Appendix B — American Association of State Highway Transportation Officials (AASHTO) Guide Specifications

In July 1996, the AASHTO Subcommittee on Bridges prepared a standard specification entitled "AASHTO Guide Specification for Design of Pedestrian Bridges." The guide specifications were adopted and published by AASHTO in 1997. The purpose of the guide is to serve as a voluntary standard for bridges which are part of highway facilities but carry primarily pedestrian and/or bicycle traffic. The guide specifications set forth minimum requirements which are consistent with current practice. Modifications may be necessary to address local conditions, such as snow load. Portions of the draft guide specification which deal with design loads follow, with the guide commentary in italics. As is the case with all references, the reader is advised to obtain a full copy. AASHTO can be contacted at 444 North Capital Street, N.W., Suite 249, Washington, D.C. Phone: 202-624-5800.

Guide Specifications for Design of Pedestrian Bridges

1.1 GENERAL

These guide specifications shall apply to bridges intended to carry primarily pedestrian and/or bicycle traffic. Unless amended herein, the existing provisions of the AASHTO Standard Specifications for Highway Bridges, 16th Edition shall apply when using these guide specifications. Either the Service Load Design or Strength Design (Load Factor Design) methods may be used.

1.1 GENERAL Commentary

This Guide Specification is intended to apply to pedestrian and bicycle/pedestrian bridges that are part of highway facilities; and thus, provide realistic standards that ensure structural safety and durability comparable to highway bridges designed in conformance with the AASHTO Standard Specifications for Highway Bridges. This specification should apply equally to all bridge types and construction materials, including steel, concrete, and timber.

The term primarily pedestrian and/or bicycle traffic implies that the bridge does not carry a public highway or vehicular roadway. A bridge designed by these specifications could allow the passage of an occasional maintenance or service vehicle.

This Specification allows the use of the service Load Design or Load Factor Design methods as provided by the AASHTO Standard Specifications. It is not presently for use in conjunction with the AASHTO Load and Resistance Factor Specifications.

1.2 DESIGN LOADS

1.2.1 Live Loads

1.2.1.1 Pedestrian Live Load

Main Members: Main supporting members, including girders, trusses, and arches, shall be designed for a pedestrian live load of 85 pounds per square foot of bridge walkway area. The pedestrian live load shall be applied to those areas of the walkway so as to produce maximum stress in the member being designed.

If the bridge walkway area to which the pedestrian live load is applied (deck influence area) exceeds 400 square feet, the pedestrian live load may be reduced by the following equation:

$$W = 85\left(0.25 + \left(15 \Big/ \sqrt{A_1}\right)\right)$$

where "W" is the design pedestrian load (psf), and A is the deck influence area (square foot,) which is that deck area over which the influence surface for structural effects is different from zero.

However, in no case shall the pedestrian live load be less than 65 pounds per square foot.

Secondary Members: Bridge decks and supporting floor systems, including secondary stringers, floorbeams, and their connections to main supporting members, shall be designed for a live load of 85pounds per square foot, with no reduction allowed.

1.2 DESIGN LOADS Commentary

1.2.1 Live Loads

1.2.1.1 Pedestrian Live Load

The 85 lb/s.f. pedestrian load, which represents an average person occupying 2 square feet of bridge deck area, is considered a reasonably conservative service live load which is difficult to exceed with pedestrian traffic.

When applied with AASHTO service load allowable stresses or group 1 load factors for load factor design, an ample overload capacity is provided.

Reduction of live loads for deck influence areas exceeding 400 square feet is consistent with the provisions of ASCE 7-95 "Minimum Design Loads for Buildings and Other Structures," and is intended to account for the reduced probability of large influence areas being simultaneous maximum loading. For typical bridges, a single design live load value may be computed based on the full deck influence area and applied to all main member sub-components.

The 65 pounds per square foot minimum load limit is used to provide a measure of strength consistency with the new Load Resistant Factor Design (LRFD) specifications, which use 85 pounds per square foot combined with a lesser load factor than used under the Load Factor Design (LFD) specs.

Requiring an 85 pounds per square foot live load for decks and secondary members recognizes the higher probability of attaining maximum loads on small influence areas. Designing decks also for a small concentrated load, for example 1 kip, may be considered where the bridge may be subject to equestrian use or snowmobiles.

1.2.2 Wind Loads

A wind load of the following intensity shall be applied horizontally at right angles to the longitudinal axis of the structure. The wind load shall be applied to the projected vertical area of all superstructure elements, including exposed truss members on the leeward truss.

For Trusses and Arches: 75 pounds per square foot
For Girders and Beams: 50 pounds per square foot

For open truss bridges, where wind can readily pass through the trusses, bridges may be designed for a minimum horizontal load of 35 pounds per square foot on the full vertical projected area of the bridge, as if enclosed.

A wind overturning force shall be applied according to Art. 3.15.3 of the Standard Specifications for Highway Bridges.

1.2.2 Wind Loads Commentary

The AASHTO wind pressure on the superstructure elements are specified, except that the AASHTO minimum wind load per foot of superstructure is omitted. The 35 lb/s.f. value applied to the vertical projected area of an open truss bridge is offered for design simplicity, in lieu of computing forces on the individual truss members. The specified wind pressures are for a base wind velocity of 100 miles per hour, and may be modified based on a maximum probable site-specific wind velocity in accordance with AASHTO Art. 3.15.

1.2.3 Combination of Loads Commentary

The load combinations, allowable stress percentages for service load design and load factors for load factor design as specified in Table 3.22.1A of the Standard Specifications for Highway Bridges shall be used, with the following modifications:

Wind on Live Load, WL, shall equal zero.
Longitudinal Force, LF, shall equal zero.

1.2.3 Combination of Loads Commentary

The AASHTO wind on live load force seems unrealistic to apply to pedestrian loads, and is also excessive to apply to the occasional maintenance vehicle which is typically smaller than a design highway vehicle. The longitudinal braking force for pedestrians is also neglected as being unrealistic.

The AASHTO Group Loadings are retained to be consistent with applying the AASHTO Service Load and Load Factor design methods without modifications.

1.3. DESIGN DETAILS

1.3.1 Deflection

Members should be designed so that the deflection due to the service pedestrian live load does not exceed 1/500 of the span.

The deflection of cantilever arms due to the service pedestrian live load should be limited to 1/300 of the cantilever arm.

The horizontal deflection due to lateral wind load shall not exceed 1/500 of the span.