14.4.1—General

Replace the 4th paragraph with the following:

For determining force effects in joints, bearings, and adjacent structural elements, the influence of their stiffnesses and expected tolerances achieved during fabrication and erection shall be considered. For design thermal movement range (Δ_T), calculations in a simply supported span, the expansion length must be taken as 0.75 of the span length.

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14.6—REQUIREMENTS FOR BEARINGS

14.6.1—General

Replace the 3rd paragraph with the following:

Bearings shall not be subjected to net uplift at any limit state.

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14.6.5.3—Design Criteria

Replace the 2nd paragraph with the following:

Bearing design shall be consistent with the intended seismic or other extreme event response of the whole bridge system. Vertical restrainers at bearing locations are not allowed.

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14.7.2.4—Contact Pressure

Replace the 3rd paragraph with the following:

Stresses shall not exceed those given in Table 14.7.2.4-1. Permissible stresses for intermediate filler contents shall be obtained by linear interpolation within Table 14.7.2.4-1. The minimum unfactored pressure on the PTFE surface must be 2.0 ksi. The maximum factored pressure on the PTFE surface must be 1.45 σ_{ss}, where σ_{ss} is the value for maximum average contact stress in Table 14.7.2.4-1.

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14.7.5—Steel-Reinforced Elastomeric Bearings—Method B

14.7.5.1—General

C14.7.5.1

Replace the 4th paragraph with the following:

The shape factor, S_i, is defined in terms of the gross plan dimensions of layer *i*. Refinements to account for the difference between gross dimensions and the dimensions of the reinforcement are not warranted because quality control on elastomer thickness has a more dominant influence on bearing behavior. Holes are not permitted in steel-reinforced bearings.

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14.7.5.3.1—Scope

Replace the 1st paragraph with the following:

Bearings designed by the provisions herein shall be tested in accordance with the requirements for steel-reinforced elastomeric bearings as specified in Article 18.2 of the AASHTO *LRFD Bridge Construction Specifications* and the AASHTO M 251. The minimum average compressive stress due to *DC* must not be less than 0.200 ksi.

Add a new paragraph after the 1st paragraph:

The maximum force at slippage must be as follows:

$$F_s = \frac{G\,A_r}{h_{rt}}\Delta_s \leq 0.2P_D \qquad (14.7.5.3.1\text{-}1)$$

where:

F_s = lateral bearing force (kips)
G = shear modulus of elastomer (ksi)
A_r = reduced rubber area (in^2)
h_{rt} = total elastomer thickness (in)
P_D = compressive load at service limit state due to permanent loads (kips)
Δ_s = maximum non-seismic bearing displacement (in)

14.7.5.3.2—Shear Deformations

Replace the 1st paragraph with the following:

The maximum horizontal displacement of the bridge superstructure, Δ_O, shall be taken as 75 percent of the design thermal movement range, Δ_T computed in accordance with Article 3.12.2, combined with movements caused by creep, shrinkage, and post-tensioning.

C14.7.5.3.2

Replace the 2nd paragraph with the following:

Generally, the installation temperature is within ±25 percent of the average of the maximum and minimum design temperatures. Consequently, 75 percent of the thermal movement range is used for design purposes. The forgiving nature of elastomeric bearings more than accounts for actual installation temperatures greater than or less than the likely approximated installation temperature. Additionally, if the bearing is originally set or reset at the average of the design thermal movement range computed in accordance with Article 3.12.2 may be substituted for 75 percent as specified.

14.7.5.3.4—Stability of Elastomeric Bearings

Replace the article with the following:

Bearings shall be investigated for instability at the strength limit load combinations specified in the Table 3.4.1-1.

The critical buckling load at strength limit displacement ($\Delta_S = \Delta_{Sst} + \Delta_{Scy}$) is given by:

$$P'_{cr_s} = P_{cr_s} \frac{A_r}{A} \qquad (14.7.5.3.4\text{-}1)$$

with

$$A_r = B(L - \Delta_s) \qquad (14.7.5.3.4\text{-}2)$$

and for rectangular bearings is:

$$P'_{cr} = 0.680 \frac{G \times B \times L^2 \times (L - \Delta_s)}{\left(1 + \frac{L}{B}\right) \times t \times T_r}$$

(14.7.5.3.4-3)

A bearing design may be considered acceptable for buckling if:

$$\frac{P'_{cr_s}}{(\gamma_{DC} P_{DC} + \gamma_{DW} P_{DW}) + \gamma_L (P_{Lst} + P_{Lcy})} \geq 2.0$$

(14.7.5.3.4-4)

where:

A = bonded rubber area of elastomeric bearing (in^2)
A_r = reduced bonded rubber area of elastomeric bearing (in^2)
B = long plan dimension of rectangular bearing (in)
G = shear modulus of rubber (psi)
L = short plan dimension of rectangular bearing (in)
P_{cr_s} = critical load in un-deformed configuration (kip)
P'_{cr_s} = critical load in deformed configuration (kip)

P_{DC} = dead load (kip)
P_{DW} = wearing surfaces and utilities load (kip)
P_{Lst} = static component of live load (kip)
P_{Lcy} = cyclic component of live load (kip)
t = rubber layer thickness (in)
T_r = total rubber thickness (in)
γ_{DC} = load factor for dead load
γ_{DW} = load factor for wearing surfaces and utilities loads
γ_L = load factor is either HL93 or Permit truck load
Δ_S = non-seismic lateral displacement (in)
Δ_{Sst} = static component of non-seismic lateral displacement (in)
Δ_{Scy} = cyclic component of non-seismic lateral displacement (in)

C14.7.5.3.4

Delete the commentary.

14.8.3—Anchorage and Anchor Bolts

14.8.3.1—General

C14.8.3.1

Replace the 3rd paragraph with the following:

Uplift must be prevented both among the major elements, such as the girder, bearing, support, and between the individual components of a bearing.

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14.10—REFERENCES

Add the following reference:

Constantinou, M.C., Kalpakidis, I., Filiatrault, A and Ecker Lay, R.A. (2011), "*LRFD-Based Analysis and Design Procedures for Bridge Bearings and Seismic Isolators*," Report No. MCEER-11-0004, Multidisciplinary Center for Earthquake Engineering Research, Buffalo, NY.

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