

# Elastomeric Bearing Design

## AASHTO LRFD Method A Design ~ English Units

Based upon 4th ed. AASHTO LRFD through Interim 2009 revisions.  
Spreadsheet applies to rectangularly shaped bearings only. All boxed entities must be input by user.

**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:** 10/6/09 **Designer:** ABC  
**Job Title:** All Pass Case

$G_{min}$ (psi)	=	200	$P_{DL}$ (kips)	=	200
$G_{max}$ (psi)	=	220	$P_{LL}$ (kips)	=	100
$F_y$ (ksi)	=	2	$\Delta_s$ (in)	=	0.8
$\Delta F'''$ (ksi)	=	2	$\theta_x$ (rads)	=	0.0001
$h_{cover}$ (in)	=	0.010	$\theta_y$ (rads)	=	0.0001

### BEARING DESIGN

Max/min allowable		Actual values	
<b>Area</b> (in <sup>2</sup> )	< 240.0	$P_{TL}$ (kips)	= 300.00
<b>L</b> (in)	< 40.00	Area (in <sup>2</sup> )	= 36.00
<b>W</b> (in)	< 40.00	<b>L</b> (in)	= 6 NG
$\sigma_{TL}$ (psi)	≤ 1250	<b>W</b> (in)	= 6 NG
<b><math>h_{ri}</math> [TL] (in)</b>	> 0.05	$\sigma_{TL}$ (psi)	= 8333
<b>S [TL] (-)</b>	< 33.33	$\sigma_{LL}$ (psi)	= 2778
<b>S (-)</b>	≤ 11.49	<b><math>h_{ri}</math> (in)</b>	= 0.250 NG
<b>N lay [<math>\Delta_s</math>] (-)</b>	< 6.3	<b>S (-)</b>	= 6.00
N lay [ $\theta_x$ ] (-)	≥ 0.0	<b><math>h_{rt}</math> (in)</b>	= 1.52
N lay [ $\theta_y$ ] (-)	≥ 0.0	<b>No. of int. layers (-)</b>	= 6 NG
N lay [Stab <sub>x</sub> ] (-)	≤ 7.9	<b>No. of shims (-)</b>	= 7
N lay [Stab <sub>y</sub> ] (-)	≤ 7.9		
<b><math>h_s</math> [service] (in)</b>	< 3.125	<b>Steel Shim Requirements</b>	
<b><math>h_s</math> [fatigue] (in)</b>	< 0.694	<b><math>h_s</math> (in)</b>	= 0.0005 NG
<b><math>h_s</math> [minimum] (in)</b>	< 0.063	<b><math>h_{st}</math> (in)</b>	= 0.004

**COMP STRAIN EXCEEDS**  
**0.07 VIOLATING LRFD**  
**SECT. 14.7.6.3.3**

Compressive Deformation	
$E_c$ (psi)	≈ 45360
$\delta_{DL-initial}$ (in)	≈ 0.19
$\delta_{LL}$ (in)	≈ 0.09

[ $\delta_{DL}$  and  $\delta_{LL}$  values are approximate and based upon Commentary Eqn. C14.7.5.3.6-1.]

### SUMMARY

<b>L</b> =	6.00 in	<b>Approx. weight</b> =	2.41 lbs
<b>W</b> =	6.00 in	<b>Allowable shear displacement</b> =	0.76 in
<b>Unloaded height</b> =	1.52 in	<b>Maximum shear force</b> =	3.96 kips
<b>Loaded (DL) height</b> =	1.34 in	(prog. by R. Dornsife; WSDOT; 2008)	