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

G_{min} (psi):	200	P_{DL}	(kips):	20
h_{ri} (in):	0.500	P_{LL}	(kips):	10
h_{cover} (in):	0.500	$\theta_{s\text{-}st}$	(rads):	0.000
h_s (in):	0.0747	$\theta_{s\text{-}cy}$	(rads):	0.000
F_y (ksi):	36	$\Delta_{s\text{-}st}$	(in):	0.4
ΔF_{TH} (ksi):	24	**Trans. fixed x?**	(y/n):	n
		Trans. fixed y?	(y/n):	n
L (in):	11.00			
W (in):	13.00	**No. of int. layers**	(-):	4

BEARING DESIGN

Area (in^2) = 143.0 h_{rt} = 3.00 in **>** $2*\Delta_{s\text{-}st}$ **OK**
S (-) = 5.96

Calculated Shear Strains (primary direction)

$\gamma_{s\text{-}st}$	= .133	
$\gamma_{s\text{-}cy}$	= .000	
$\gamma_{a\text{-}st}$	= .150	**< 3.00 OK**
$\gamma_{a\text{-}cy}$	= .075	
$\gamma_{r\text{-}st}$	= .000	
$\gamma_{r\text{-}cy}$	= .000	
$\gamma_{comb\ sum}$	0.414	**< 5.00 OK**

Calculated Shear Strains (secondary direction)

$\gamma_{s\text{-}st}$	= .000	
$\gamma_{s\text{-}cy}$	= .000	
$\gamma_{a\text{-}st}$	= .139	**< 3.00 OK**
$\gamma_{a\text{-}cy}$	= .070	
$\gamma_{r\text{-}st}$	= .555	
$\gamma_{r\text{-}cy}$	= .000	
$\gamma_{comb\ sum}$	0.816	**< 5.00 OK**

Stability Requirements

σ_{TL} (psi)	< 3298	**OK (x - dir.)**
σ_{TL} (psi)	< 5315	**OK (y - dir.)**
0.00	<1.00	NO RESTRAINT REQD.

Calculated Stresses

$\sigma_{DL} = \sigma_{st}$ = 140 psi
$\sigma_{LL} = \sigma_{cy}$ = 70 psi
σ_{TL} = 210 psi

Compressive Deformation

E_c	≈	42,602 psi
$\delta_{DL\text{-}initial}$	≈	.010 in
δ_{LL}	≈	.005 in

Steel Shim Requirements

h_s (service)	≥	.009 in	**OK**
h_s (fatigue)	≥	.003 in	**OK**
h_s (minimum)	≥	.063 in	**OK**

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

SUMMARY

L =	11.00 in	Approx. weight =	33.9 lbs
W =	13.00 in	Allowable shear displacement =	1.50 in
Unloaded height =	3.37 in	Maximum shear force =	14.3 kips
Loaded (DL) height =	3.36 in	(prog. by R. Dornsife; WSDOT; 2008-2020)	