

# Cement Ties

By Gerald Braun



I was looking through some back issues of MODELTEC (Dec. 1991) and found an article written by Ed Archer on Concrete Ties.

Ed built concrete ties for his two-foot gauge railroad. He suggested that this concept could be adapted to most scales of the railroad hobby.

I am currently planning a 7.5 inch gauge track around my house and yard. I thought about different tie materials and after reading Ed's article, I decided, why not use concrete? I've worked with the stuff a number of times and know that it's not the easiest work that I've had to do. The 450 ft of track amounted to 1440 ties, give or take a few, plus a few longer lengths for the 3 switches that I would need. I planned on spacing the ties from two to three inches apart and finally ended up with 2.25 inch spacing or whatever would work out evenly for 10 foot lengths of rail.

I needed a quick way to pour a lot of ties. My ties are to be 1.5 inches square and 14 inches long for the mainline. I cast ¼ inch bolts in the ties to hold the rail at the proper spacing. One tie would have the bolts on the inside of the rails and the next on the outside., alternating around the right of way.

I built two forms; one for bolts inside and one for bolts outside of the rails, each of 14 ties (originally 15 ties per form but I only measured once and cut twice). The only problem with the form is calculating how many ties you have produced. Lets see....14 times X is aah about?? You know what I mean?

A 1:3 mixture of cement to sand and using 9 quarts of sand will just fill one form of 14 ties. This worked out well because the "ODJOB" (plastic cement mixer that you roll on the floor or ground ) I bought at a local hardware store was just right for that quantity.

Some 1/4 inch pencil rod and 1/4 by 1 inch bolts filled out the materials list and were purchased from a local re-bar company and hardware store.

## Forms

### Bottoms-

4 lengths of 1x12 pine (that's what I had) into 7 inch by 30-1/2 inch pieces were used for the bottom. (32 inches long would make 15 ties per form.) I also cut 4 pieces of 1x12 into 1-1/2 x 12 pieces for legs to set the forms off the floor and to keep the bottoms from warping. 2 of the 7x30.5 in boards were glued together to form 14 x 32.5 bottoms. The legs were glued and screwed on to complete the bottom. (Figure 1).

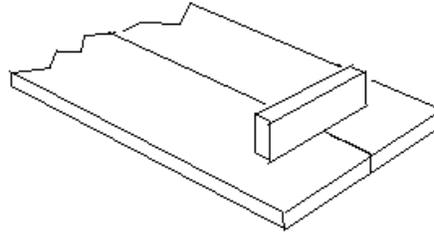


Fig. 1

Figure 1



### Spacers-

1x12's were again ripped to 1.5 in strips 14 inches long. Extras were cut in case of knots and other errors. 26 are needed for 2 14-tie forms, 28 for 15-tie forms. I thought that the ties should be about 1/4 inch smaller at the top so the ballast would help hold the ties down as well as sideways and endwise. This took a little extra work and I don't know if it will make any difference. I tapered the spacers 1/8 inch on each side, the smaller end goes to the bottom of the form.

The spacers are held in place on the bottom of the form by nails with heads cut off or pins driven into the spacer's bottom and corresponding holes drilled into the bottom of the form and holes in the ends corresponding to pins in the sides of the forms. (figure 2) If you build a jig to drill the holes all the same distances apart and space the nails in the bottoms and sides of the spacers evenly you will save time later.

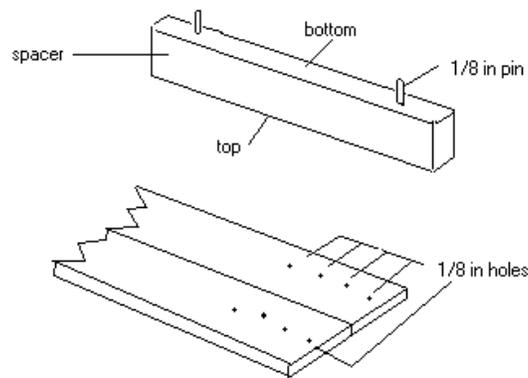


Figure 2

### Ends and Sides-

The ends of the forms are the same as the spacers but tapered on the insides only.

The sides of the form are 2.5 x 30.5 x 3/4 in. pine and are not tapered. Nails are driven through them to correspond with the holes drilled in the ends of the spacers. The Sides are anchored to the bottom by driving nails through the end pieces and into the bottom of the form then separating and drilling out the holes in the bottom board for a sliding fit. (figure 2.)



**Assembly-**

The spacers, ends and sides are fit together and held in place by rubber bands. See Figure 3 for placing more nails into the sides and bottom ends of the form. This will hold the rubber bands that secure the sides to the bottom of the form in turn securing the spacers to the sides and bottom of the form.

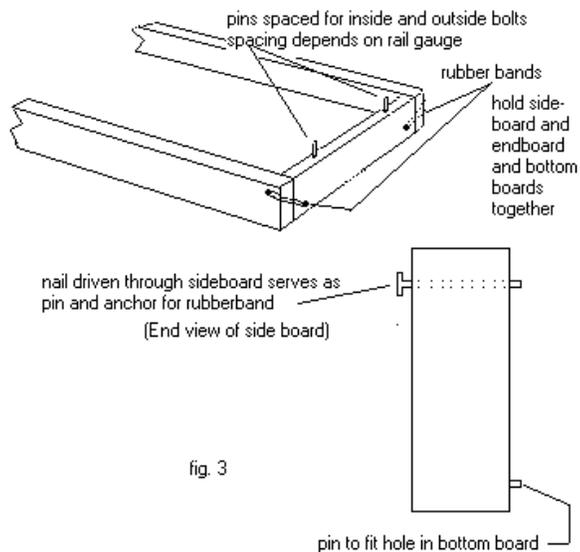
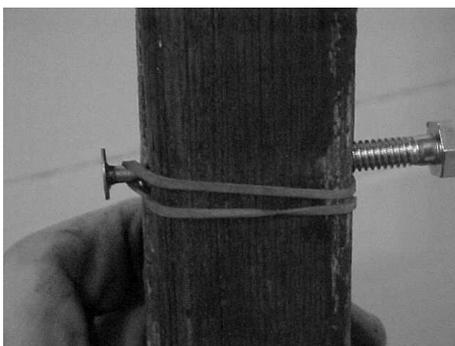


Figure 3

Pat yourself on the back if you got this far. You must really be motivated and want some cement ties.

The worst part is done. Now, you will want to space the 1/4 inch bolts in the ties before curing. Depending on the gauge of your railroad and the thickness of the base on your rail, figure out the spacing and allow 1/16 to 1/8 in. on both sides for error. My rail bottoms were 6-7/8 inches apart to give me a 7-1/2 inch spacing at the top of the rail. Remember to build in some tolerance because once the rails are poured that's what you get.



Insert nails with heads removed and spaced for your rails (a in figure 2) on the end pieces of your form. (Inside bolts in one form and outside bolts in the other. Plan now to always place the larger of the two pieces of wood in your "Bolt Spacer" where your rail will set on your tie.

#### Bolt spacers-

I ripped a 2x6 into  $\frac{3}{4}$  and  $\frac{1}{4}$  inch thick strips 30.5 inches long. I held two  $\frac{1}{4}$  inch strips together with clamps and centered them on my drill press so I could drill a  $\frac{1}{4}$  inch hole down the centers of each piece 1-1/2 inches apart and  $\frac{3}{8}$  inch deep. (figure 4) This gives you  $\frac{1}{2}$  of a  $\frac{1}{4}$  inch hole in each  $\frac{1}{4}$  x 1-1/2 x 32 inch strips spaced to hold the  $\frac{1}{4}$  inch bolts. Using  $\frac{1}{4}$  inch bolts and aluminum roofing nails and rubber bands, secure the bolts between a  $\frac{1}{4}$  inch and  $\frac{3}{4}$  inch strip as shown in figure 5. Insert nail in slot on opposite side of bolt and hold the two pieces of wood together. Loop the rubber band over the head of the nail and stretch it around both pieces of wood first on one side of bolt and around both pieces of wood again and on the other side of the bolt and loop over nail head. Do this for all bolts and they will be held snugly for easy insertion into the cement.

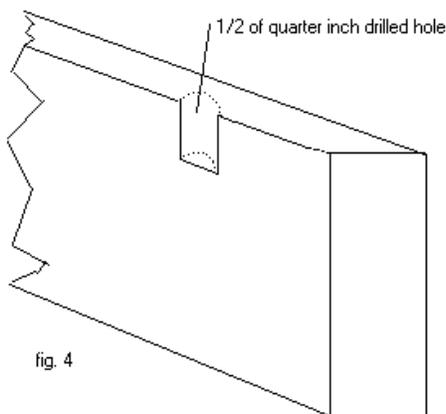
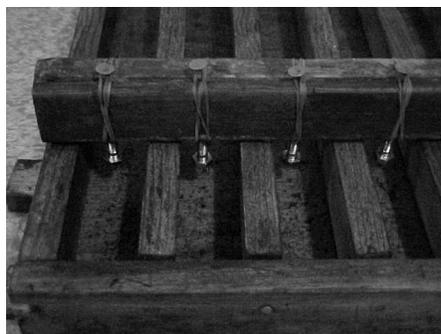


fig. 4

Figure 4

I used two coats of sanding sealer

on all surfaces and lightly sanded them. Before assembling the form, apply a light coat of vaseline or petroleum jelly with a small brush to all the surfaces of the spacers and the inside surfaces of the ends and sides.



Cover the top side of the bottom of the form completely even under the bottoms of the spacers. You must do this every other time you use these forms. The cement ties separate nicely when enough petroleum jelly is present.

#### Pouring your first ties-

1. Cut pencil rod into 12 inch lengths.
2. Have bolts ready in the bolt holders.
3. Mix up enough cement, sand and color to fill one form. (My form took 9 qts. Sand, 3 qts. Cement,  $\frac{1}{4}$  cup color and 3 to 3-1/4 qts

water.

4. My "ODJOB" instructions suggested that I add 3 qts. water, 3 qts. cement, 6 qts. sand and mix. Open the container and add the rest (3 qts.) of sand and color if you're using it and mix for at least 1 minute.
5. Pour about 1/2 of the mixture in the middle of the form and spread out to fill all the ties about 1/2 full. You will have to work the cement into the corners and sides with a small trowel. I bought a mason's trowel 1-1/2 in. wide by 6 in. long and 1 small triangular one. These are a must for getting the cement into the corners of the ties.
6. Place one pencil rod in the center of each tie and tap it into the cement making sure it is centered and is deep enough to not interfere with the bolts when they are inserted.
7. Pour in the rest of the cement and work it into all the corners and level off.
8. Take one "bolt spacer" and place it over the locating pin on the end of the form and gently push it into the cement, jiggling it as you push the bolts into the cement. Remember, the 3/4 inch piece of wood always goes where you want the rail to set on the tie. (the 3/4 inch piece would be on the outside of the inside bolts and on the inside of the outside bolts just like your rail) . Do this with the other "spacer" now.
9. To insure that the cement completely covers the inserted bolts, gently work a pointed trowel under the "spacer" and flatten any humped up cement and work it back under and around the bolts. (You will see what I meant once your ties are ready to come out of the form)
10. Repeat the above steps for the second form. Do not forget to clean up your mixing equipment and get rid of the excess cement.
11. After 1 or 2 hours, hold down on the "bolt spacers" and pull out the nails and let the rubber bands come loose. Be careful as some snap pretty hard and will cause some cement to fly up and into your eyes if not protected. Once all the rubber bands are loosened you can remove the wooden spacers and use your trowel to even the cement around the bolts.



12. Let set for 24 hours and remove all the rubber bands from the form and gently remove the sides and starting on one end remove one end, one tie, one spacer, one tie, another spacer, another tie, etc.
13. I stack all the ties from two forms in a plastic garbage sack and add a couple of rags soaked in water and close and cure for 1 week.
14. All you have to do now is clean up the forms, re-oil with petroleum jelly, and reassemble.

You're ready to make more!!!!

Remember....this is a HOBBY...you can take as long as you want to make more ties. You don't have to make a thousand in one week.



## About the author



**Gerald Braun** Jerry is about to retire from his pharmacy in 17 months. He built a 350 feet long 7.5 gauge railroad (B&M Railroad) around his house on which he plans to run a Plymouth switch engine and a Class A 2 truck Shay he is currently building from scratch. Jerry lives in Spokane, Washington.

