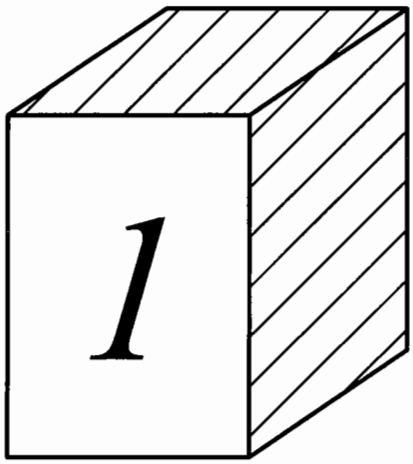


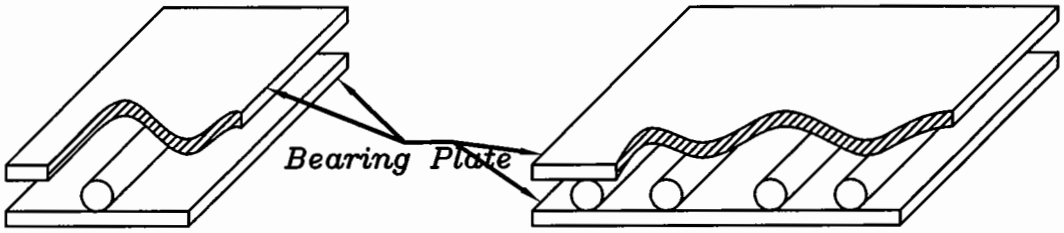
Modern Bearing

Bridge Bearing 2

The basic features of the various types of bearings

A–Roller Bearing

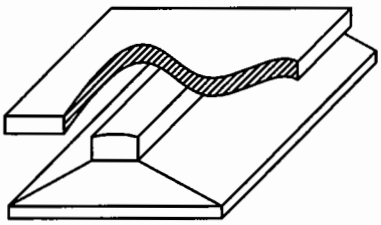
(معلومات عامه) (للقراءة فقط)

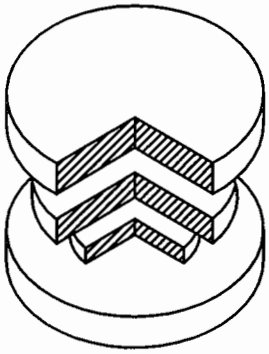


(Single Roller Bearing) (Multi Roller Bearing)

B–Rocker Bearing

Rocker Bearing Permit rotation by rolling of one part on another.

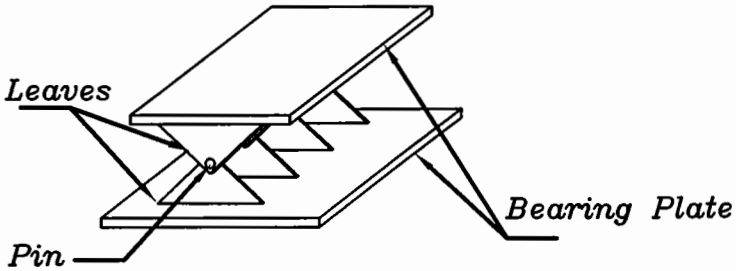




(Linear Rocker Bearing) (Point Rocker Bearing)

C–Knuckle Bearing

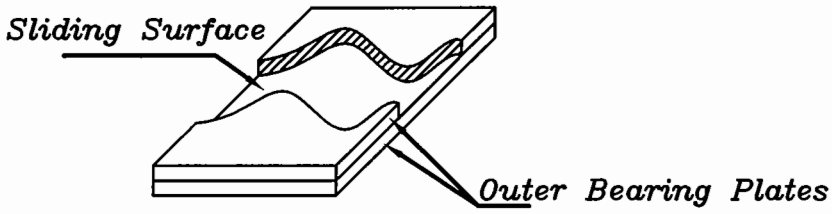
Knuckle bearing permit rotation by sliding of one part on another.



(Knuckle Leaf Bearing)

D–Sliding Bearing

A bearing consist assentially of two surfaces sliding one on the other.



E–Elastomeric Bearing

The elastomeric bearing consist of block of elasomer that way be reinforced interally with steel plates. Elastomer is a compound containing chloroprene rubber with proprities similar to those of rubber.

–Types of Elastomeric Bearing

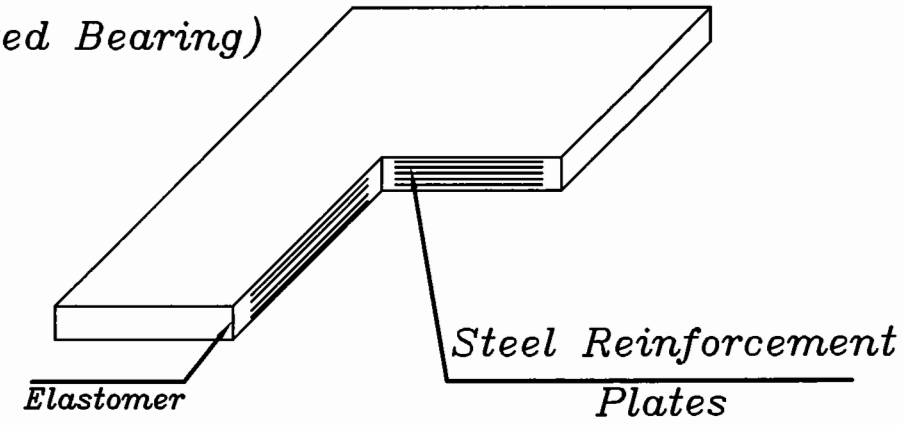
a–Laminated Bearing.

b–Plain Pad Bearing ⟶ Umreinforced Bearing.

c–Strip Bearing ⟶ Plain Pad Bearing(the length ten times width)

d–Pot Bearing.

(Elastomeric Laminated Bearing)



Function of Elastomeric Bearing:

Ealstomeric Bearing can accommodate translational movements in any direction and rotational movements about any axis by elastic deformation.

- *The should not be used in tension.*
- *What are the recommendations (requirments) of elastomeric design?*

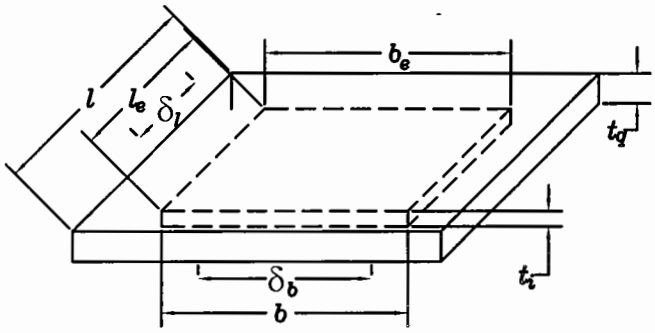
(OR) What are the design considrations for design of elastomeric bearing?

1-Their Geometry Satisfies the following:

The shear strain $\frac{\delta_r}{t_q} \not> 0.70$

$\delta_r = \sqrt{\delta_b^2 + \delta_l^2}$

$\therefore \varepsilon_q = \frac{\delta_r}{t_q} \not> 0.70$



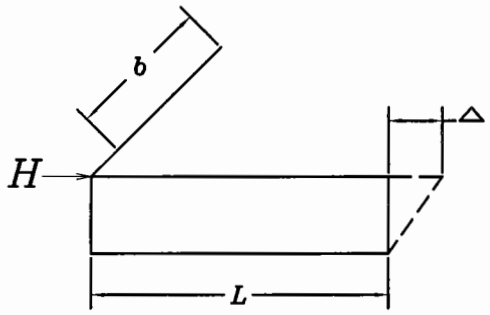
δ_b ----> *max Hz. relative displacement in b dimension*

δ_l ----> *max Hz. relative displacement in l dimension*

Stress $= H/b*l$

$G = \frac{Stress}{Strain}$ — *Shear Moduls*

$G = \frac{E}{2(4\upsilon)}$ — *Posion ratio*



$\upsilon = 0.3$ *steel.*

$\upsilon = 0.2$ *concrete.*

2−a) Mean design pressure:

$\frac{V}{A} \not> G^*S$ or $5G$.

$A = (L^*b)$

V ----> Vertical design load effect.

Where S ----> Shape Factor.

$$S = \frac{A_e}{L_p t_e} = \frac{L_e b_e}{2(L_e + b_e)t_e}$$

peremiter; t_e: t_i for inner layers, $1-4t_i$ for outer layers.

2−a) At any points in the laminated bearing the sum of the strains due to all loads effects(ε_t).

$$\varepsilon_t = K(\varepsilon_c + \varepsilon_q + \varepsilon_a) \not> 5.00$$

ε_q ----> Shear Strain.

ε_c ----> Nominal Strain due to Compressive Loads.

ε_a ----> Nominal Strain due to Angular Loads.

K ----> Is a factor equal to: 1−5 for live load effect.

1−0 for all other effect.

$$\varepsilon_c = \frac{1.5V}{GA_1S} \qquad A_1 = Ae\left(1 - \frac{\delta_b}{\delta_e} - \frac{\delta_l}{L_e}\right)$$

$$\varepsilon_c = (b_e^2\alpha_b + L_e^2\alpha_1)/2t_1\Sigma t_i$$

$A_e = L_e\, b_e$

δ_b, δ_l *Defined as before*

b_e ----> *The effective width of bearing.*

L_e ----> *The effective length of bearing.*

α_b----> *Angle rotation cross the width b.*

α_b----> *Angle rotation cross the width L.*

t_i ----> *Thickness of individual layer.*

Σt_i----> *Total thickness of elstomer in the bearing.*

S ----> *Shape factor.*

(3) Tensile Stress

Min. thickness of steel plate should be:

$$t_{min} = \frac{1.3V(t_1 + t_2)}{A_1 \delta_s}$$

δ_s ┬ *120N/mm for plates with holes*
└ *240N/mm for plates without holes*

t_1 *and* t_2 *are the thicknesses of elastomer on either side.*

(4) The pressure V/A should satisfy the expression

$$V/A < \frac{2b_e G S'}{3\Sigma t_i}$$

S' ----> *Shape factor for the thickest elastomer layer.*

(5) Design movement $\triangle = \Sigma \delta$

$$\delta = \frac{V_{ti}}{5A_e G S^2} + \frac{V_{ti}}{A_e E_b}$$

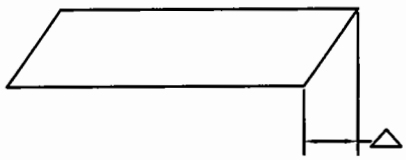
(6) Rotational of bearing

$$4 > (b_e \alpha_b + L_e \alpha_l) / 3$$

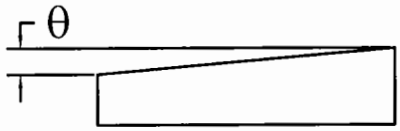
–Translation Movement

$\triangle > \triangle_{max\ Roller}$

$\triangle < \triangle_{max\ Hinge}$



–Rotational Deformation



Elastomeric Bearing must satisfy that:

a)Don't allow sepration at contact surface after rotation.

b)Don't slip under the applied forces.