

APPENDIX C – BRIDGE ELEMENTS AND STANDARDS

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Following are examples of various types of bridges commonly used to cross waterways within National Forest lands. Each bridge type is recommended for only certain Recreation Opportunity Spectrum (ROS) types, and utilizes design elements and materials that are appropriate to the requisite ROS classification. In addition to the ROS classification, each bridge would be located, planned, and designed with respect for the natural, cultural, and historical context in which they reside, according to the Built Environment Image Guide (FS-710).

Suspension

Cable suspension bridges are supported by two main steel cables. The deck is hung from suspender cables or steel rods. Decks are usually sawn timber planks. The cables are anchored into the streambanks and are supported by intermediate towers.

Longer span cable suspension bridges are usually designed with a stiffening truss. The stiffening truss supports and stiffens the deck. Bridges with spans shorter than 120 feet are often designed without the stiffener truss.

Stiffening trusses can be designed to carry dead loads and construction loads at sites where trusses can be supplied and installed in one piece. Cables are then added to carry live loads.

Concrete Towers

Typical main span 80 to 400 feet

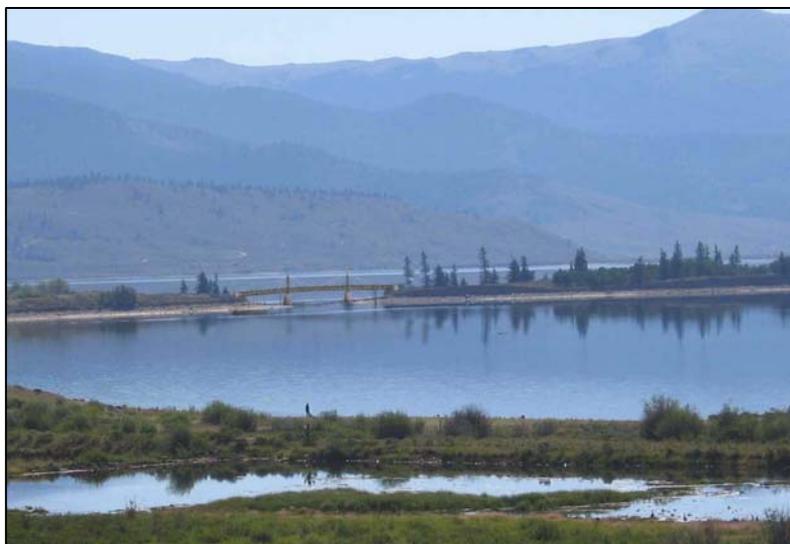
ROS Zones: U, R, RN, SPM

Steel Towers

Typical main span 80 to 400 feet

ROS Zones: U, R, RN

The following is a depiction of elements for the proposed Twin Lakes Bridge at Twin Lakes Reservoir from State Highway 82. The bridge would most likely be constructed as one of the examples listed above. The graphic is not to scale and is used for illustrative purposes only.



Deck Cable

Deck cable bridges are supported by two main steel cables. The deck is also supported on the two main cables. The cables are anchored to the abutments and may or may not be supported by intermediate towers. Decks are usually sawn timber planks.

Without Towers

Typical span 40 to 80 feet

ROS Zones: U, R, RN, SPM, SPNM

Timber Towers

Typical main span 40-120 feet

ROS Zones: U, R, RN, SPM, SPNM

Concrete Towers

Typical main span 80 to 300 feet

ROS Zones: U, R, RN, SPM

Cable Stayed

Cable stayed bridges are supported by multiple steel cables connected to the tops of one or more sets of towers. Decks may be timber, concrete, or steel grid.

Steel Towers

Typical main span 100 to 400 feet

ROS Zones: U, R

Deck Girder

Deck girder bridges are supported by two or more longitudinal girders (beams). Decks are supported on the tops of the girders and are usually timber (log, sawn or glulam), but may be concrete or steel.

Timber

Log

Typical span 10 to 50 feet

ROS Zones: U, R, RN, SPM, SPNM

Sawn

Typical span 10 to 30 feet

ROS Zones: U, R, RN, SPM, SPNM

Glued Laminated Timber (Glulam)

Typical span 20 to 100 feet

ROS Zones: U, R, RN, SPM

Steel**Steel Girder**

Typical span 30 to 120 feet

ROS Zones: U, R, RN

Plank decks are usually nailed to timber nailers bolted to the top of the beams. Glulam decks are usually bolted to brackets that fit under the top flange of the steel beam.

Deck Truss

Deck truss bridges are supported by two or more longitudinal trusses. Decks are supported on top of the trusses and are usually timber (sawn or glued laminated), but may be concrete, steel, or fiberglass.

Timber Truss

Typical span 50 to 80 feet

ROS Zones: U, R, RN, SPM

Steel Truss

Typical span 50 to 100 feet

ROS Zones: U, R, RN

Fiberglass Truss

Typical span 50 to 80 feet

ROS Zones: U, R, RN

Side Girder

Side girder bridges are supported by two longitudinal girders (beams). The deck is hung on the interior side of the girders, either on floor beams or ledger beams attached to the main girders. Deck planks will be transverse when ledgers are used or longitudinal when floor beams are used. Larger bridges may use longitudinal stringers on top of the floor beam. The girders usually function as all, or part of the handrail system. Decks are usually timber (sawn plank or glued laminated), but may be concrete or steel.

Glued-Laminated (Glulam) Timber

Typical span 60 to 120 feet

ROS Zones: U, R, RN, SPM

Steel

Typical span 60 to 120 feet

ROS Zones: U, R, RN

Many abandoned railroad bridges of this type have been converted to trail bridges.

Deck Arch

Decks are supported by longitudinal beams or walls that are supported by the arches.

Timber

Typical main span 60 to 120 feet

ROS Zones: U, R, RN

Masonry

Typical main span 20 to 60 feet

ROS Zones: U, R, RN

Concrete - Filled

Typical span 20 to 80 feet

ROS Zones: U, R

Concrete - Open Spandrel

Typical span 40 to 100 feet

ROS Zones: U, R

Suspended Arch

Suspended arch bridges are supported by two arches. The deck is supported by longitudinal beams that are hung (suspended) from the arches with steel rods or cables. Decks can be timber (sawn or glued laminated), concrete, or steel. The longitudinal beams often function as tension members, holding the ends of the arch together. These arches are often referred to as "tied arches."

Timber

Typical span 60 to 120 feet

ROS Zones: U, R

Steel

Typical span 60 to 200 feet

ROS Zones: U, R

Single Unit

Single unit bridges are bridges in which the bridge is a single, self-supporting unit.

Foot Log

Typical span 10 to 40 feet

ROS Zones: U, R, RN, SPM, SPNM, P

Nailed- or Glued-Laminated Timber

Typical span 10 to 40 feet

ROS Zones: U, R, RN, SPM, SPNM

Prestressed Concrete

Typical span 30 to 120 feet

ROS Zones: U, R