CONCRETE roofs

for outdoor structures

Low-cost materials and simple techniques provide durable, realistic roofs

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Photos by the author

Building a roof is a good starter project for getting the feel of modeling in concrete. The materials are inexpensive—if you goof, it costs you only pennies. When made of concrete, your roof won’t warp or separate. It can withstand cold, hot, UV, snow, rain, hail, and water. It tends to be heavier than plastic, so it won’t blow away in the wind. It won’t be eaten by squirrels, deer, or even termites. When poured into a thin (¼”) substrate, it can easily be covered with scale roofing materials, including aluminum, copper, wooden shakes, slate, or asphalt roofing. It can also be made with a cast-in roofing pattern. And, best of all, your models can be left outdoors in all seasons and appreciated for years to come.

When a roof is cast in two steps, the “pitch” is fixed; it will never sag. The two sides won’t separate, as there’s no glue holding one side to the other. It can’t pull apart with moisture, heat, or age. Its reinforcing wire (hardware cloth) can be bent and twisted to create unique roofing details, like dormers and porches.

For some reason, when you mention cement to most people, visions are conjured of heavy wooden forms, lots of aggregate stone, pours measuring 6” to 8” thick and weighing tons. Nº 2 fuel oil as a form release, and beating on the forms with hammers to get the bubbles out. Forget all that, and the sweat, too. Modeling in concrete uses unusual modeling materials and easy methods.

Definitions

Here are some new definitions to ease your mind:

- **Forms** are made from extruded polystyrene foam board. Known as insulation sheets, the 1”-thick blue or pink material is commonly used to build indoor-railroad scenery. Foamboard cuts easily with a paring knife, bandsaw, or utility knife. Walls, roofs, and pieces are all poured flat, not vertically. If you use ½”-thick foam board for “dams,” this allows you to gauge the depth of the flat pour. Formwork is secured with “quilting pins” when using roof-texture patterns (see below). If no pattern is used, formwork can be secured with toothpicks, deck screws, brads, or whatever you choose. Wood is not needed.

- “Modeling concrete” does not have any aggregate stone and rocks for strength. It sets up slowly because it contains Portland cement, and has a similar “green stage” after pouring—a time for troweling, shaping, or cleanup. You can

Jerry Frey’s weathering technique:

First, give the entire roof a base coat of silver or aluminum acrylic paint. After that’s dry, define the edges of the individual panels with black lines using a paint brush. Using a piece of cardboard as a hand-held mask, airbrush the individual panels with rust-colored acrylic, giving each panel its own personality. “Rust” is made by mixing red and brown paint.
Jerry Frey modeled the walls of his Chambers Logging Company Bridge from wood. The roof was made of concrete, then weathered. It has been on his Rocky Bottom Railroad in the southern Missouri sun for four years without touch-up.

This enginehouse, built by the author and her husband Tem Lovely, is made of cast cement — roof substrate, walls, foundation, and doors. Aluminum roofing was glued to the roof's concrete substrate. The photo was taken after four years on a Phoenix, Arizona railroad. The enginehouse weighs 64 lbs.

The roof pattern used in this article was originally used more than eight years ago to make the roof for this bluestone cabin. It lived both on the author's railway in Wisconsin and, later, on a Phoenix, Arizona line. A cutout in the pattern allows the stone chimney to extend through the side of the roof.
Reusable formwork is created in 1" pink-foam insulation board, sized to accommodate your texture sheets.

WD-40 makes a good form-release agent. A light spray is all that's needed.

buy it in a six-pound tub or 40-pound bag (bags are about $12). The best concrete for casting parts and sheer durability that we've found in our 10 years of experimenting is the material used to patch and repair cracks in your concrete driveway, commonly called “vinyl concrete patch.” It feathers to 1/4” and it's strong when cured, and may support up to 3,500 pounds. Quikrete Vinyl Concrete Patch is our choice for modeling. It holds fine detail when cast and is readily available in building centers throughout the US. (Warning: Do not use the “quick-set,” “10-minute set,” or “Post cement,” which contains gypsum and requires sealing after curing, or it will disintegrate if left outside.)

- **Reinforcing wire** is 19 gauge, 1/2" hardware cloth, available at building-supply and hardware stores.
- **The release agent** we use is WD-40. Cooking sprays, such as Pam, work okay, but are heavy. WD-40 gives a thinner coat and appears to produce finer detail when casting textures.
- **For roofing patterns** we like Precision Products 1:24 scale, 15" x 15" x .025" styrene sheets. You may have used them by gluing them to foam, plywood, or other material. With the cement technique, you can reuse them again and again. They clean up well and can be cast on their reverse side. These sheets are larger than others, cost about $8 each, and have a wide selection of casting patterns for roofs, including New England shingles, wood shakes, fish-scale shakes, asphalt shingles, slate roof, Spanish tile, flat tile, 18" steel rib, corrugated metal, diamond tile, hexagon tile, and octagon tile (contact Precision Products at www.appliedimagination.com). When damwork is secured using quilting pins, the pin holes created in the styrene plastic are too small for the vinyl concrete patcher to cast dimples when the sheet is reused.

### Making a roof

The roof project will be completed in two pours. Make a pattern for the roof from your model. Allow cutouts for chimneys and other details. Cut out a copy of this pattern from 1/2" x 1/2" hardware cloth. Fold and flatten each side so that it fits your building. The roof we show in this article has a 1:1 pitch: for every 1" up, it goes 1" in. When modeling, this makes a convenient 90° corner at the peak.

The 1" foam board is cut to 18" x 18", with two side dams, made from 1½"-wide strips (photo 1). These form the lower left-hand corner of the form. Position the dams at a right angle (90°) and secure them to the larger board with 2" deck screws. This formwork can be reused many times.

For this example, we are using the corrugated roof-pattern styrene sheet in the form. Trim off the borders on the bottom and left-hand side of the sheet with straightedge and knife. Spray the sheet evenly with WD-40 (photo 2) and place it in the foam formwork, with the lower left, trimmed edges against the dams. (Note: With the corrugated-metal texture, either side of the sheet can be used.) Cut several 1½"-wide strips from ½" foam board for additional dam work. Place one side of the folded hardware cloth onto the plastic texture sheet. Place ½" dams around the other two sides of the hardware cloth so that they define the shape of the roof panel you want to cast. Pin these dams to the foam formwork, through the styrene sheet, with quilting pins (photo 3). The other folded panel of the hardware cloth stands upright.

After the formwork is completed, the pouring (casting) technique is simple. You'll repeat the following five steps for all your future concrete castings of buildings, textures (including stone), windows, and more.

### Pour #1

1. Mix the Quikrete Vinyl Concrete Patcher to a creamy, pourable thinness. Mix it
by hand or use a single rotary beater (or dedicate your KitchenAid mixer to concrete modeling).

2. Pour the roof thickness to \( \frac{1}{4} \)" (photo 4).

3. Vibrate the form with a saber saw (blade removed) or small air-compressor motor. This will level and evenly distribute the cement to a consistent depth.

4. At the "green stage," when the concrete patcher is setting up (12 to 18 hours after pouring), the cast piece can be gently demolded. At this stage, sculpting and cleanup is easily accomplished. After demolding, clean-up the Precision Products casting master with warm water and liquid detergent.

5. Cure the piece for an additional 12 to 24 hours. The concrete may be filed and rasped to further refine the shape if needed. Then it's ready for the second pour.

Pour #2

After the roof casting has cured somewhat and gained in strength, respray the casting master with WD-40 and repeat the pouring process for the other half. Support the already-cast portion with a carpenter's square to ensure a 90° angle. When cleaning up the roof in the green stage, after the second pour, carefully sculpt the top of the peak to match the other side (photo 5). Cure the finished casting fully before painting or gluing on roofing materials.

Finished roofs may be glued to your buildings or left unattached for access to the electricals. If unattached, you can weight the roof by embedding a hook on the inside when casting. A small piece of twine tied to a rock can then be attached to weight it, similar to the Japanese gardening trick of training tree limbs using stones as weights.

Your roof should look about the same in five to 10 years as it does now. You may need to refresh the paint, if it has faded. Using these methods, you'll definitely have more time for railroading instead of fixing models.