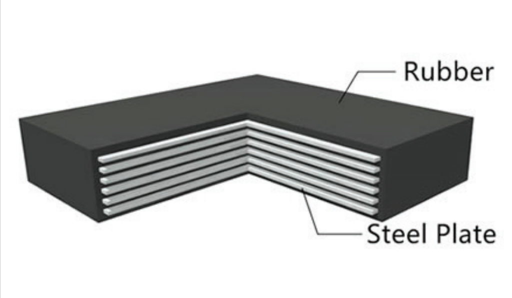
HANNA RUBBER COMPANY

Specification Sheet

Laminated Bearing Pads



HR-LBP

APPLICATIONS

HR LBP bearings can be used for bridges, viaducts and buildings, and for seismic vibration and isolation, acoustic isolation and shock absorbing applications.

MATERIAL

HR LBP bearings are molded bearings made of high quality natural rubber or neoprene with steel plates vulcanized to the elastomer in such a way that no part of the steel is exposed.

Elastomer: meets the CAN/CSA-S6-06 standard, and Ontario OPSS 1202 (see Table E-1).

Steel: conforms to ASTM A-1011 Grade 36, thickness of at least 3 mm.

DESIGN

SHAPE FACTOR (S)

The behavior of each individual elastomer layer (t) is influenced by the shape factor which, similar to formula (1) Series E, is defined as:

$$S = \frac{A \times B}{t \times 2\,(A+B)} \qquad (1)$$

Where:
t = Thickness of each individual elastomer layer

ALLOWABLE BEARING PRESSURES

	SLS	ULS
Max. pressure under permanent load	4.5 MPa	7.0 MPa
Max. pressure under total load	7.0 MPa*	10.0 MPa

Where:
SLS = Serviceability limit state
ULS = Ultimate limit state
*Max: 0.22 S^2 (see Figure E-3)

The maximum pressures should be limited only so that the maximum compressive deflection, δ_c, does not exceed 0.07 x t under all service load combinations.

The total compressive deflection, Δ_c, is the sum of the deflection of each individual layer, δ_c, calculated according to formula (2) of Series E, except coefficient β, as follows:

β = 1.0 for layers bonded on both surfaces (inner layer)

β = 1.4 for layers bonded on only one surface (outer layer) (2)

HR LBP

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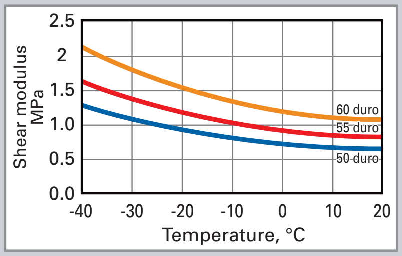

Figure HR LBP-2

Hardness	Shear modulus G (at +20°C)
50	0.63 (MPa)
55	0.81 (MPa)
60	1.06 (MPa)

Table HR LBP-1

HR LBP with beveled top plate

ALLOWABLE ROTATION

The maximum allowable rotation should be limited to:

$$\alpha_{MAX.} \leqslant \frac{\Delta_c}{A/2 \text{ or } B/2} \qquad (3)$$

MAXIMUM SHEAR DEFORMATION (Δ_S)

The maximum shear deformation of a laminated bearing pad is limited to:

Maximum shear deformation $\leqslant 0.50 \times T_{eff}$ (4)

Where:

T_{eff} = Total rubber thickness between the laminates.

SHEAR STIFFNESS (K_S)

The shear stiffness is primarily influenced by the hardness of the rubber compound and by the service temperature. At -40°C, the shear modulus nearly doubles its value at +20°C (see Figure HR LBP-2).

Therefore, $$K_S = \frac{G \times AREA}{T.R.T.} \qquad (5)$$

Where:

G = Shear modulus as a function of the hardness and service temperature (see Table HR LBP-1 for the precise values at +20°C or see Figure HR LBP-2 for the values at temperatures between -40°C and +20°C).

AREA = Plan area of bearing pad

T.R.T. = Total rubber thickness

POSITIVE ATTACHMENT

Positive attachment should be provided when:

1) The maximum compressive stress under service load is $\leqslant$ 1.5 MPa

2) The force of friction, P_f, is insufficient to resist the shear force required to deform the pad, that is:

$$P_f = \mu P_V \leqslant K_S \times (\text{max. movement}) \qquad (6)$$

Where:

P_f = Friction force
P_V = Vertical load
μ = Coefficient of friction
= 0.10 to 0.15 between rubber and steel
= 0.20 between rubber and broom-finished concrete
= 0.15 between rubber and steel trowel-finished concrete

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