American Railway Engineering & Maintenance-of-Way Association
Letter Ballot No. 15-21-23

Assignment: At the September 2021 Virtual Meeting, a new letter ballot 15-21-23 was proposed. The letter ballot revised language in Article 5.2.1 in Part 5, Bearing Design and Construction of Chapter 15, Steel Structures and Article 9.5.2.1 in Part 9, Commentary, of Chapter 15, Steel Structures.

Rationale: Currently the manual provides redundant language on Basic Allowable Stresses. This ballot would remove language from Section 5.2 that can be found in Table 15-1-11 and reorganize the Basic Allowable Stress within the section to clarify the allowable stresses for bearing elements.

Submitted by: William C Farrow III, Chair SC 7 Bearing Design and Construction

Due Date: January 21, 2022

Edit existing Articles 5.2.1 and 9.5.2.1 as shown below (additions shown as **underlined bold red**, deletions shown as ~~**bold red strikethrough**~~, comments in brackets [ ] not part of balloted text):

SECTION 5.2 BASIC ALLOWABLE STRESSES

5.2.1 STRUCTURAL STEEL, BOLTS AND PINS (~~2020~~2023)[1]

a. Except as provided in ~~**paragraph c below,**~~ **this Article,** the basic allowable stresses for all steel bearing components, weld metal, or fasteners, shall be as specified in Section 1.4, Basic Allowable Stresses.

b. The allowable stress for steel bearing components is expressed in terms of F_y or F_u as specified in Article 5.3.2.1, Table 15-5-2, Article 5.3.2.2, Table 15-5-3, Table 15-5-4, or, for the ASTM designations listed for Structural Steel in Article 1.2.1a, the applicable ASTM specification (see also Table 15-9-1).

	psi (MPa)
c. ~~**Bearing on pin material or material on which the pin bears**~~	~~**0.75Fy**~~
~~**Bearing on milled web members, milled stiffeners and other steel parts in contact, except as specified in this Article**~~	~~**0.83Fy**~~
Bearing between rockers and rocker pins	0.375Fy
~~**Stress in extreme fibers of pins**~~	~~**0.83Fy**~~
d. **Allowable stress** ~~**Shear**~~ in dowels or nominal unthreaded area of anchor bolts**:**	~~**0.20Fu**~~
Shear	**0.20Fu**
Tension	**0.38Fu**
~~**e. Tension in dowels or nominal unthreaded area of anchor bolts**~~	~~**0.38Fu**~~

e. Line bearing on rollers, rockers, rocker plates, or base plates:

	Pounds per linear inch	(kN/mm)
~~**Line bearing on rollers, rockers, rocker plates, or base plates:**~~		
For diameters up to 25 inch (600 mm)	$\frac{(Fy-13000)600d}{20000}$	$\frac{(Fy-90)d}{33000}$
For diameters from 25 inch (600 mm) to 125 inch (3 000 mm)	$\frac{(Fy-13000)3000\sqrt{d}}{20000}$	$\frac{(Fy-90)\sqrt{d}}{1300}$

d = diameter of roller, rocker, or rocker plate curved surface; inch (mm)

9.5.2 BASIC ALLOWABLE STRESSES

9.5.2.1 STRUCTURAL STEEL, BOLTS AND PINS (~~2012~~2023) ~~R(2018)~~

c. The allowable stress in bearing between rockers and rocker pins was adapted from editions of AREMA Manual Chapter 15, Steel Structures, Section 1.4, prior to the 1969 edition and the low value of 0.375 F_y was retained to minimize pin wear. Pin wear had historically been a cause of trouble when higher valuesfor this condition were permitted.

d. The allowable stresses for anchor bolts match the 2005 AISC provisions for Allowable Strength Design (ASD) of bearing-type connection bolts with threads included in the shear plane and are 1/2 of the 2005 AISC and 2007 AASHTO LRFD nominal capacities. The nominal capacities as listed in the 2005 AISC Steel Construction Manual, Table J3.2, are divided by the ASD safety factor, **Ω**, of 2.00.

e. The allowable stress in bearing on expansion rollers and rockers was based on static and rolling tests on rollers and rockers (Reference 25). The average vertical pressures over calculated contact areas for loads substantially less than allowable design values are in excess of the yield point, causing a flow of the material. It was concluded that the resulting "spread" of the roller and base, measured parallel to the axis of the roller at points near the surfaces in contact, was the most satisfactory phenomenon to use in determining design values. Such "spreads" or deformations were measured in units of 0.001 per inch per 1,000 strokes, each stroke corresponding to a roller movement of 4 inches and an equal movement back. Design values according to the tests would give total deformations varying from about 3 units to less than 1.