



**Table of Contents**

37.1 Structure Selection..... 2  
37.2 Specifications and Standards..... 3  
37.3 Protective Screening ..... 5



### **37.1 Structure Selection**

Most pedestrian bridges are located in urban areas and carry pedestrian and/or bicycle traffic over divided highways, expressways and freeway systems. The structure type selected is made on the basis of aesthetics and economic considerations. A wide variety of structure types are available and each type is defined by the superstructure used. Some of the more common types are as follows:

- Concrete Slab
- Prestressed Concrete Girder
- Steel Girder
- Prefabricated Truss

Several pedestrian bridges are a combination of two structure types such as a concrete slab approach span and steel girder center spans. One of the more unique pedestrian structures in Wisconsin is a cable stayed bridge. This structure was built in 1970 over USH 41 in Menomonee Falls. It is the first known cable stayed bridge constructed in the United States. Generally, pedestrian bridges provide the designer the opportunity to employ long spans and medium depth sections to achieve a graceful structure.

Pedestrian boardwalks should not be assigned a bridge structure (B-Structure) when their clear spans are less than or equal to 20 feet (between faces of supports). Boardwalks not meeting the B-Structure criteria will not be required to follow the design requirements in the WisDOT Bridge Manual, but will need to follow the standards established in the *Wisconsin Bicycle Facility Design Handbook* (Article 4.17.6).

Refer to 2.5 for guidance on assigning structure numbers.



37.2 Specifications and Standards

The designer shall refer to the following related specifications:

- "AASHTO LRFD Bridge Design Specifications"
- "AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges", hereafter referred to as the "Pedestrian Bridge Guide"
- See Standardized Special Provision (STSP-506-085) titled "Prefabricated Steel Truss Pedestrian Bridge LRFD" for the requirements for this bridge type

For additional design information, refer to the appropriate Wisconsin Bridge Manual chapters relative to the structure type selected.

The pedestrian live load (PL) shall be as follows: (from "Pedestrian Bridge Guide")

- 90 psf [Article 3.1]
- Dynamic load allowance is not applied to pedestrian live loads [Article 3.1]

The vehicle live load shall be applied as follows: (from "Pedestrian Bridge Guide")

- Design for an occasional single maintenance vehicle live load (LL) [Article 3.2]

Clear Bridge Width (w)	Maintenance Vehicle
$7 \text{ ft} \leq w \leq 10 \text{ ft}$	H5 Truck (10,000 lbs)
$w > 10 \text{ ft}$	H10 Truck (20,000 lbs)

- Clear bridge widths of less than 7 feet need not be designed for maintenance vehicles. [Article 3.2]
- The maintenance vehicle live load shall not be placed in combination with the pedestrian live load. [Article 3.2]
- Dynamic load allowance is not applied to the maintenance vehicle. [Article 3.2]
- Strength I Limit State shall be used for the maintenance vehicle loading. [Article 3.2, 3.7]

The FHWA Pedestrian and Accessible Design guidelines and the ADA Standards for Accessible Design both recommend a limiting gradient of 8.33 percent (1:12) on ramps for pedestrian facilities to accommodate the physically handicapped and elderly.

The minimum inside clear width of a pedestrian bridge on a pedestrian accessible route is 8 feet. (AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 2004), (Article 3.5.3).



The width required is based on the type, volume, and direction of pedestrian and/or bicycle traffic.

The vertical clearance on the pedestrian bridge shall be a minimum of 10 feet for bicyclists' comfort and to allow access for maintenance and emergency vehicles. The Wisconsin Department of Natural Resources recommends a vertical clearance on the bridge of at least 12 feet to accommodate maintenance and snow grooming equipment on state trails. Before beginning the design of the structure, the Department of Natural Resources and the Bureau of Structures should be contacted for the vertical clearance requirements for all vehicles that require access to the bridge.

In addition, ramps should have rest areas or landings 5 feet to 6 feet in length which are level and safe. Rest area landings are mandatory when the ramp gradient exceeds 5 percent. Recommendations are that landings be spaced at 30 foot maximum intervals, as well as wherever a ramp turns. This value is based on a maximum gradient of 8.33 percent on pedestrian ramps, and limiting ramps to a maximum rise of 30 inches per ramp run. Also, ramps are required to have handrails on both sides. See Standard Details for handrail location and details.

Minimum vertical clearance for a pedestrian overpass can be found in the *Facilities Development Manual (FDM)* Procedure 11-35-1, Attachment 1.8 and 1.9. Horizontal clearance is provided in accordance with the requirement found in *(FDM)* Procedure 11-35-1, Attachment 1.5 and 1.6.

Live load deflection limits shall be in accordance with the provisions of **LRFD [2.5.2.6.2]** for the appropriate structure type.

Pedestrian loads, as described in the *AASHTO LRFD Bridge Design Specifications*, shall be used to not only design the pedestrian railings on the structure, but shall also be used to design stairway railings that are adjacent to the structure and are part of the contract.



### **37.3 Protective Screening**

Protective Screening is recommended on all pedestrian overpasses due to the increased number of incidents where objects were dropped or thrown onto vehicles traveling below. Several types of screening material are available such as aluminum, fiberglass and plastic sheeting, and chain link type fencing. A study of the various types of protective screening available indicates that chain link fencing is the most economical and practical for pedestrian overpasses. For recommended applications refer to the Standard Details.

The top of the protective screening may be enclosed (not required) with a circular section in order to prevent objects from being thrown over the sides and to discourage people from climbing on (over) the top. The opening at the bottom is held at a 1 inch clearance to prevent objects from being pushed under the fence.

The core wire of the fence fabric shall be a minimum of 9 gauge (0.148 inch) thickness, galvanized and woven in a 2 inch mesh. A 1 inch mesh may be used in highly vulnerable areas. A vinyl coating may also be used for aesthetic purposes. Add a special provision to the contract if these additional features are used. Special provisions for common items are available as STSP's or on the Wisconsin Bridge Manual website.

Region project staff should be consulted with regards to fencing preferences.



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