

# Elastomeric Bearing Design

## AASHTO LRFD Method B Design ~ English Units

Based upon AASHTO LRFD 9th Edition (2020)

Spreadsheet applies to rectangular shaped bearings only. All boxed entities must be input by user.  
 Shear strain due to rotation in secondary direction is based upon 0.010 radian out-of-plumb tolerance.  
 Peak hydrostatic stresses must be checked for bearings with externally bonded steel plates.

**Units:** in, kips, psi unless noted otherwise

**Coordinates:** x, L are perpendicular; y, W are parallel, to the primary rotation axis. Usually W>L.

### INPUT DATA

**Date:** 4/28/11

**Designer:**

ABC

**Job Title:** Name of Job

<b>G<sub>min</sub></b> (psi):	200	<b>P<sub>DL</sub></b>	(kips):	2
<b>h<sub>ri</sub></b> (in):	0.010	<b>P<sub>LL</sub></b>	(kips):	1
<b>h<sub>cover</sub></b> (in):	0.250	<b>θ<sub>s-st</sub></b>	(rads):	0.500
<b>h<sub>s</sub></b> (in):	0.0005	<b>θ<sub>s-cy</sub></b>	(rads):	0.500
<b>F<sub>y</sub></b> (ksi):	2	<b>Δ<sub>s-st</sub></b>	(in):	0.8
<b>ΔF<sub>TH</sub></b> (ksi):	2	<b>Trans. fixed x?</b>	(y/n):	y
		<b>Trans. fixed y?</b>	(y/n):	y
<b>L</b> (in):	6.00	<b>No. of int. layers</b>	(-):	12
<b>W</b> (in):	6.00			

### BEARING DESIGN

$$\text{Area (in}^2\text{)} = 36.0 \quad h_{rt} = .62 \text{ in} \quad < \quad 2 * \Delta_{s-st} \quad \text{NG}$$

$$S \text{ (-)} = 150.00$$

#### Calculated Shear Strains (primary direction)

$$\begin{aligned} \gamma_{s-st} &= 1.290 \\ \gamma_{s-cy} &= .000 \\ \gamma_{a-st} &= .027 < 3.00 \text{ OK} \\ \gamma_{a-cy} &= .014 \\ \gamma_{r-st} &##### \\ \gamma_{r-cy} &##### \\ \gamma_{comb \text{ sum}} &##### < 5.00 \text{ OK} \end{aligned}$$

#### Calculated Shear Strains (secondary direction)

$$\begin{aligned} \gamma_{s-st} &= .000 \\ \gamma_{s-cy} &= .000 \\ \gamma_{a-st} &= .027 < 3.00 \text{ OK} \\ \gamma_{a-cy} &= .014 \\ \gamma_{r-st} &= 127.520 \\ \gamma_{r-cy} &= .000 \\ \gamma_{comb \text{ sum}} &= -127.469 < 5.00 \text{ OK} \end{aligned}$$

#### Stability Requirements

$$\begin{aligned} \sigma_{TL} \text{ (psi)} &< 298526 \quad \text{OK ( x - dir. )} \\ \sigma_{TL} \text{ (psi)} &< 298526 \quad \text{OK ( y - dir. )} \\ 1370769.23 &> 1.00 \quad \text{RESTRAINT SYSTEM REQD.} \\ &[\text{See LRFD Sect. 14.7.5.4}] \end{aligned}$$

#### Calculated Stresses

$$\begin{aligned} \sigma_{DL} = \sigma_{st} &= 56 \text{ psi} \\ \sigma_{LL} = \sigma_{cy} &= 28 \text{ psi} \\ \sigma_{TL} &= 83 \text{ psi} \end{aligned}$$

#### Compressive Deformation

$$\begin{aligned} E_c &\approx ##### \\ \delta_{DL-initial} &\approx .000 \text{ in} \\ \delta_{LL} &\approx .000 \text{ in} \end{aligned}$$

#### Steel Shim Requirements

$$\begin{aligned} h_s \text{ (service)} &< .001 \text{ in} \quad \text{NG} \\ h_s \text{ (fatigue)} &\geq .000 \text{ in} \quad \text{OK} \\ h_s \text{ (minimum)} &< .063 \text{ in} \quad \text{NG} \end{aligned}$$

[δ<sub>DL</sub> and δ<sub>LL</sub> values are approximate and based upon Commentary Eqn. C14.7.5.3.6-1.]

### SUMMARY

L =	6.00 in	Approx. weight =	1.0 lbs
W =	6.00 in	Allowable shear displacement =	.31 in
Unloaded height =	.63 in	Maximum shear force =	3.6 kips
Loaded (DL) height =	.63 in	(prog. by R. Dornsife; WSDOT; 2008-2020)	