# 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) | = | 20 |
| $G_{max}$ (psi) | = | 220 | $P_{LL}$ (kips) | = | 10 |
| $F_y$ (ksi) | = | 36 | $\Delta_s$ (in) | = | 0.4 |
| $\Delta F_{TH}$ (ksi) | = | 24 | $\theta_x$ (rads) | = | 0.0001 |
| $h_{cover}$ (in) | = | 0.500 | $\theta_y$ (rads) | = | 0.0001 |

### BEARING DESIGN

| | Max/min allowable | | Actual values | | |
|---|---|---|---|---|---|
| Area (in$^2$) | ≥ 24.0 | $P_{TL}$ (kips) | = 30.00 | | |
| L (in) | ≥ 1.85 | Area (in$^2$) | = 143.00 | | |
| W (in) | ≥ 2.18 | **L** (in) | = 11 | OK | |
| $\sigma_{TL}$ (psi) | ≤ 1250 | **W** (in) | = 13 | OK | |
| | | $\sigma_{TL}$ (psi) | = 210 | | |
| $h_{ri}$ [TL] (in) | ≤ 3.55 | $\sigma_{LL}$ (psi) | = 70 | | |
| S [TL] (-) | ≥ 0.84 | | | | |
| S (-) | ≤ 10.49 | $h_{ri}$ (in) | = 0.500 | OK | |
| | | S (-) | = 5.96 | | |
| N lay [$\Delta_s$] (-) | ≥ -0.4 | $h_{rt}$ (in) | = 3.00 | | |
| N lay [$\theta_x$] (-) | ≥ 0.0 | | | | |
| N lay [$\theta_y$] (-) | ≥ 0.0 | **No. of int. layers** (-) | = 4 | OK | |
| N lay [$Stab_x$] (-) | ≤ 4.5 | No. of shims (-) | = 5 | | |
| N lay [$Stab_y$] (-) | ≤ 5.7 | | | | |

**Steel Shim Requirements**

| | | | | |
|---|---|---|---|---|
| $h_s$ [service] (in) | ≥ 0.009 | **$h_s$** (in) | = 0.0747 | OK |
| $h_s$ [fatigue] (in) | ≥ 0.003 | $h_{st}$ (in) | = 0.374 | |
| $h_s$ [minimum] (in) | ≥ 0.063 | | | |

**Compressive Deformation**

| | | |
|---|---|---|
| $E_c$ (psi) | ≈ 44732 | |
| $\delta_{DL\text{-}initial}$ (in) | ≈ 0.01 | |
| $\delta_{LL}$ (in) | ≈ 0.00 | |

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

### SUMMARY

| | | | |
|---|---|---|---|
| L = | 11.00 in | Approx. weight = | 33.86 lbs |
| W = | 13.00 in | Allowable shear displacement = | 1.50 in |
| Unloaded height = | 3.37 in | Maximum shear force = | 15.73 kips |
| Loaded (DL) height = | 3.36 in | (prog. by R. Dornsife; WSDOT; 2008) | |