

Iron Furnace

An HO Scale Historical Model Designed by E.C. "Stan" Field



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This kit is loosely based on an ancient iron furnace that is (as of this writing) still standing in Shannondale, West Virginia. The Shannondale Iron Furnace is near the Horseshoe Bend of the Shenandoah River.



Unless you know exactly where to look, it's a forest ghost, lost in the foliage and doomed to fade into the shadows. You can read up on its history here:

<http://www.shannondale.org/forum/content.php?197-The-Shannondale-Iron-Furnace>

Additional information on a similar iron smelting community can be found on this page:

<http://www.cornwallironfurnace.org/>

Prior to the age of the giant Bessemer process steel mills, there were hundreds of these furnaces, supplying the needs of our new republic.

The Iron Furnace Educational Model

This model can be built in two ways. I will illustrate constructing it as a cutaway classroom model but the kit also provides an extra face and top so that it can be used as a display on an HO scale model railroad or diorama.

Carefully read the following instructions before starting construction of the Iron Furnace model. *And don't forget to take your time and have fun!*

Chapter 1: Tools and Supplies

While the assembly process is not difficult, having the proper tools will make it a pleasure. Here are a few tools and supplies I recommend in order to complete this kit.

Recommended Tools:

- An X-Acto or Excel hobby knife handle with a package of #11 blades
- A self-healing cutting mat
- A stainless steel ruler without a cork backing.
- A package of small clamps – Radio Shack part number 270-373 “Smooth Clips”

Optional Tools:

- A headband magnifier
- An Ott-lite or other source of plain, white light
- Needle-nose pliers

This is what my work space looked like while building the prototype.



I have listed the tools with their common trade names. Naturally, you may use similar tools from other manufacturers. A list with some of the relevant websites is shown at the bottom of this document.

Recommended Supplies:

- A set of Pigma color brushes
- Arlee's Tacky Glue

Chapter 2: Component Assembly

Before we go any further, be sure you are always working with a new, sharp blade. During this build, plan on using and discarding at least one blade.

Center Cuts

We'll start by removing the material inside each object.

Take your time and place the steel straight edge on the cutting line where you can just barely see the line. The idea is that the knife blade is running against the steel rule and the actual cut is half the thickness of the blade away from the edge. You might want to experiment with a couple of scraps and then cut out the easy, rectangular pieces as practice.

In order to avoid tearing out or over cutting inside corners, **make sure the knife is held vertically** and carefully press the tip down at a corner point. Draw the knife along the steel straightedge until you are almost, but not quite at the end. Don't try to cut it all the way to the other corner. Leave an 1/8" or so of space before you reach the end of the cut mark.

After you have made each of the four interior cuts, go back over and start at the opposite end of each of the cuts and carefully insert the tip at the exact corner and draw the blade out to complete the final 1/8" of the cut. When you complete the last one, the scrap center should just drop out with no tearing. If something is still connected, CUT IT! Do not tug it loose as that will leave an ugly rough edge.

Fold Cuts (crease or score)

Carefully cut only halfway through the card stock on each of the pale, green lines. This will allow a nice, sharp fold at those points. You may wish to practice this technique on a few scraps. Try to let the knife barely score the surface using no real down force. Let the weight of the knife itself, score the paper. You might want to practice this on a few scraps before attempting any of the major scores. Also, it is a very good idea to always use a stainless straightedge for the score. It is hard to fold a line with even a slight irregularity.

The Furnace

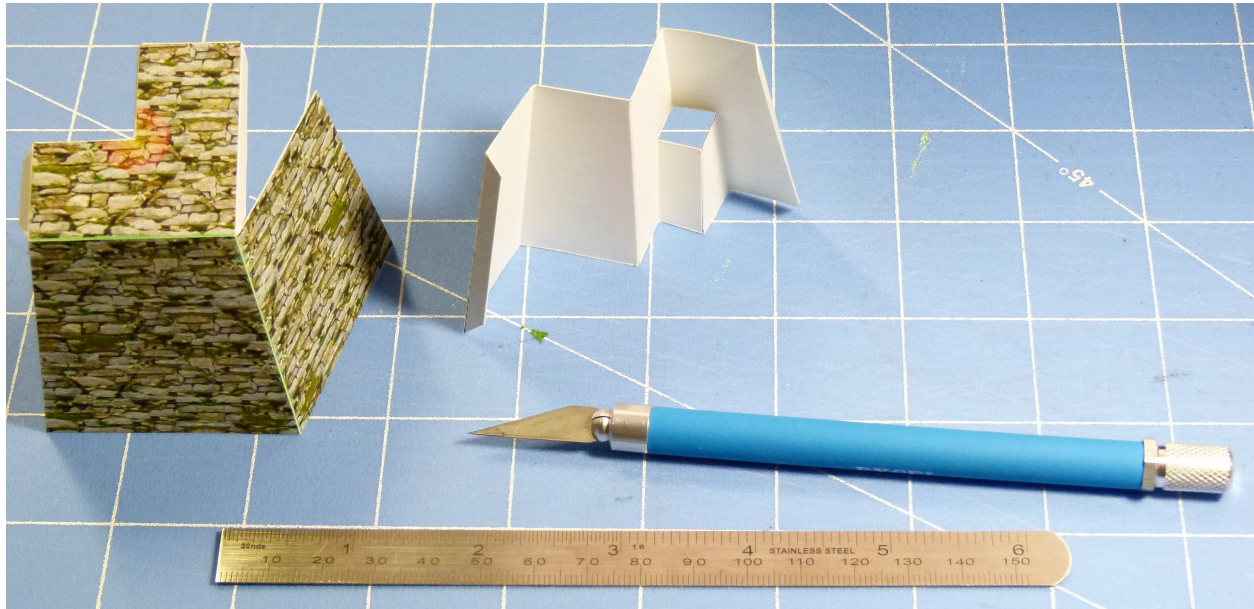
This is where you must choose whether to create an educational (cut away) model or a scale replica for a diorama or model railroad. These instructions will show the slightly more complex cut away version that exposes the interior of the furnace.

The furnace body has two major components. The two backsides and the top are one part and the cut away front side is the other.

After cutting out the front section, carefully cut the red line all the way through the paper.

Now, using a straightedge, lightly score the green lines with the exception of the one marked in the image below.

The exception score will have you place a very small cut using just the tip of the blade at each end of the score mark. Turn the paper over and align the straightedge with the two small cut marks and score between them. This is referred to as a *back score* and we will be using it in other places as well.



I made this one as a cutaway teaching aid. This is what the initial folds look like.

The Waterwheel

What can I say? In my opinion, cutting the circles are the biggest pain in the whole build. All I can say, is to take your time and **turn the paper, not your blade**. Cut no more than a 1/4" or so around the edge of the circles before re-aligning the paper so your hand remains in the proper, comfortable cutting position. Once again... TAKE YOUR TIME CUTTING THE CIRCLES.

The long, dark wood strip with all the triangles is the face of the waterwheel. Start at one end, use the tip of the blade to punch exactly where a triangle meets the dark area and cut out, just past the tip of the triangle. Do all of one direction at once, turn the paper and do the next section. The final cuts are on the square ends.

Using a steel straightedge, score each line of triangles where they meet the wheel surface. Bend all of the triangles to make sure they will fold inward, properly.

Roll the strip around a pen body or some other even cylinder in order to give it a smooth, tubular shape.

Apply a coat of glue to the tab end without triangles, overlap the other end to form a tube, clamp and let dry.

The Waterway

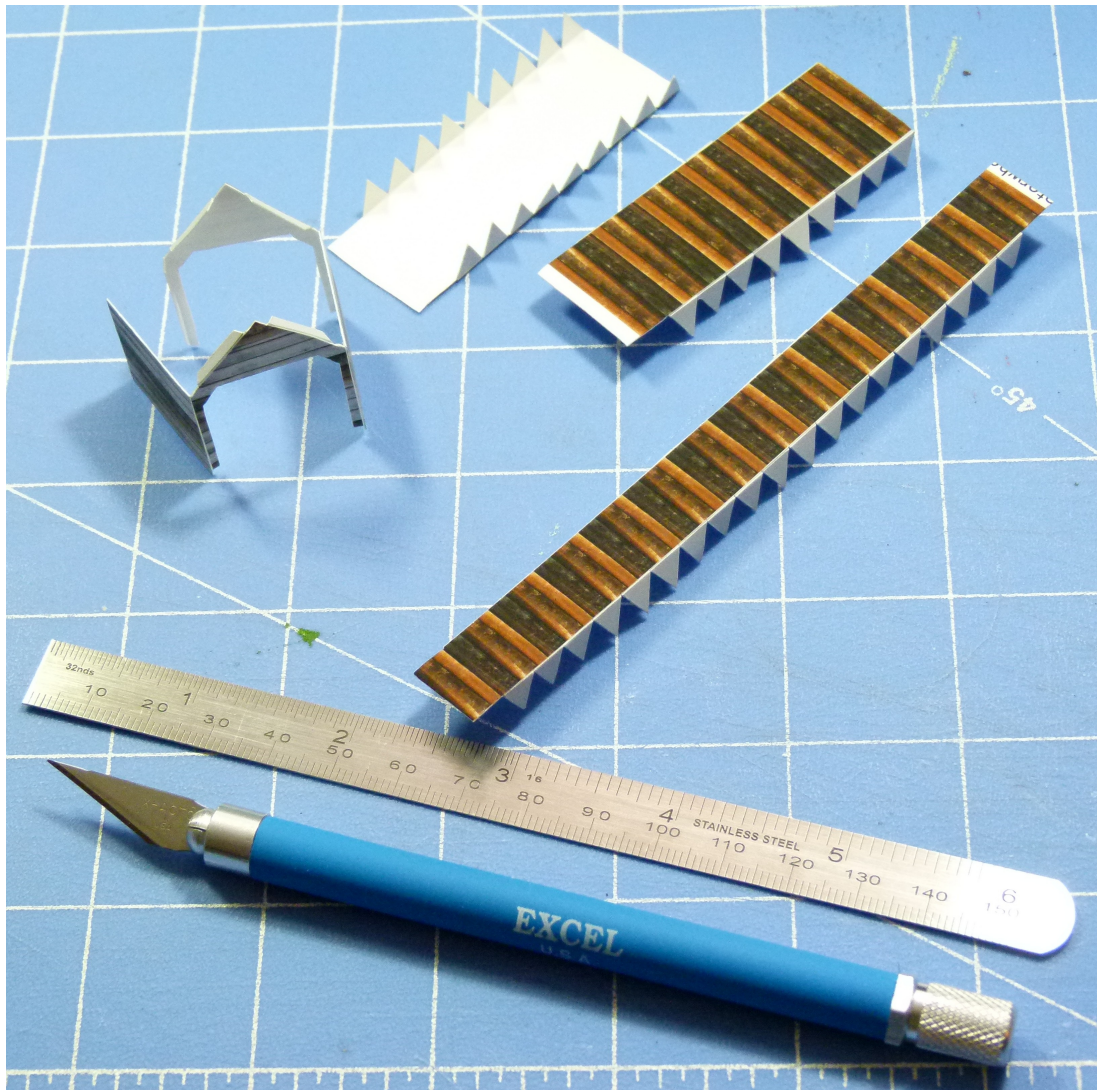
On the other hand, this is one of the easiest parts of the model. Once it is cut out, you are folding two boxes with the water image between them.

Please note there is a back score on either side of the water itself. The two boxes form the stone walls that control the flow of water.

Fold the triangle glue tabs under, then glue and clamp them. The long side glue tabs will only be glued down to the diorama base, later on.

The Blowing Tubs

After you have cut out the blowing tubs, the next step is to score along the edge of all the triangle (teeth) shapes. Be sure to use a straightedge for this step.



Roll each of the tubs around a pen body or some other even cylinder in order to give them a smooth, tubular shape.

Overlap and glue the tab so that the triangles meet at the corners. Clamp and set aside.

The Support Structures

Fold and glue the three boxes that are supports for the feed ramp and the blowing tubs.

Painting

I recommend using Pigma Brush Pens to cover the white edges of the paper that are exposed when you cut or score and bend the cardstock. If you don't have them, any good quality, fine-line colored marker should do as well. You'll want both black and dark brown colors.

After the glue has dried, carefully run the side of the brush or marker along the edge of the exposed, white surfaces. Where folds have exposed the bright white, use the tip of the brush to fill in the area. Take your time and go slowly and it will look great.

Chapter 3: The Diorama Assembly

We are going to use an empty CD case as a base for our little diorama. Alternatively, you can use any stiff, flat surface. Foamcore, thin plywood or lucite are just some of the options.

Waterway

Center the waterway approximately 1/2" in from the edge of the CD case and glue it in place. Cover it with a small, flat weight to hold it while the glue is setting.

Waterwheel

Before continuing, use a brown pen or marker to paint all the exposed white on the backside and edge of each wheel.

Choose a place on the wheel that you want hidden and use scissors to cut both wheel edges flat. This flat surface will get glued down on the diorama.

Blowing Tub Support Towers

These two go in the middle, on either side of the waterway. Apply glue to the inside of the flaps and fit them over the stone wall. Make sure they are straight and parallel to each other.

Blowing Tubs

Start with the square end of blowing tub deck and fold the triangle tabs inward, apply glue and clamp so that you have a shallow box shape. Just fold the triangles on the other end inward, but don't glue to anything yet.

Repeat this process on both ends of the blowing tub roof.

Apply glue to all the triangular tabs on one side of the two tubs. Press them inside the shallow tray formed by the blowing tub roof. Place a weight over them to hold them snug and flat while the glue dries.

Apply glue to the fold tabs inside the top of the blowing tub support columns, fit the deck

over them with the outside column snug against the inside of the closed box-end of the deck.

Apply glue to the rest of the triangular tabs, place the tubs on the deck, over the support columns. Once again, place a small weight on top to make sure the tubs sit flat while the glue is drying.

Stone pile

Apply glue to the bottom tabs and slip the stone furnace under the blowing tub deck. Align it so the angle cut allows a clear view of the cutaway stone pile. You can add a drop of glue to the inward-folded triangles of the deck in order to help hold deck snug against the stone furnace.

Feed Ramp

Start with the square end of feed ramp and fold the triangle tabs inward, apply glue and clamp so that you have a shallow box shape. Just fold the triangles on the other end inward, but don't glue to anything there, yet.

Fold, glue and clamp the feed ramp shed.

Apply glue to the tabs on top of the feed ramp support column. Place it under the boxed end of the ram and let a small weight hold it in place while the glue is drying.

Apply glue to the base tabs on the column, fit the feed ramp to the opposite side of the stone furnace and apply a small weight while the glue is drying.

Apply a thin bead of glue to the inside, bottom edge of the side walls of the shed. Place it over the column.

Apply glue to the roof tabs and place the folded roof on the shed walls.

Clap yourself on the back! That is it for the basic structure.

Chapter 4: Options

Adding details around the base such as tools, HO scale workmen, grass, dirt and some weeds can help bring your little diorama to life.

A bit of acrylic paint around the base will hide the gaps. While it is still wet, you can apply small brush cuttings for weeds or ground foam for grass. Check with your local hobby shop for landscape materials used for model railroads.

Chapter 5: Credits and Sources

The Shannondale Iron Furnace page has a nice history as well as some drawings and photos.

This was the original inspiration for the Iron Furnace model kit.

<http://www.shannondale.org/forum/content.php?197-The-Shannondale-Iron-Furnace>

The Cornwall Iron Furnace museum complex up in Pennsylvania is the only surviving, completely original one in existence.

<http://www.cornwallironfurnace.org/index.htm>

Here is a brief review of the Pigma Brush Pens:

<http://shortlinemodelers.com/reviews/pigma-brush-review>

Basic Techniques of paper models for beginners:
[http://www.papermodelers.com/articles/index.php?
title=Paper_Model_Articles#Building_Techniques](http://www.papermodelers.com/articles/index.php?title=Paper_Model_Articles#Building_Techniques)

And finally, my website for cardstock model, photography and travels:
<http://postorbitaldesign.net/>



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