



- *Roebling Aqueduct*: Delaware River at Lackawaxen
- *Saxton River Bridge at Bellow Falls*: Vermont Association of Snow Travelers (VAST), Vermont
- *Saxton River Bridge at Grafton*: Vermont Association of Snow Travelers (VAST), Vermont
- *School House Road Bridge*: Chester, Vermont
- *Smokey Angel Bridge*: Hartland, Maine
- *Tye River Bridge*: Appalachian Trail, George Washington and Jefferson National Forest, Virginia
- *Wallace Tract Trail Bridge*: George Washington and Jefferson National Forest, Virginia
- *Wilderness Trail Bridge*: White Mountain National Forest, New Hampshire
- *Winooski Wonder Bridge*: Vermont Association of Snow Travelers (VAST), Waterbury, Vermont

The difference between the Pochuck Quagmire Bridge and the pedestrian bridges listed above became readily apparent in this inventory. Almost all of the bridge sites were easily accessible by a paved roadway. All of the bridges were located on solid rock outcrops or had similar good foundation conditions and crossed a well-defined river in a gorge or sheltered valley. The Pochuck Quagmire site did not have any of these benefits. In addition, the majority of the bridges were located in out-of-the-way rural locations as opposed to the Pochuck site, which is on the fringe of the New York City Metropolitan area. This necessitates a greater emphasis on public safety and anticipation of misuse.

USDA Forest Service's Use of Suspension Bridges

With this inventory it became apparent that USDA Forest Service bridges were the only pedestrian suspension bridges that were built to a consistent, identifiable standard. The USDA Forest Service appears to use the same basic plans for its trail suspension bridges with regional variations. It seems that these plans originated in the 1930s.

During the development of this publication, the author learned of an additional 31 USDA Forest Service suspension bridges in Idaho and Montana. Photographs of a few of these bridges are included in Appendix H. The Appalachian Trail Tye River Bridge was originally built in 1972 and reconstructed in 1992. The Kimberly Creek Appalachian Trail Bridge is the most recent USDA Forest Service Suspension Bridge on the Appalachian Trail, having been built in 1992. The Pochuck Quagmire Bridge design incorporates some of the proven features of the Forest Service bridges and provides alternatives to other elements. The author acknowledges the valuable input of the USDA Forest Service. The Pochuck Quagmire Bridge upgrades structural and public safety elements to Building Officials and Code Administrators® International (BOCA®), American Association of State and Highway Transportation Officials (AASHTO), and the Americans With Disabilities Act (ADA) standards where practical. Based on the field inventory by the author, the Pochuck Quagmire Bridge meets or exceeds the standards utilized for the USDA Forest Service Suspension Bridges on the Appalachian Trail.

Suspension Bridge Nomenclature

Following are some definitions and simple sketches (Figure 2, page 15) of suspension bridge components. These are provided at this time to give the reader an overview. Greater detail is provided later in this case study. As stated previously, suspension bridges consist of a rigid flooring system hung by suspender cables from main catenary cables. The main catenary cables pass over the support towers via cable saddles and are connected to subsurface anchorages.



Main Catenary Cables: These cables provide for the distinctive parabolic silhouette. Cables are in tension. To be correct in a technical sense, what are generally called the cables are more properly called wire rope. Groups of individual wires make up a strand. Groups of strands make up a wire rope. When a wire rope reaches a large diameter, it is generally called a cable. There does not appear to be a common consensus as to the threshold diameter that differentiates between a wire rope and a cable.

Backstays: That portion of the main tension catenary cables (wire rope) that extends from the tower top saddles to the subsurface anchorages.

Suspenders: The vertical wire ropes that run from the main cables to the rigid floor system. Normally these are significantly smaller in diameter than the main cables, and these are equally spaced. They distribute the roadway load to the main cable.

Center Span: The horizontal distance between the towers.

Towers: Also called piers or pylons. The towers support the main cables. They must address wind, temperature, and live and dead loads.

Sag: Also known as dip. The vertical distance between the high and low points of the main cable.

Sag-Span Ratio: The ratio of the cable sag to the span. A critical design element.

Cradle: The horizontal offset distance between the midpoint of the main cable to the straight line established by the cable saddles.

Flare: The horizontal offset distance between the straight line established by the cable saddles and connection of the main cable to the anchorage.

Stiffening Trusses: These act to distribute a concentrated live load over a length on the main cable by loading several suspenders. They provide support for the floor system.

Camber: The arch of the walkway. The vertical distance from the underside of the truss chords at the bridge midpoint to the straight line drawn between the tower walkway support points.

Tower Footing: This component transfers the axial load of the bridge towers to suitable bearing subsurface stratum. It is designed to address uplift, overturning, and sliding.

Anchorage: Mechanisms that counter-act the inclined tension load of the backstays.

Design Standards

A problem that presented itself during the 1994 design phase of this project is that no formal design criteria for any type of pedestrian bridge had ever been addressed by any of the major recognized design codes. Pedestrian bridges seem to have “fallen through the cracks.” This was verified by a review of the literature and discussion with engineers nationwide. In order to address this void, in 1997, AASHTO published the “Guide Specifications for Design of Pedestrian Bridges.” Excerpts of this guide specifications are provided in Appendix B. Liability by not meeting recognized “design standards” on the part of project partners in the event of an accident or misuse on the bridge became a major concern.