BUILDING RGS BRIDGE 45-B

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Abstract

This is a "how-to" article for building a highly detailed model of one of the most famous high line bridges on the Rio Grande Southern railroad. A section on jigs and molds gives valuable information for making and using these handy tools that simplify model bridge building. The article contains very detailed step-by-step instructions for preparing plans, fabricating the various sub-assemblies, and assembling the completed trestle. Some of the drawings contained in the article are drawn to scale and can be used as templates for making various components. The tips and techniques clearly explained in this article will provide the modeler with valuable information for building this and other RGS trestles.

Introduction

Bridge 45-B was located on the Ophir Loop, just south of the depot. It crossed the Howard Fork of the San Miguel River on a 24-degree curve and 2% grade. No other curve on the RGS was tighter, although the curve at the upper end of Trout Lake at Bridge 51-A was just as tight. Bridge 45-B was unique in that it had a pedestrian walkway beside the track on the inside edge of the curve.

The original bridge was 112 feet long and 24 feet high. It consisted of eight bents placed sixteen feet on centers. In 1919 the bridge was reported as 108 feet in length. This corresponds to the timeframe (1914-1918) when the other Ophir trestle, Bridge 45-A, and several of the other high line bridges were extensively modified.

The modification to Bridge 45-B shortened the distance between the last two bents (#7 and #8) to twelve feet. This is probably also when the pedestrian walkway was added, the concrete foundation was placed under bent #4, and the guard rails moved from the inside to the outside of the running rails. Judging from photographs of the bridge after it was modified, it does not appear that the end panel between bents #7 and #8 was actually shortened. I think that another bent (call it Bent #8A for reference) was simply added between bents #7 and #8. The pedestrian walkway ended at the new bent #8A.

My completed model represents Bridge 45-B as it would have appeared in the 1939 timeframe. This model is applicable for most RGS layouts from the 1920’s through the end of operations. The hand railing on the pedestrian walkway was repaired several times over the years, and looks slightly different in various photographs.
Part 1. Prototype Trestle Construction

**Stringers**
The bridge engineers had to make some adjustments when building a bridge on a curve this sharp. The three 8” x 18” stringers that made up each of the bridge beams were staggered and spanned two panels each, just as they were for most trestles. However, they were not parallel, as they would be in a tangent (straight) trestle.

![Diagram of curved trestle stringer arrangement](image)

- **Figure 1 - Curved Trestle Stringer Arrangement**

On a 24-degree curved trestle like bridge 45-B, the center stringer of each beam was angled. To accommodate this arrangement, the beams were about 36 inches wide and were spaced only a foot apart. This resulted in a total deck width of about 84 inches when measured from the outside edge of one beam to the outside edge of the other beam. With the beams resting on the tops of the 14-foot long bent caps, this resulted in about 42 inches of exposed cap on each side of the beams at bents #1, #3, #5, #7, #8, and #8A. On bents #2, #4 and #6, the exposed portion of the bent cap on the outside curve side would be slightly greater than 42 inches and the exposed portion on the inside curve side would be slightly less than 42 inches (approximately a six inch difference.) The 9-foot long bridge ties overhung the beams by an average of twelve inches on each side.

**Tie Placement**
The 8” x 8” x 9’ bridge ties were laid 12 inches center to center, which is typical for RGS trestles. This results in a 4-inch spacing between the ties. The ties were not perpendicular to the beams; they were laid perpendicular to a chord drawn between the midpoints of each bent cap. The track centerline also passes through these same midpoints. Viewed from above with the ties in place, the trestle deck appears to be constructed of seven straight segments, with angled joints above each of the bent caps.

**Curve Radius**
Bridge engineers use basic trigonometry to layout prototype curves. They reference curves using a term called "Degree of Curvature". To convert degree of curvature into an actual curve radius, simply take the sine of ½ the degree of curvature and divide it into 50 feet. The result will be the prototype radius in feet. To find the model radius, just multiply the prototype radius by the scale. The 24-degree curve of the prototype represents an actual curve radius of about 240 feet. My model trestle is built in S Scale (1:64) and scales out to a 45-inch radius. In the case of Bridge 45-B in S Scale, the computation is as follows:
- Sine of 12° = 0.208 (rounded to three decimal positions)
- 50 feet / 0.208 = 240 feet (rounded to nearest foot)
- 240 feet x 1/64 = 3.75 feet or 45 inches

**Panel Configuration**
The portion of a trestle between two bents is called a panel. Bridge 45-B was composed of eight bents (nine, if you count bent #8A) and seven panels. Since the number of panels is uneven, the beam configuration does not appear perfectly symmetrical when viewed from the sides. The odd panel was at panel #7 on the south or uphill end of the trestle (toward Rico), between bents #7 and #8.

![Panel Configuration Diagram]

**Pedestrian Walkway**
The supports for the walkway consisted of twenty-eight 4” x 8” x 12’ timbers placed between the ties at every fourth tie, starting at bent #1 and ending at bent #8A. They extended out about four feet past the tie ends on the inside of the curve. Three 3” x 12” floorboards were nailed to the 4” x 8” supports to form the walkway. The vertical handrail posts were four foot lengths of 3” x 6”. The horizontal railings were a combination of 3” x 12” and 3” x 6” boards. A 3” x 6” cap ran along the tops of the posts.

Figures #3 and #4 show how the walkway was attached to the trestle. The stringers that form the beams of the deck are visible between the ties for reference. On the actual trestle, the beams were covered with #22 galvanized sheet metal and the individual stringers would not be visible. Also, note how the ends of the walkway support timbers were butted up against, but did not extend under, the guard timbers on the outside edge of the trestle.
**Figure 3 - Pedestrian Walkway Cross-Section**

**Figure 4 - Pedestrian Walkway Overhead View**
Bents
On a straight or mildly curved trestle, the two vertical posts within each bent were typically spaced 36" center-to-center. On Bridge 45-B, the two vertical posts of each bent were spaced 48" center-to-center, probably due to the wider beams. This causes the trestle to have a short, squat appearance when compared to other bridges. Like most curved trestles, the angled posts of each bent were 3 in 12 batter. This means they spread 3 inches for every foot of height.

One other difference was the bent caps; on 45-B they were 12" x 12" x 14’ as opposed to the normal 12" x 14" x 14’. Other than these unique differences, Bridge 45-B followed typical RGS bridge building practices: 12” x 12” posts and sills, 3” x 12” diagonal cross bracing, 8” x 8” x 9’ bridge ties, and notched 5” x 8” guard timbers.

The bents in Bridge 45-B were all single-story. Bents #1, #8, and #8A did not contain any posts. All bents except bent #4 rested on timber footings made from 3-foot lengths of leftover 12” x 12” post material. Bent #4 rested on a concrete footing. The following figures show Bents #1 through #8A.
Viewed Toward Ridgway

- Figure 5 - Bent #1

Viewed Toward Ridgway

- Figure 6 - Bent #2
Figure 7 - Bent #3

Viewed Toward Ridgway

Ridgway >
Figure 8 - Bent #4

Viewed Toward Ridgway

Ridgway >
Figure 9 - Bent #5

Viewed Toward Ridgway

Ridgway >
**Figure 10 - Bent #6**

- Viewed Toward Ridgway

**Figure 11 - Bent #7**

- Viewed Toward Ridgway

- Ridgway >
• Figure 12 - Bent #8A

• Figure 13 - Bent #8
Part 2. Model Trestle Construction

Note: Any scale dimensions given in this section are for an S Scale model. Where prototype dimensions are given, the equivalent model dimensions are sometimes shown in parentheses for clarity.

Material Preparation
You will need the following sizes of scale timbers:

- 8" x 18" Stringers
- 12" x 12" Caps, Posts, Sills, Footings
- 3" x 12" Cross Bracing, Walkway Floor Boards, Walkway Railing
- 3" x 6" Walkway Railing, Walkway Posts
- 4" x 8" Walkway Supports
- 5" x 8" Guard Timbers
- 8" x 8" Ties
- 4" x 12" Dump Boards

Prepare the materials as explained in steps 1 through 5.

Step 1. Obtain and Prepare the Wood
After you have purchased or cut the required sizes of timbers, you need to prepare the wood. Distress, age, paint, stain, weather, or otherwise “doctor” the wood according to your preferred method. No one seems to agree on the best method but here’s how I did mine:

- First, I rubbed the surfaces of each timber lengthwise with a file card to add grain texture. The file card is a stiff, short-bristled, wire brush used to clean files. It is sometimes called a file cleaner.

- Then I stained each timber with Minwax brand water-based wood stain; Colonial Pine color. I brushed on the full strength stain, allowed it to dry for a few minutes, then wiped the timbers with a damp rag to remove the excess. At this stage the timbers will be a nice, soft brown color.

  Note: For items where multiple, identical-sized, short lengths are required (like the ties or foundation timber blocks), I cut the pieces to length and stain them all at once by dipping rather than brushing. This saves me the bother of touching-up the cut ends later. You will need 113 ties (8” x 8” x 9’) and 144 foundation timber blocks (12” x 12” x 3’). When dipping, I thin the stain about 50/50 with tap water. Rather than wiping each individual piece with a rag, I simply take the stained pieces and rinse them under running water to remove the excess stain. Shake off the excess water, place the pieces in a large paper bag, then shake the bag to remove the surface moisture and to keep the pieces from sticking together. Empty the damp pieces from the bag onto a paper towel, and microwave them at high heat for about 30 seconds to 1 minute, or until they are slightly warm to the touch. Spread them out on a piece of newspaper and they will dry quickly.

- Next I brushed each timber with a coat of A-West “Weather-It” to tone down the brown color and add blackish gray surface highlights.
Note: Again, for the small pieces, I used the dip, shake and "nuke" method.

- During assembly, after cutting the various sized timbers to the required lengths, I touched-up any unstained cut edges before gluing them together.

- Finally, after the major components such as the bents and deck were assembled, I brushed on a solution of India ink in alcohol (about 25 drops per ounce.) The ink ran into the cracks and crevices of the timbers scratched by the file card and accentuated the simulated grain texture.

Step 2. Prepare the Sheet Metal Pieces
You will need material for the #22 galvanized sheet metal flashing that goes between the bridge beams and the ties, and also on the exposed bent caps. I used Avery #6873 white shipping labels for color laser printers and copiers. These labels are 2” x 3 ¾” each. Eight labels are on each 8.5” x 11” page. You can also use regular white 20-pound bond typing paper. Color print or paint the paper pieces with rust and grays shades. The advantage of using the shipping labels is that they are a “peel-and-stick” item. If you use plain paper, you will need to glue the paper to the wood with Elmer’s White glue or equivalent. Use whatever material you feel most comfortable with to duplicate the sheet metal.

- Make 14 strips 3’ wide x 17’ long (9/16” x 3 1/16”). You will use these for the flashing between the beams and the ties.

- Make 18 strips 18” wide x 52” long (9/32” x 13/16”). You will use these to cover the exposed bent caps.

Step 3. Fabricate the Concrete Foundation for Bent #4
Bent #4 rests on a concrete footing. I made mine from plaster, poured into a mold made from strip wood. This allowed the wood grain from the mold to appear on the concrete, just as on the prototype. Here are the dimensions of the concrete footing:

![Concrete Foundation Diagram]

Note: The mold and directions for its use are described in the JIGS AND MOLDS section of this article.

Step 4. Obtain and Prepare the Rail
You will need two pieces each of code 40 and code 55 rail. These typically come in 3-foot sections. The code 40 rail represents the 30# guard rails. The code 55 rail represents the 57# running rail.
Note: If you would rather use larger rail sizes, you can go up to code 70 for the running rails and code 55 for the guard rails without looking too much out-of-scale. Just remember to keep the relative size differences between the running rails and guard rails.

- Paint the rail a rusty-brown color. (I used weathered rail so I wouldn't have to bother painting it.)

Step 5. Obtain and Prepare the NBW Castings
- Obtain and paint 56 NBW castings for the beams. I used Grandt Line, HO Scale #5099 (3” Nut & 4 1/2” Washer). In S scale, this represents a 2 1/4” Nut & 3 3/8” Washer.

- Obtain and paint 74 NBW casting for the guard timbers. I used Grandt Line, O Scale #62 (7/8” Nut & 2” Washer.) In S scale, this represent a 1 1/8” Nut & 2 5/8” Washer.

- I painted mine a dark earth color, and then weathered them with rust while they were still attached to the sprues.

Deck Plans
The easiest method for assembling a trestle is to mount scale plans on a flat surface and to build the trestle directly on the plans. You will need two versions of the deck plan; one in normal view (viewed from above) and the other in reversed view (viewed from below.) You will need two copies of the reversed view and one copy of the normal view. Draw the plan as explained in steps 6 through 11. This will result in a reversed view plan.

Step 6. Layout the Track Centerline and Bent Positions #1 - #8

- Begin by laying out the 45-inch (240-foot) radius arc that will represent the track centerline.

- Mark the arc at eight points in 3-inch (16-foot) increments.

- Label the marks as Bent #1 through Bent #8 going from right to left.
Step 7. Layout the Chords and Bent Position #8A

- Figure 16 - Chords Drawn and Bent Position #8A Marked

- Draw reference lines between adjoining marks on the arc to locate the seven panel chords. These chords should be exactly 3 inches (16 feet) long.

- On the panel chord between the marks for Bent #7 and #8, measure ¾” (4-feet) from the mark for Bent #8 and make another mark. Label this mark as #8A.

- Draw reference lines between the marks for Bents #1 and #3, Bents #3 and #5, and Bents #5 and #7 to locate the exterior stringer chords. These chords should be slightly less than 6 inches (32 feet) long.

- Draw reference lines between the marks for Bents #2 and #4, Bents #4 and #6, and Bents #6 and #8 to locate the interior stringer chords. These chords should be slightly less than 6 inches (32 feet) long.

Step 8. Layout the Bent Cap Positions and the Tie End Lines

- Figure 17 - Bent Cap Positions and Tie End Lines Drawn

- Lay a straightedge between the arc center point and the mark for Bent #1 and draw a reference line through the mark, extending 1 5/16” (seven feet) on either side of the arc. Repeat for remaining eight marks. These reference lines represent the centerlines of the 2 5/8” (14-foot) bent caps. They will also be the cut line for all stringers that end at bents #2 through #7.
Draw the outlines of the bent caps sides by drawing lines parallel to each of the nine bent cap centerlines and spaced \( \frac{7}{32} \)" (6-inches) on either side. Connect the ends of the side lines to outline the bent cap positions.

Next draw reference lines parallel to the seven panel chords and spaced \( \frac{27}{32} \)" (4 1/2 feet) on each side. These lines represent the ends of the 1 \( \frac{11}{16} \)" (9-foot) ties.

**Step 9. Locate the Long Exterior Stringers**

- Each beam is composed of three stringers: two exterior stringers and one interior stringer.
  - The exterior stringer on the outside of the beam (the side facing the tie ends) is called the outer exterior stringer.
  - The exterior stringer on the inside edge of the beam (side facing the other beam) is called the inner exterior stringer.
  - The inner exterior stringers are always \( \frac{3}{16} \)" (1 foot) apart.

- To locate the long inner exterior stringers, draw lines parallel to the exterior stringer chord and spaced \( \frac{7}{32} \)" (6-inches) on either side. Now draw another set of lines parallel to the exterior stringer chord and spaced \( \frac{7}{32} \)" (14-inches) on either side. These sets of parallel lines locate the edges of the \( \frac{1}{8} \)" (8-inch) wide inner long exterior stringers.

- The outer exterior stringers are always spaced \( \frac{5}{16} \)" (20-inches) from the inner exterior stringers. To locate the long outer exterior stringers, draw lines parallel to the exterior stringer chord and spaced \( \frac{17}{32} \)" (34-inches) on either side. Now draw another set of lines parallel to the exterior stringer chord and spaced \( \frac{21}{32} \)" (42-inches) on either side. These sets of parallel lines locate the edges of the \( \frac{1}{8} \)" (8-inch) wide long outer exterior stringers.

- These stringers end at the centerlines of bent caps #7, #5, and #3, and at the right edge of bent cap #1.
Step 10. Locate the Long Interior Stringers

- Figure 19 - Long Interior Stringers Drawn

- The long interior stringers of each beam alternate back and forth; touching the outer exterior stringer at one bent and the inner exterior stringer at the next.

- To locate the long interior stringers, draw lines parallel to the interior stringer chord and spaced $\frac{5}{16}$" (20-inches) on either side. Now draw another set of lines parallel to the interior stringer chord and spaced $\frac{7}{16}$" (28-inches) on either side. These sets of parallel lines locate the edges of the $\frac{1}{8}$" (8-inch) wide long interior stringers.

- These stringers end at the centerlines of bent caps #6, #4, and #2, and at the left edge of bent cap #8.

Step 11. Locate the Short Stringers at Trestle Ends

- Figure 20 - Short Stringers Drawn

- The short stringers at either end of the trestle are parallel to the panel chords.
  - On the Bent #8 end of the bridge, the short stringers are the four exterior stringers.
  - On the Bent #1 end of the bridge, the short stringers are the two interior stringers.

- To locate the short inner exterior stringers at the left (Bent #8) end of the trestle:
- Draw lines parallel to the panel chord between bents 7 and 8 spaced $\frac{3}{32}$" (6-inches) on either side.

- Now draw another set of lines parallel to the panel chord between bents #7 and #8 spaced $\frac{7}{32}$" (14-inches) on either side.

- These sets of parallel lines locate the edges of the $\frac{1}{8}$" (8-inch) wide short inner exterior stringers.

- The short inner exterior stringers end at the left edge of bent cap #8 and the centerline of bent cap #7.

- To locate the short outer exterior stringers at the left (Bent #8) end of the trestle:
  - Draw lines parallel to the panel chord between bents #7 and #8 spaced $\frac{17}{32}$" (34-inches) on either side.
  - Now draw another set of lines parallel to the panel chord between bents #7 and #8 spaced $\frac{21}{32}$" (42-inches) on either side.
  - These sets of parallel lines locate the edges of the $\frac{1}{8}$" (8-inch) wide short outer exterior stringers.
  - The short outer exterior stringers end at the left edge of bent cap #8 and the centerline of bent cap #7.

- To locate the short interior stringers at the right (Bent #1) end of the trestle:
  - Draw lines parallel to the panel chord between bents 1 and 2 spaced $\frac{5}{16}$" (20-inches) on either side.
  - Now draw another set of lines parallel to the panel chord between bents #1 and #2 spaced $\frac{7}{16}$" (28-inches) on either side.
  - These sets of parallel lines locate the edges of the $\frac{1}{8}$" (8-inch) wide short interior stringers.
  - The short interior stringers end at the centerline of bent cap #2 and the right edge of bent cap #1.

- The deck plan is now complete. Make a copy of the plan and label it as "REVERSED VIEW PLAN."

- Make a mirror image copy of the plan and label it as "NORMAL VIEW PLAN."

### Deck Assembly

Assemble the bridge deck as explained in steps 12 through 15.

**Step 12. Cut and Assemble the Stringers Into Beams**

- Attach the original reversed view copy of the deck plan to a flat work surface. I used masking tape to attach the corners of the plan onto piece of smooth 1/4" hardboard.

- Cut a $\frac{1}{8}$" x $\frac{9}{32}$" (8" x 18") stringer to fit over each stringer in the plan, using the appropriate position of the angle cut jig.
Note: The angle cut jig and directions for its use are described in the JIGS AND MOLDS section of this article.

- Drill #71 holes in the outer exterior stringer of each beam to accept the NBW castings.

Notes: The NBW positioning jig and directions for its use are described in the JIGS AND MOLDS section of this article. You can also drill holes for NBW castings on the inner exterior stringers if desired. These inside NBW castings would be almost impossible to see on the completed trestle. I left them off on my model. If you decide to add them, you will need an additional 56 #5099 NBW castings.

- Touch-up any unstained cut edges of the stringers.

- Glue the stringers to each other and to the plan with small drops of Elmer's wood glue. The deck is constructed upside down, so the surface of the stringers glued to the plan will eventually be covered by the sheet metal flashing and the ties.

- After the stringers are assembled into completed beams, slide a razor blade between the plan and the beams. Discard the plan.

- Sand the surface of the beams smooth to remove any glue or paper residue.

- Add NBW castings to the beams at each bent position in the previously drilled holes.

Step 13. Add the Sheet Metal Flashing to the Beams

- Attach the normal view copy of the deck plan to the work surface.

- Glue the beams onto the plan with small drops of Elmer's wood glue at each end bent location.

- Starting at the left (Bent #1) end of the beams, glue 9/16" x 3 3/16" strips of simulated sheet metal flashing to the tops of the beams. Trim the strip ends at the Bent #3, #5, and #7 centerlines. Trim the last pieces at the right (Bent #8) end of the beams.

Step 14. Add the Ties, Guard Timbers, and Walkway Supports

- First, glue ties to the beams directly above bent caps #1 through #8 (not at Bent #8A.) These eight ties are aligned parallel with, and centered over, the bent caps and fit between the tie end reference lines on the plan.

- Next, fabricate fourteen guard timbers using the notch jig.

Note: The notch jig and directions for making guard timbers are described in the JIGS AND MOLDS section of this article.

- Touch-up any unstained cut edges and notches of the guard timbers.

- Then, fabricate seven tie / guard timber sub-assemblies using the tie positioning jig.

Note: The tie positioning jig and directions for making the tie / guard timber sub-assemblies are described in the JIGS AND MOLDS section of this article.

- Starting with panel #7, and working back towards the left end of the trestle, test fit the panels on the beams. The lap joints should meet directly over the ties previously glued to the beams above the bent caps.
Carefully trim the excess material from the lap joint areas where the guard timbers meet. Touch-up any trimmed edges of the guard timbers with stain.

Glue the tie / guard timber sub-assembly onto the beams using the tie end reference lines on the plans as a guide.

As you glue on each panel, add the pedestrian walkway support timbers that are next to tie #1/17 directly above bent caps #1 - #7. These support timbers are parallel with, and on the right side of, ties #1/17.

At the lap joints where the panels connect (bents #2 - #7), at the tie#1 end of panel #1 (bent #1), and at the tie #17 end of panel #7 (bent #8), drill sixteen #71 holes in the guard timbers for the NBW castings. Drill the holes completely through the guard timbers and ties.

Add sixteen #62 NBW castings to the holes in the guard timbers.

Note: The sixteen corresponding NBW castings beneath the ties will be added after the deck is removed from the plan.

Step 15. Add the Rails
- Add code 55 running rails and code 40 guard rails.
  - The running rails are located \( \frac{9}{32} " \) (18") on either side of the track centerline.
  - The guard rails are located approximately halfway between the running rails and the guard timbers.
  - Use your preferred method for attaching rail to the ties. I used micro-sized spikes on each side of the rails above every bent position.

- Cut the running rail lengths to extend a minimum of six inches beyond the trestle deck so that the rail joints will not be near the ends of the trestle. I used the full 36-inch length rails, overhanging the ends approximately equally on either side.

- Cut the guard rails at approximately 2 ½ to 3 inches beyond the ends of the trestle. The guard rails extend onto approximately eight ties at both approaches and flare slightly outward at both ends.

- Remove the deck from the plan by sliding a razor blade between the plan and the beams. Discard the plan.

- Remove any glue or paper residue from the bottoms of the beams.

- Add sixteen #62 NBW casting to the holes in the bottom ends of ties 1/17 at each bent position, corresponding to the sixteen #62 NBW castings above.

Trestle Assembly
Assemble the trestle as explained in steps 16 through 19.

Step 16. Fabricate and Add the Bents
- Fabricate the nine bents using the angle cut jig and bent jigs.

  Note: The angle cut jig and bent jigs and directions for making the bents are described in the JIGS AND MOLDS section of this article.

- Lightly sand the tops of the bent caps at an 88.854 degree angle using the bent attachment jig.
Note: The bent attachment jig and directions for its use are described in the JIGS AND MOLDS section of this article.

- Attach the second reversed view copy of the deck plan to the work surface.
- Position the deck onto the plan and secure with masking tape or weights.
- Glue the bents to the underside of the beams at the indicated bent positions with the bents leaning toward the north or downhill end of the trestle (the Bent #1 end toward Ridgway.) Use the bent attachment jig to insure the bents are leaning at the proper 88.854 degree angle.

Step 17. Add the Bent Footings
- Add timber bent footings to bents #1 through #3 and #5 through #8A and the concrete footing to bent #4.

Note: If desired, the concrete footing can be left off until the trestle is ready to be installed in final position.

- Remove the trestle from the plan and discard the plan.
Step 18. Add the Bent Cap Sheet Metal

- Figure 21 - Bent Cap Sheet Metal Arrangement

- Temporarily support the trestle in an upright position by placing supports under the various height bents.

- Glue a piece of sheet metal to the exposed portion of each bent cap as shown.

- The piece should cover the top of the cap and extend down the vertical edges about $\frac{1}{32}$" (2").
The piece should be cut to the length of the exposed bent cap plus about \( \frac{1}{16}\) (4") so that about \( \frac{1}{32}\) (2") extends up the side of the beam and down over the end of the cap.

Step 19. Add the Dump Boards Behind Bents #1 and #8

*Note:* Dump boards were located at most trestle abutments (end bents) to keep the earth fill in place. These dump board were usually made from leftover scraps of bridge timbers or heavy planks. Since they were in constant contact with the ground, they tended to rot quickly and were generally replaced at least once during the life of a bridge. For the dump boards on my model, I used scrap pieces of 4” x 12” timbers.

There are four dump boards on Bent #1 and three dump boards on Bent #8. Refer to Figure 5 and Figure 13 for details. Cut the dump boards to length so that the lowest board extends approximately one foot beyond the bent footing on either side. The next higher board is two feet shorter than the one below it, so that the outer edges of the dump boards have a stair-step appearance.

Step 20. Add the Pedestrian Walkway

*Note:* Over the years, there were various handrail configurations, and possibly some floorboard changes as well. Several photographs show only 27 handrail posts. No photographs clearly show the actual south end (uphill or Rico end) of the pedestrian walkway.

Add the floor boards to the pedestrian walkway support timbers as follows:

- Carefully cut-to-fit three 3” x 12” floor board to fit at each segment of the deck corresponding to panels #1 through #7 of the tie / guard timber sub-assemblies.
- The angle for the cut ends is 88.0898 degrees or position #2 on your angle cut jig, unless otherwise noted.
- Touch-up the cut edges with stain.
- On panels #2 through #6, the ends of the floorboards meet at the support timber closest to bent caps #2 – #7.
- On panel #1, the left ends of the floorboards extend to the left edge of bent cap #1 and have perpendicular end cuts.
- On panel #7 the right ends of the floor boards extend to the right edge of the right-most walkway support timber and have perpendicular end cuts.
- After you have glued the floorboards to the walkway support timbers, use a needle to impress nail holes at each support timber.

Add the handrail posts as follows:

- Cut twenty-eight pieces of handrail posts, each 3” x 6” x 4’.
- Touch-up the cut edges with stain.
- Glue a post to each walkway support timber flush against the outer floorboard. The posts go on the right (Bent #8) side of the support timbers.
- After you have glued the posts to the walkway support timbers, use a needle to impress nail holes at the bottom of the post at each support timber.
Add the bottom railings as follows:

- Carefully cut-to-fit seven 3” x 12” bottom railings, one per segment.
- Touch-up the cut edges with stain.
- Glue the bottom railings to the inside of the handrail posts, just touching or about an inch (1/64”) above the floorboards.
- After you have glued the bottom railings to the handrail posts, use a needle to impress nail holes in the rails at each post.

Add the center and top railings as follows:

- Carefully cut-to-fit fourteen 3” x 6” center and top railings, one of each per segment.
- Touch-up the cut edges with stain.
- Glue the top railings to the inside of the handrail posts, with the tops of the railing level with the tops of the posts.
- Glue the center railings to the inside of the handrail posts approximately halfway between the top railings and the bottom railings.
- After you have glued the top and center railings to the handrail posts, use a needle to impress nail holes in the center and top rails at each post.

Add the railing caps as follows:

- Carefully cut-to-fit seven 3” x 6” railing caps, one per segment.
- Touch-up the cut edges with stain.
- Glue the railing caps to the handrail posts, on the post tops and flush with the inside edge of the top railing.
- After you have glued the railing caps to the handrail posts, use a needle to impress nail holes in the railing caps at each post.

Brush the pedestrian walkway with an India ink / alcohol solution (about 25 drops per ounce) to highlight the grain detail and nail head indentations.

Step 21. Add the Step-down at the Upper End of the Pedestrian Walkway

**Note:** No photographs clearly show the actual south end (uphill or Rico end) of the pedestrian walkway. In most photographs taken from this end of the bridge, either a large shrub or a locomotive blocks the view. Some photographs indicate a possible step-down at this end with the walkway railing angling downward similar to a staircase handrail. In any case, use your own judgment and feel free to deviate from my directions if you desire.

If desired, add a step-down at the upper (Rico) end of the pedestrian walkway. I fabricated mine using leftover pieces of 3” x 12” boards from the pedestrian walkway floorboard material. The step-down consists of two four-foot wide steps, each with a 12-inch step and rise. The steps are supported on pieces of 4” x 12” dump boards mounted behind bents #8 and #8A. The step arrangement is shown in the following figure. The handrail for the steps is omitted from the figure for clarity, but is similar to the walkway handrail.
• Figure 22 - Step-down at Upper End of Pedestrian Walkway
Part 3. Jigs and Molds

General Information
Several types of jigs and one mold were used to simplify construction of the model. These items can be fabricated from various types of material such as wood, acrylic (Plexiglas), or metal. Most of the jigs were used with my Dremel 4” table saw to cut the various timber pieces. The jigs and molds that I used to build the model of Bridge 45-B are described in this section of the article.

I use .093-inch thick Plexiglas as the backing material for most of my jigs. It is available at most home improvement stores (Lowe's, Home Depot, etc.) and comes in various size pieces (8” x 10”, 11” x 14”, and larger.) For most S-scale jigs, the 8” x 10” size is about right.

For jigs that slide in the slots on my table saw, such as the angle cut jig and bent jig, I start by gluing a strip of Plexiglas to the bottom of the Plexiglas sheet. This strip is the width of the slot in the table saw, and will align the jig so that it slides across the table of the saw in the same position every time. I glue the strip a little further from the edge of the sheet than the actual distance from the blade to the slot. After the glue is dry, I run the jig through the saw blade. This will trim the edge of the jig precisely. This edge of the jig will always be the "cut line". At his stage, I refer to the jig as a "jig blank".

Note: You can make jig blanks for either side of your table saw, depending on if you are left-handed or right-handed. On my Dremel table saw, the blanks are not interchangeable -- the slots are not quite the same distance from the blade on the left and right. My personal preference is to make my jigs to slide in the right side slot to the right of the blade. The plans shown for the various jigs are drawn accordingly.

To make a specific jig, I glue my paper plans onto the Plexiglas jig blank with spray adhesive or a glue stick. I align the "cut line" of the plan with edge of the jig blank that touches the saw blade. The cut line of the plan should just touch the blade as you slide the jig through the saw. I glue small blocks of wood to the paper plan with Elmer's Wood Glue as required to hold the pieces being fabricated. When I no longer need the jig, I can peel the paper plan from the Plexiglas, clean the adhesive residue from the surface, and re-use the jig blank with another plan.

Angle Cut Jig
Description
The angle cut jig has four positions. Starting from the top the positions are used to cut:

- 90 degrees - All perpendicular end cuts
- 88.0898 degrees - Walkway floorboard angled end cuts
- 86.1796 degrees - Long stringer end cuts (both ends) and short stringer end cuts (at Bent #2 end and Bent #7 end)
- 75.9638 degrees - 3 in 12 batter bent post end cuts
How to Make the Jig
To make the jig, attach the plan to a right side jig blank. Align the cut line at the left of the plan with the left edge of the jig blank. Glue strips of wood along the four position lines, directly below the lines so that the lettering is still visible. I used leftover strips of 8” x 18” stringer material. Let the left ends of the strips overhang the left edge of the jig. Run the jig through the saw to trim the edges of the wood strips along the cut line.

How to Use the Jig
To use the jig, place a piece of timber to be cut in the desired angle position, on the lettering and with the left end slightly overhanging the left edge of the jig. Hold the timber against the wood strip glued to the jig and push the jig through the blade. Pull the jig back and remove the cut timber.

Notch Jig
Description
The notch jig is used when cutting the notches in guard timbers that fit over the ties. The notch jig is actually a type of "stop block" that is clamped to the table of your table saw. The steps on the jig are spaced 12 scale inches apart. This allows you to make a series of cuts in a piece of timber stock that will be spaced 12 inches apart by making repeated passes through the blade, while stepping the stock to the next notch position on the jig. Depending upon the thickness of your saw blade, you will need to make a series of passes in order to cut the 8 scale inch wide notches in the stock.
How to Make the Jig
The notch jig can be made from any stiff material (plywood, acrylic, or metal). I made mine by attaching the plan onto a piece of six-inch square, .063 thick, 6061-T6 aluminum with a glue stick and cutting out the metal along the outside edges of the "stair-step" lines.

**Note:** *All dimensions shown are actual dimensions.*

How to Use the Jig
Here are examples of the steps involved in making the notched guard timbers.
Figure 25 - Steps in Using the Notch Jig
To make the notched guard timbers:

- Place the angle cut jig on the right side of the saw.
- Adjust the blade height for a \( \frac{1}{32} \)" (2-inch) cut above the height of your angle cut jig.
- Place a left side jig blank on the left side of your table saw. This will raise the height of the notch jig by the thickness of the jig blank. It will also support the cut portion of the guard timber as it is notched.
- Clamp the notch jig on the left side of your table saw, on top of the jig blank, with the bottom edge of the jig aligned with the front edge of the table. The stair-step notches face the blade. The first (lower right) notch should be about \( \frac{3}{8} \)" (2-feet) to the left of the blade.
- Make the first pass through the saw:
  - Place a six-inch long piece of \( \frac{5}{64} \times \frac{1}{8} \) (5" x 8" x 32") guard timber stock on the perpendicular cut position of the angle cut jig with the \( \frac{1}{8} \)" side facing up.
  - Butt the left edge of the stock against notch position #1 of the notch jig and run the angle cut jig and stock through the blade. This will cut a 2" deep slice into the 5" thick timber.
  - Pull the jig back to the front of the table and advance the left edge of the stock to the next (#2) notch position.
  - Continue making cuts, advancing the stock to the next notch position after each pass, until you reach notch position #17 for a total of seventeen cuts.
  - Your piece of guard timber will now look like Example #1, assuming your blade is .050" thick like mine.
  - Continue until you have notched all fourteen pieces.

**Note:** A \( \frac{1}{8} \)" thick blade would be perfect for this task since the eight scale inch notches would be cut during this first pass through the jig notch positions. Since most of you will have blades thinner than \( \frac{1}{8} \)", you will need to make at least one additional pass thorough the jig notch positions. If your blade is \( \frac{1}{6} \)" thick, skip the second pass.

- Make the second pass through the saw:
  - To make the second pass, move the notch jig a small distance to the left. The distance is equal to 8 scale inches minus the thickness of your saw blade. For me, this amount was 0.075" (0.125" - 0.050").
  - Starting back at notch position #1 on the notch jig, make seventeen more cuts in each timber, just as before. These cuts will be slightly to the right of the cuts made on the first pass.
  - Your piece of guard timber should now look like Example #2, again assuming that your blade is .050" thick like mine.
  - Continue until you have made the second pass on all fourteen pieces.

- Now clean out the notches for each tie position.
  - Remove the notch jig from the saw.
Carefully remove the material between the cuts made on the first and second passes for each tie position.

You can either do this with a sharp hobby knife, or by running the timber through the saw blade repeatedly while moving it slightly along the edge of the perpendicular cut position of your angle cut jig.

Your piece of guard timber should now look like Example #3.

Continue these steps until you have made fourteen identical pieces.

Trim the fourteen pieces of guard timber to length.

Trim the ends at 4” left of notch #1 and 4” right of notch #17.

Your fourteen pieces of guard timber should now look like Example #4.

Extend the first and last notches.

Extend notch #1 to the left end of the timber and notch #17 to the right edge of the timber.

Your fourteen pieces of guard timber should now look like Example #5.

At this point, the directions change, depending on which particular guard timber you are making. Two guard timbers for panel #1 will not have lap joints on the left ends. Ten of the guard timbers, for panels #2 through #6, have lap joints at both ends. The remaining two guard timbers for panel #7 will not have lap joints on the right ends.

For the two guard timbers that go on panel #1 (lap joints at right end only):

- Trim the 3-inch thick portion of the guard timber above notch #17 into a 1 \( \frac{1}{2} \)" thick lap joint.
- To make this lap joint, remove a 1 \( \frac{1}{2} \)" section from the bottom of the timber at notch #17.
- Your piece of guard timber should now look like Example #6.
- Repeat for a second guard timber.

For the ten guard timbers that go on panels #2 through #6 (lap joints on both ends):

- Trim the 3-inch thick portion of the guard timber above notches #1 and #17 into two 1 \( \frac{1}{2} \)" thick lap joints.
- To make these lap joints, remove a 1 \( \frac{1}{2} \)" section from the top of the timber at notch #1 and a 1 \( \frac{1}{2} \)" section from the bottom of the timber at notch #17.
- Your piece of guard timber should now look like Example #7.
- Repeat for nine more guard timbers.

For the two guard timbers that go on panel #7 (lap joints at left end only):

- Trim the 3-inch thick portion of the guard timber above notch #1 into a 1 \( \frac{1}{2} \)" thick lap joint.
- To make this lap joint, remove a 1 \( \frac{1}{2} \)" section from the top of the timber at notch #1.
Your piece of guard timber should now look like Example #8.

Repeat for a second guard timber.

Now modify the seven guard timbers that go on the inside edge of the bridge to fit over the walkway support timbers by removing the tabs between the tie notches as follows:

- (1 piece) On one of the two guard timbers for panel #1, remove the tab between the notches for ties #1 - #2, #5 - #6, #9 - #10, and #13 - #14. This piece of guard timber should now look like Example #9.

- (5 pieces) On five of the ten guard timbers for panels #2 through #6, remove the tab between the notches for ties #1 - #2, #5 - #6, #9 - #10, and #13 - #14. These five pieces of guard timber should now look like Example #10.

- (1 piece) On one of the two guard timbers for panel #7, remove the tabs between the notches for ties #1 - #2, #5 - #6, #9 - #10, and #13 - #14. This piece of guard timber should now look like Example #11.

Place the two guard timbers for a panel into a labeled zip-lock plastic bag, along with fifteen ties and four pedestrian walkway support timbers.

- Each panel takes two guard timbers, one on the inside edge and one on the outside edge of the ties.

- The inside edge guard timber is the one with the tabs removed to clear the walkway support timbers.

Note: The final trimming of the lapped ends of the guard timbers is performed after the tie / guard timber sub-assemblies are built and added to the bridge beams.

Bent Jigs

Description
I made a bent jig for every different bent size in the trestle except bents #1, #8, and #8A. Since bents #3 and #4 are the same size, they can be made on the same jig. This example is for bent #5.
How to Make the Jig
Glue a scale sized bent plan onto a right side jig blank with the cut line of the plan aligned with the left edge of the jig. The small rectangles on the plan indicate small blocks of scrap wood glued to the plan to hold the bent components in proper alignment. The shaded areas show where the cap and posts fit into the jig. The dashed line shows where the diagonal cross brace attaches to the cap and posts.

Notes: Before I start to assemble the bents, I cut all of the bent caps and sills to finished length and touch up the cut ends with stain. I cut the posts to approximate length (about an inch or so longer than final length.) I cut one end of these posts at a perpendicular angle and the other end at a 3 in 12 batter angle using my angle cut jig (so that it can be used either as a vertical post or as an angled post.) I touch up both ends of the posts with stain. I also cut the diagonal cross braces to final length and touch up the ends with stain. I take all of the pieces for a bent and put them into a labeled zip-lock plastic bag to keep them together until I am ready to assemble the bent.

How to Use the Jig
☐ Place the cap into the bent cap position of the jig.

☐ Put a small drop of wood glue on the 3 in 12 batter angle cut ends of two posts, place them into the angled post positions of the jig, and butt them up against the cap. The posts should overhang the cut end of the jig by about an inch.
- Put a small drop of wood glue on the perpendicular cut ends of the other two posts, place them into the vertical post positions of the jig, and butt them up against the cap. The posts should overhang the cut end of the jig by about an inch.

- Run the jig through the table saw. This will produce a perfectly flat cut along the cut line.

- Touch up the cut ends of the posts with stain. Allow stain to dry before continuing.

- Glue on the bottom sill, aligning the ends with the sill end lines.

- Glue on one of the diagonal cross braces at the reference position.

- Carefully remove the bent from the jig.

- Glue on the other diagonal cross brace for the opposite side of the bent.

- Using a pin or awl, insert nail head indentations into the diagonal cross braces at each position where they would be nailed to the cap, posts, and sill.

- Brush on an India ink / alcohol solution to bring out the grain detail and nail head indentations.

**Bent Attachment Jig**

**Description**
The bents on a trestle are always vertical. On a trestle where the deck is level, the bents would be perpendicular (90-degrees) to the deck. Since Bridge 45-B is on a 2% grade, the bents are not perpendicular to the deck. To calculate the correct angle, just take the inverse cosine of the grade. The inverse cosine of 0.02 (2%) is 88.854 degrees. Therefore we know that the bents are attached to the deck at a 88.854 degree angle.
How to Make the Jig
The jig shown is made from a stiff piece of material, with the top edge angled at 88.854 degrees from the sides.

**Note:** All dimensions shown are actual dimensions.

Think of this angle as equivalent to a 2 in 100 batter. To lay it out on a piece of material, start with a square rectangle. Starting at the upper right corner, measure 100 units along the top edge from right to left. From this point, go in 2 units. Make a mark. Draw a line from the corner to the mark and extend it to the left side of the rectangle. Cut or sand the rectangle along the line. This is a very slight angle; it works out to about $\frac{1}{4}$" rise in a foot of length. My jig is made from a two-inch square of $\frac{3}{4}$" thick wood. The jig can be any width as long as it can fit between bents. Label the top edge as DECK, the left edge as DOWNHILL BENT and the right edge as UPHILL BENT.

How to Use the Jig
- First, I use the jig as a template to set the tilting table of my Dremel 5” Table Sander.
  - I slightly sand the tops of my bent caps to match the angle. This is not prototypically correct, but the angle is so slight that the material removed is not noticeable.
  - This angle provides maximum contact between the bent cap and the deck when the bent is glued in place.
- Adjust the table until the UPHILL BENT side of the jig is parallel to the table and the DECK side of the jig is parallel with the sanding disk.

- Remove the jig and lay the bent flat on the table with the bent cap against the sanding disk.

- Turn on the sander and remove only a slight amount of the bent cap.

**Note:** This is easier to do before the diagonal braces are added to the bent. If the diagonal braces are already on the bent, place shims between the bent and the table as required.

- Secondly, I use the jig as a tool when gluing the bents in place.

  - Lay the upside down deck on a flat work surface, and place the jig on the deck with the side labeled DECK against the underside of the deck.

  - Glue the bents into place, aligning the bent posts with either side labeled BENT.

**Notes:** To use this method, the bents need to be glued to the deck before the pedestrian walkway posts / railings and the bent footings are added. If a cross brace on the bent is in the way, I remove a small piece of the jig BENT edge so that the edge can fit snugly against the bent post. Make sure you angle the bents in the correct direction toward the downhill or bent #1 (Ridgway) end of the trestle.

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**NBW Positioning Jig**

**Description**
The jig shown is used when drilling the holes for the NBW castings in the exterior stringers. The jig is used in three different areas: on the left edge of a stringer, on the right edge of a stringer, and in the center of a long stringer.

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*Figure 28 - NBW Positioning Jig*

**How to Make the Jig**
Draw the plan to scale on a piece of paper.
**Note:** All dimensions shown are scale dimensions.

Glue the paper onto a piece of stiff backing material. I used thin brass shim stock. Drill #71 holes through the plan and backing material at the six indicated points. Glue two pieces of scrap 8” x 18” stringer material to the plan at the top and bottom positions indicated by the darker shaded areas. Mark the center reference line on the exposed surfaces of the two pieces of wood. Carefully trim the backing material and wood along the outer edges of the jig plan.

**How to Use the Jig**

- Place the stringer to be drilled into the jig, with the outside surface of the stringer (where the NBW casting goes) against the paper.

- Make sure the top of the stringer (the edge where the ties go) is at the top of the jig.

- To drill the two holes at the left end of a stringer:
  - Slide the right end of the stringer flush with the right edge of the jig.
  - Turn the jig over and drill through holes #5 and #6.

- To drill the two holes at the right end of a stringer:
  - Slide the left end of the stringer flush with the left edge side of the jig.
  - Turn the jig over and drill through holes #1 and #2.

- To drill the four holes at the center of a long stringer:
  - First lay the stringer on the plan and mark the centerline of the bent cap position onto the stringer.
  - Then, position the stringer in the jig and align the mark on the stringer with the center reference line on the jig.
  - Turn the jig over and drill through holes #2, #3, #4, and #5.

**Notes:** Drill all holes from the backing material side of the jig into the stringers with a #71 drill bit. The holes only need to go into the stringers about 1/16” or deep enough to accept the sprues of the NBW castings.

**Tie Positioning Jig**

**Description**

The jig shown is used to assemble the tie / guard timber panel sub-assemblies. It will insure that the ties are perpendicular to the guard timbers, and that the guard timbers are uniformly spaced at the ends of the ties so that adjacent panels will mate properly at the lap joints.
How to Make the Jig

- Draw the plan on a piece of paper.

  **Note:** All dimensions shown are actual dimensions.

- Attach the plan to a piece of stiff backing material. Glue six pieces of $\frac{1}{8}" \times \frac{1}{8}"$ and $\frac{1}{8}" \times \frac{1}{32}"$ strip wood to the plan where indicated by the shaded portions of the plan.

How to Use the Jig

- Open the zip-lock bag for a sub-assembly.

- Place the two notched guard timbers into the jig, notches facing up.

  **Note:** Insure that the timbers are placed into the jig in the proper orientation: tie #1 end to the right, tie #17 end to the left; inside edge guard timber on bottom, outside edge guard timber on top (the inside edge guard timbers are the ones with the tabs removed where the walkway support timbers will go.)

- Glue tie #2 into the tie #2 notches of both guard timbers. Insure that the tie is flush against the right side of the jig.

- Glue tie #16 into the tie #16 notches of both guard timbers. Insure that the tie is flush against the left side of the jig.

- Glue ties #3 through #15 into the respective notches in the guard timbers. When completed, there will be fifteen ties in each panel, corresponding to tie positions 2 through 16 on each guard timber.
After the glue is dry, remove the panel from the jig.

Turn the sub-assembly over and add three of the four \( \frac{1}{16}'' \times \frac{1}{8}'' \times 2 \frac{1}{4}'' (4'' \times 8'' \times 12') \) walkway support timbers between the ties.

The walkway support timbers butt up against the outside edge guard timber and go under the inside edge guard timber.

The walkway support timbers go between ties #5 - #6, #9 - #10, and #13 - #14.

**Note:** The walkway support timber between ties #1 - #2 will be added later when the sub-assembly is added to the deck beams.

Place the tie / guard timber sub-assembly on the work surface with the guard timbers on top.

Drill a #71 hole into the guard timber above the tie ends at tie positions #5, #9, and #13. Add three #62 NBW castings to the holes in each guard timber.

Place the completed sub-assembly back into the labeled zip-lock bag with the single unused walkway support timber.

**Note:** On the prototype, the guard timbers were attached to every fourth tie with 5/8" x 8" Lewis lag screws (except at lap joints). At the lap joints, the lapped ends of two adjacent timbers were bolted to the tie with a 3/4" x 12" bolt, washer and nut. Refer to Figure 30 for details. This results in a NBW casting on the timber above the lap joint (tie #1/17) and a NBW casting below the tie. These NBW castings at the lap joints will be added after the panels are glued to the beams.

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**Concrete Foundation Mold**

**Description**

The concrete foundation for Bent #4 was made by pouring plaster into a mold made from \( \frac{3}{16}'' \) square strip wood. The surfaces of the strip wood on the interior of the mold were distressed with a file card to impress grain texture into the wood.
How to Make the Mold

Make Two Identical Pieces

- Figure 31 - Mold Side Pieces

Glue together pieces of $\frac{3}{16}$" strip wood as shown to form the mold side pieces. Make two identical sides. Don’t worry about the alignment holes; they will be drilled later.

- Figure 32 - Mold End Pieces

Glue together pieces of $\frac{3}{16}$" strip wood as shown to form the mold end pieces. Make two identical ends. Again, don’t worry about the alignment holes; they will be drilled later.
Assemble the four pieces of the mold as shown.

Now, drill the alignment holes about the diameter of a straight pin through the ends and into the sides after the four mold pieces are assembled. Exact placement of the holes is not critical.

Disassemble the mold and spray the surfaces with a thin coat of paint to keep the plaster from sticking to the wood. I used clear polyurethane spray paint. Let the paint dry thoroughly before using the mold.

**How to Use the Mold**

- Re-assemble the mold pieces and insert straight pins into the alignment holes to hold the pieces together.

- Set the mold on a flat non-stick surface (I used a piece of Plexiglas) and place it on top of the clothes dryer (or use anything that vibrates.)

- Turn on the dryer and slowly pour plaster into the mold until it is slightly above the surface of the mold sides. The vibration from the dryer will help release any trapped air bubbles.

- Smooth the top surface of the plaster level with the top of the mold with a straight edge. This surface becomes the bottom of the foundation so absolute smoothness is not critical.

- After the plaster sets, remove the pins and carefully remove the mold ends first. Then remove the mold sides.

  **Note:** *The surface of the casting that was against the Plexiglas is the top of the foundation.*

- Stain, paint or otherwise weather the casting to represent concrete. I used Woodland Scenics concrete paint.