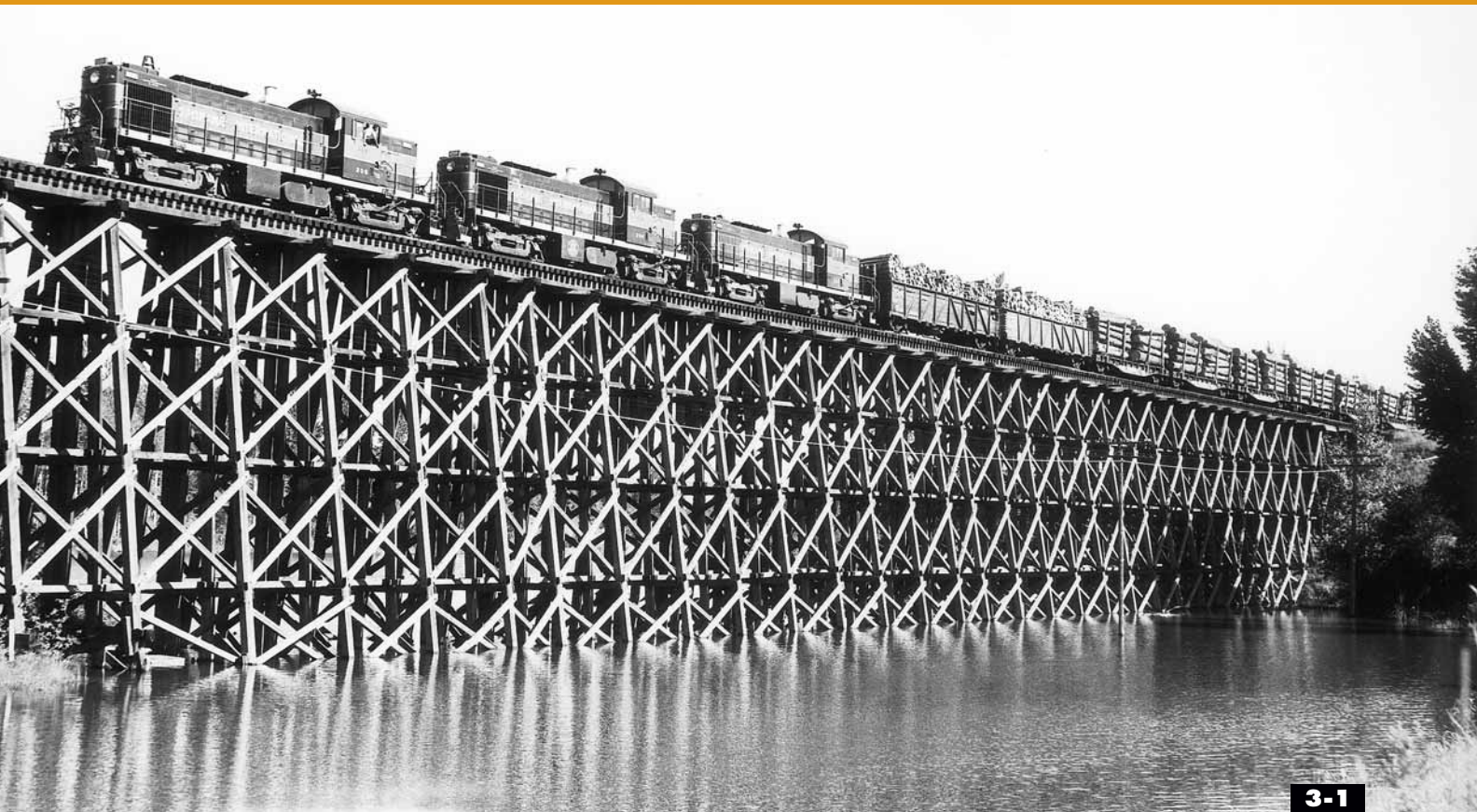


CONTENTS

Introduction	4
Chapter One: Bridge basics	5
Chapter Two: Culverts and beam bridges	9
Chapter Three: Trestles	14
Chapter Four: Plate-girder bridges	25
Chapter Five: Truss bridges	38
Chapter Six: Stone and concrete bridges	50
Chapter Seven: Movable bridges	58
Chapter Eight: Highway bridges	65
Chapter Nine: Abutments and piers	72
Chapter Ten: Tunnel portals	80
List of available models	86

Trestles



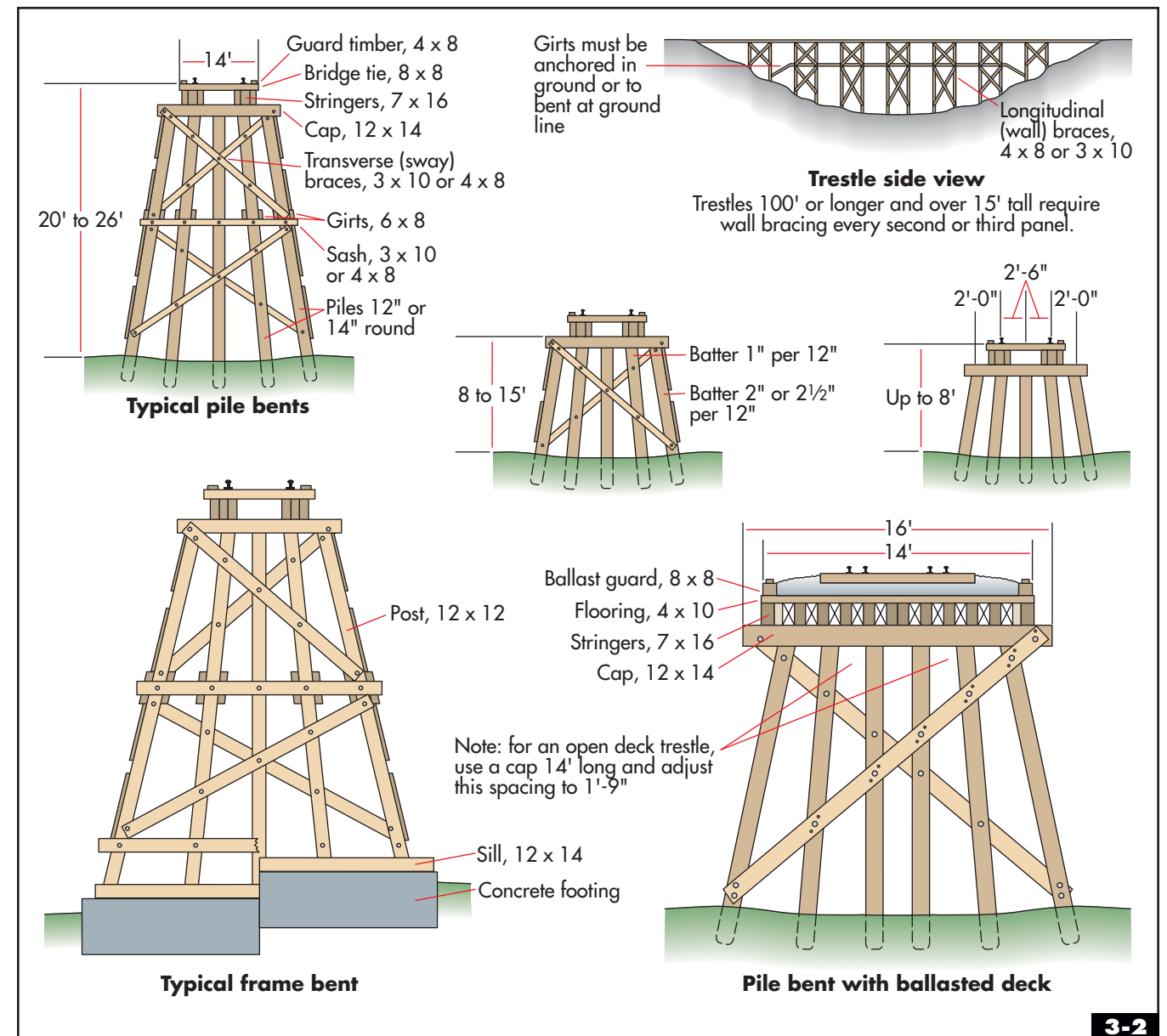
3-1

This tall frame trestle on the Spokane International is typical of many found all over the U.S. into the early 1900s. Located in lumber country, this wood trestle was still receiving heavy use in 1955. *L.E. Shawver*

When most model railroaders hear the word “trestle,” they think of the classic tall wood structure that dominated early years of railroading, especially in the Midwest and West,

3-1. Although most of the large, towering structures have been replaced, many small wood trestles still exist. They remain an economical way of bridging small gaps where drainage is required and where below-deck clearance isn’t an issue.

A trestle is essentially a series of short spans over multiple supports—in the case of a wood trestle, a series of short wood-beam bridges on wood bents. And, regardless of size, wood trestles just look impressive, which is why they find their way onto so many model railroads.



Wood trestles

Wood trestles were popular in the early days of railroading because of their ease and speed of construction, particularly in areas that had a plentiful local supply of timber. Most trestles have a common look, **3-2**, with vertical supports called “bents” made of five or six vertical posts. Some early light-duty trestles have four-post bents, **3-3** (page 16). The outermost posts of the bents angle outward, with cross- and X-bracing for rigidity.

The bents are spaced about 12' to 15' apart, with wood stringers placed across the tops. Wood ties—spaced much more closely

than on conventional track—are laid across the stringers, as you can see in the prototype photos throughout this chapter.

Wood trestles fall into two categories: frame and pile. Frame trestles have bents with posts that aren’t driven into the ground, but are framed and rest on a solid foundation, **3-4** (page 16). Square timbers were typically used for the posts on frame trestles, although round posts were not unheard of.

Pile trestles have round posts that are driven into the ground by a pile driver. Most trestles still in service, including those being built today, are pile trestles, **3-5** (page 16).

Bracing on trestles includes X-braces, called sway or transverse braces, on the bents. The straight horizontal pieces between stories are called sash braces. X-braces that connect adjacent bents are called wall or longitudinal braces. If a trestle is more than one story tall, the bents are connected by straight horizontal members called girts.

Most trestles have open decks, with the ties laid on the stringers, **3-6** (page 16). Guard timbers at the outside of the ties keep the ties aligned. Many trestles have guardrails inside the running rails, although these are omitted on some short spans.



7-6 On a center-bearing bridge, the center bearing supports the entire weight of the bridge structure. The small wheels at the outside help balance the bridge as it pivots. *Historic American Engineering Record; Wm. Barrett*



7-7 Large wheels on a track support the weight of a rim-bearing bridge. This bridge (the same as shown in photo 7-1) is supported by forty 20"-diameter wheels on a 25'-diameter track. *Historic American Engineering Record; C.N. Beasley*

used for spans over channel widths of 50' or more. The bridges used for the movable spans are usually symmetrical, with the pivot at center (see **7-1**, **7-2**, and **7-3**). However, to provide a larger waterway channel, bridges are sometimes longer on one end, with a counterweight on the other end to make up for the size difference. Photo **7-4** (page 59) shows an offset bridge in the open position, with its large concrete counterweight visible; photo **7-5** (page 59) shows the same bridge closed.

Swing bridges range in length from 50' up to 400' or 500'.

Swing bridges are center bearing, rim bearing, or a combination of the two. Center-bearing bridges swing on a pivot bearing that holds the whole weight of the bridge. A series of balance wheels on a circular track stabilize the bridge, **7-6**. Center-bearing bridges are simpler in design than rim-bearing bridges and use fewer construction materials because they require a smaller support pier. They are typically used where a relatively short,

lightweight bridge (under 250') is required.

Rim-bearing bridges are supported by a series of rollers around a rim that is usually as wide as the bridge itself, **7-7**. These bridges have wider bases, with a more complex structure between the bridge and pier. Rim- and combination-bearing bridges are more common on longer spans.

To move a swing bridge, an operator sits in a shelter either on the bridge structure itself or on the shore, controlling the bridge movements. As the bridge swings into place, contacts (wedges) on the ends of the swing span slide and lock into slots on the piers at the permanent track ends, **7-8**.

Rails on the bridge span are beveled to mate with rails on the adjoining track, **7-9**. They are raised when the bridge is open, allowing them to swing over the stationary adjoining rails as the bridge is moved to the closed position. They then drop down and lock into position.

Swing bridges started to fall out of popular use shortly after

Wedges are remotely driven from a center-bearing bridge into a cross-girder at the end pier to support the live load. *Historic American Engineering Record; Wm. Barrett*



7-8

the beginning of the 20th century, as new technology came into use for bascule and lift bridges.

Bascule bridges

Bascule bridges have one end hinged, with the track bridge rising into the air from the hinged end, **7-10**. Although this basic type of bridge has been used since the days of castles with moats, it wasn't until the 1890s that the challenges of counterbalancing a heavy railroad span were met, allowing electric motors to efficiently drive the mechanisms. The bascule bridge quickly became popular for railroad use.

Bascule bridges offer several advantages over swing bridges, including speed of operation and the absence of a center pier to interfere with water traffic. Where a swing bridge must be opened completely to let water traffic pass, a bascule bridge need not be raised to its full height to clear water traffic.

The bascule design is also compact, allowing it to fit into cities and other areas where side clearances are tight, especially where there are neighboring bridges. They are common sights in crowded areas where multiple bridges cross narrow waterways.

Bascule bridges for roadways are often "double-leaf" bridges, with a pair of bridges (leaves) that meet in the middle of the span. The complexities of rail alignment and the support strength that would be required at the joint preclude this for railroads, so railroad bridges are almost all the single-leaf style.

There are several types of bascule bridges, **7-11** (page 62), but they follow two basic patterns. The first type in wide use, shown in photo **7-10**, is the rolling lift bridge. As the name implies, it rolls backward on curved extensions of the bridge girders, **7-12** (page 62). As it does this, the leaf rises and the counterweight drops. The counterweight makes this very economical to operate.



7-9

Rails, tapered at the ends, are hinged on the typical swing bridge. They are lowered to mate with the land-side rails once the bridge is closed and locked in position. *Historic American Engineering Record; Wm. Barrett*



7-10

This double-track Scherzer rolling lift bridge was built on the New York, New Haven & Hartford near East Lime, Connecticut, in 1907. *Historic American Engineering Record; Wm. Barrett*

The Scherzer design is perhaps the most-common counterweight bascule design (see photo **7-10**).

The hinged or trunnion bridge eventually became the most common bascule type. A trunnion bridge has a heavy counterweight

mounted on a frame at the fixed end of the span, **7-13** (page 63). The bridge rotates around a fixed pivot point. As the leaf is raised, the counterweight swings down. There are several variations of the trunnion bridge, including