BUILD A TRESTLE BRIDGE

BOB YULE

Originally published in "BUFFER STOP" Journal of SARMA (South Australian Railway Modellers Association)

A trestle is a bridge type structure supported on a number of posts or bents. The connecting spans are stringers which connect the supports and support the track. Trestles can be made of wood, steel or concrete, or a combination of these. A variation in trestle design is a series of towers supporting truss spans. These spans can be lattice steel truss or plate steel truss.

In Australia trestles have been widely used in all states. Timber and steel trestles are a common sight even today. In the early pioneering days the availability of extremely strong, durable and good hardwood timber enabled economic construction of bridges and the extension of the railway network, despite the lack of suitable steel and engineering workshops. Due to these economics trestles were built on standard gauge and broad gauge main lines, branch lines, country lines and cross country lines as well as narrow gauge lines. In recent times some have been replaced by steel trestles and bridges and the latest trend is the extensive use of prestressed concrete bridges.

Wooden trestles are basically two types:—

1. Frame trestle
2. Pile trestle

Frame trestles are made of sawn timber frames and rest on a sawn sill on concrete abutments or on a sawn sill resting on piles. There are usually five vertical timbers to a frame.

Pile trestles are made of piles driven into the ground, directly into the soft soil or riverbed. They are usually driven three to a bent or in the case of the Puffing Billy trestle at Belgrave four to a bent.

Most Australian trestles make extensive use of the corbel, a device used to replace a cap on the top of the piles or frames. This is a difference between Australian and overseas trestles, particularly North American trestles. Another difference is the Australian use of hardwood compared to the wide use of softwood in North America. In North America this results in the use of five 14" piles per bent and shorter distances between frames (15' max.) and the use of cap timbers and multi-main stringers bolted beside each other.

This article describes the construction of a typical Australian "Pile" type trestle. The drawing is based on a photograph of a trestle at Mascot (Sydney) N.S.W. appearing on page 12 of the November/December 1970, issue of the Australasian Model Railroad Magazine.

Trestles fill a useful place and function on your model railway just as they do on the prototype. Some span a dry gully, others span a dry creek but subject to seasonal flooding, some span creeks and swampy ground and others span rivers.

The plan is drawn to 3.5 mm = 1 foot scale and dimensions can be read from the drawing using an HO scale rule.

Fig 1 shows how the trestle bent can be made to the desired height by extending the piles and bracing in 12 foot panels. If this is done then longitudinal girts and cross bracing should be used. As a guide consider the difficulties of the gully or the wind and traffic loading that the trestle will have to bear.

Materials.

Quantities and lengths will depend on the height and length of the trestle, the number of bents or frames and whether or not longitudinal girts and cross sway braces are used.

This would mean that all the piles were the same length and a jig could be used to speed construction and achieve uniform appearance.

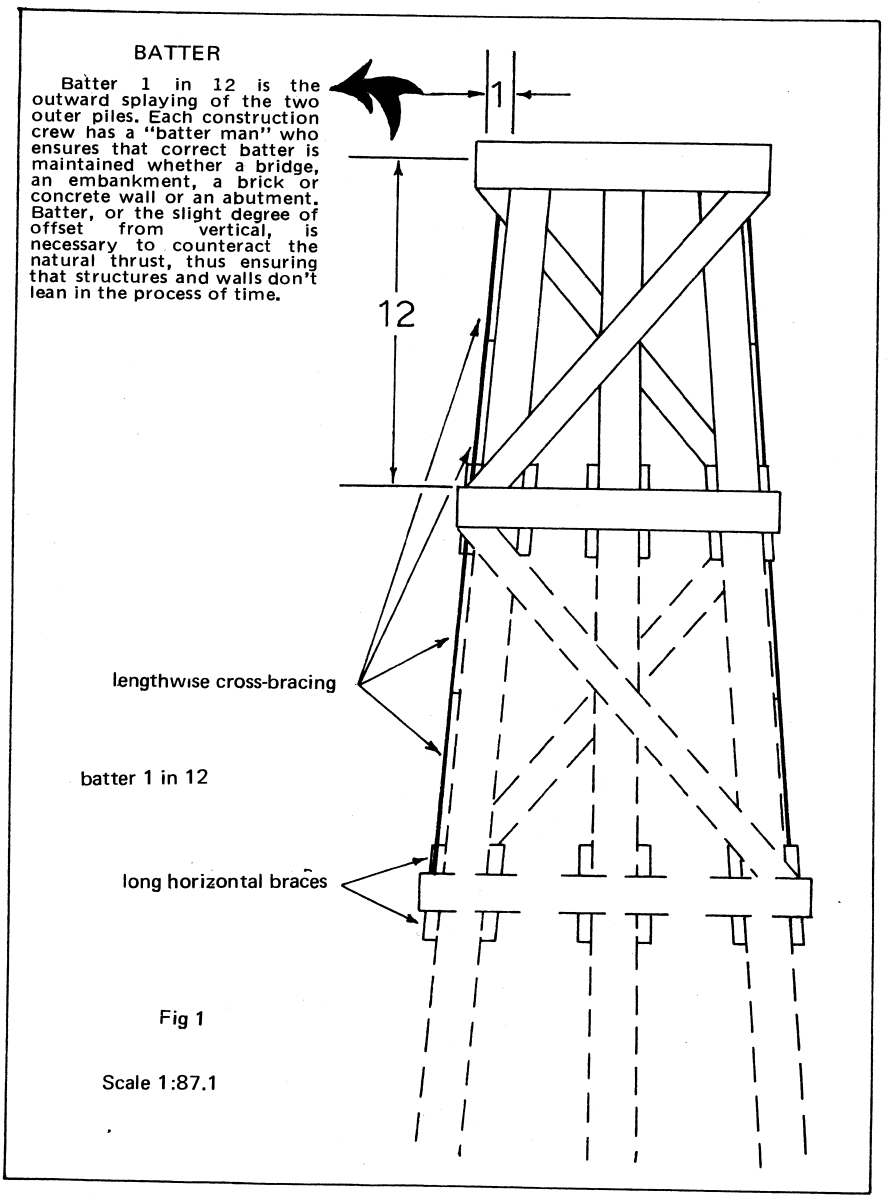


Fig 1

Scale 1:87.1

Material	Prototype	Model
Track Sleepers	8'6" x 9" x 9" (21" x 15")	(7/64" x 7/64") or 3/32" x 3/32"
Main Stringers	(18" x 15")	(1/4" x 3/16")
Corbels	26" x 15"	5/16" x 3/16"
Sash Braces	21" x 9"	1/4" x 3/32"
Sway Braces	12" x 6"	1/8" x 1/16"
Piles	18" Diameter	7/32" or 1/4" Diameter
Longitudinal Girts (Braces)	12" x 8"	1/8" x 3/32"
Longitudinal Cross Sway Braces	12" x 6"	1/8" x 1/16"
Abutment Posts	4" x 6"	3/64" x 1/16"
Abutment Planks	3" x 12"	1/32" x 1/8"
Abutment Vertical Bolting Planks	4" x 12"	3/64" x 1/8"
Rail		Code 65 or 70
Fishplates		Adapt Rail Joiners
Rail Base Plates (Styrene)		Size from Plan
Spikes		Code 70
Nut and Bolt Washer castings		Suggest Kadee Type

To make the jig use fig. 1 (and also refer to fig. 6). Draw this on a piece of ply wood or heavy card and glue ½" blocks of 1/8" square stip wood or balsa to this outline so that the piles can be positioned, shaped, cut and the sway braces added directly at this jig stage.

The jig can be a three panel bent and thus can be used for making all the bents regardless of actual height (if they vary). The number of panels used depends on the requirements of the site.

Cut all timber (including track sleepers) to size, sand smooth and stain or paint now at this stage as it is easier to do now than later when assembled. To stain the timber try to achieve a weathered timber appearance. This is usually a grey to steely grey colour but could be redder or browner depending on environment. Thinners, turps, grey paint and a few drops of white and perhaps a dash of brown mixed together to give a "slosh" stain should result in a grey weathered appearance.

Cut the piles to length, point the ends also cut the recess at the top for the corbel (note that this is not a straight vertical recess but canted slightly due to the outer piles having a batter of 1 in 12.) Also cut the recesses for the sash braces and the sway braces. This makes a neater job and also gives a better bolting (glueing) surface.

Place the piles in the jig and glue on the sash braces then the sway braces.

Lift out the bent and turn it over and repeat the steps. Now you should have the basic bent. Carefully drill and add, by glueing, the nut and bolt and washer castings.

The corbels can be glued on now and make sure that they are seated correctly and horizontally on the top sash brace and resting in the recesses of the outer piles. (The corbels won't be horizontal if a grade or cant (super elevation) is included in the trestle.)

Corbels serve the function of supporting the main stringers and transferring the stresses to the trestle bent and also of supporting the joints in the main stringers.

Now glue the main stringers onto the corbels and the joints should be staggered so that only one joint is on each bent and located at the lengthwise centre of the corbel.

Lengthwise girts and cross stays can be added now if needed.

A good glue to use is Selley's Triple purpose or Tarzan's Grip or an epoxy such as Resiweld Five.

This results in the basic trestle at this stage.

The abutments can be assembled now from the stripwood. Six inch piles or logs can be used as the main uprights in place of the 4" x 6" posts.

Normally the abutments are not just under the corbel but adjoins a bent with a half corbel (fig. 8) or sometimes just the main stringer attached to the sash braces and resting on the pile (fig. 9) or a concrete abutment (fig. 10).

Glue the abutments in place, then place the trestle in position and when all is lined up glue the piles to the floor of the recess.

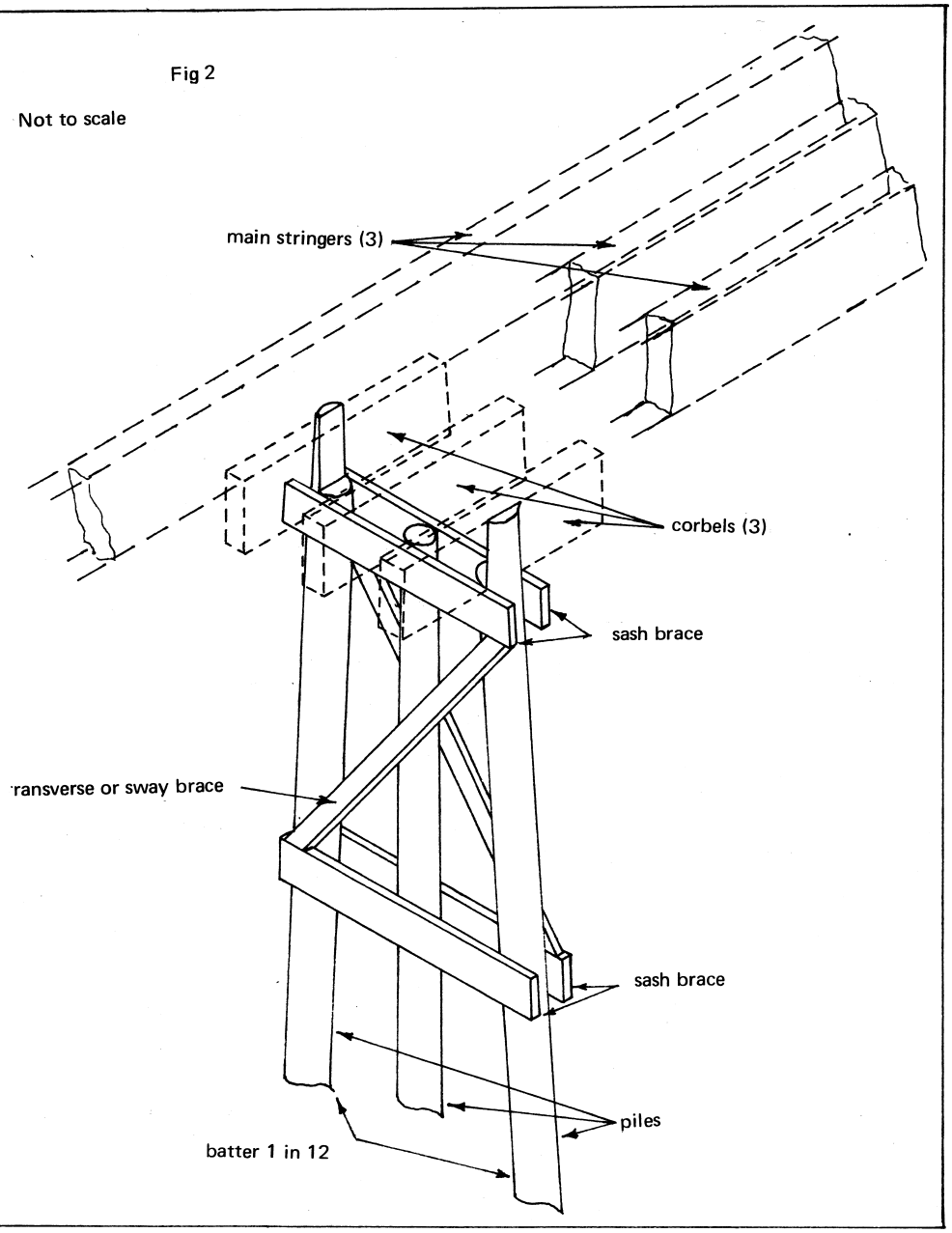
Glue the sleepers to the main stringers and add the rail (on styrene plates) spiking the rail to the sleepers through the plates. To join the rails make fish plates and drill the rail using 16BA nuts and bolts or pins glued in the holes. An epoxy glue (such as Araldite) will ensure that the joints don't come apart.

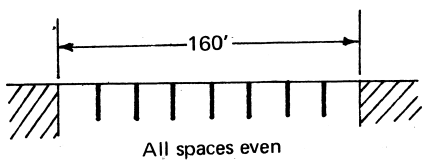
Then add the inner guard rails. Bend the ends of the guard rails towards the track centre (45 degrees) about 20 feet from the trestle on the approach sides of the abutments. The function of these rails is, in the event of a de-railment, to keep the wheels of the locomotive and train on the sleepers and hence on the bridge.

North Eastern wood strips are in 24" lengths. Austral Model Craft also have timber shapes and you could also buy Camino Scale lumber from North America.

Fig 2

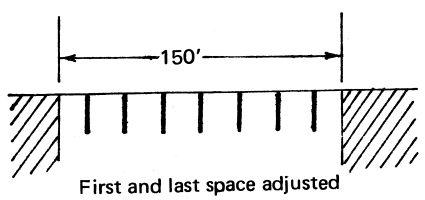
Not to scale





All spaces even

Fig 3



First and last space adjusted

Fig 4

Some of the timbers can be modified to suit the proportions of the trestles or the type of traffic to use the trestle.

For branch lines and light locomotives and loads smaller, thinner timber could be substituted and to maintain the proportions reduce the distance between the bents or pile frames i.e. 15-18 feet instead of 20 feet.

Commence by determining the overall length and height of the trestle. Calculate the number of bents at 20' spacings. If uneven then the two end spans can be adjusted for the difference leaving the other spans at 20 foot. i.e. (1) 160 scale feet = 20) 160 = 8 spaces or nine frames needed and the spacing is constant. (2) 150 scale feet = 20) 150 = 7½ spaces use 8 spaces and 9 frames, the first spaced at 15 feet the next 6 at 20 feet and the last at 15 feet. It might be easier if the space available was a constant depth and the plaster river banks graded to match the contour of the river bed with the number of 12 foot sections per bent pre determined. The gap is the base board could be as fig. 5.