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## FoamRail Layout Clinic

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A clinic by Jere Eggleston and Keith MacPhail

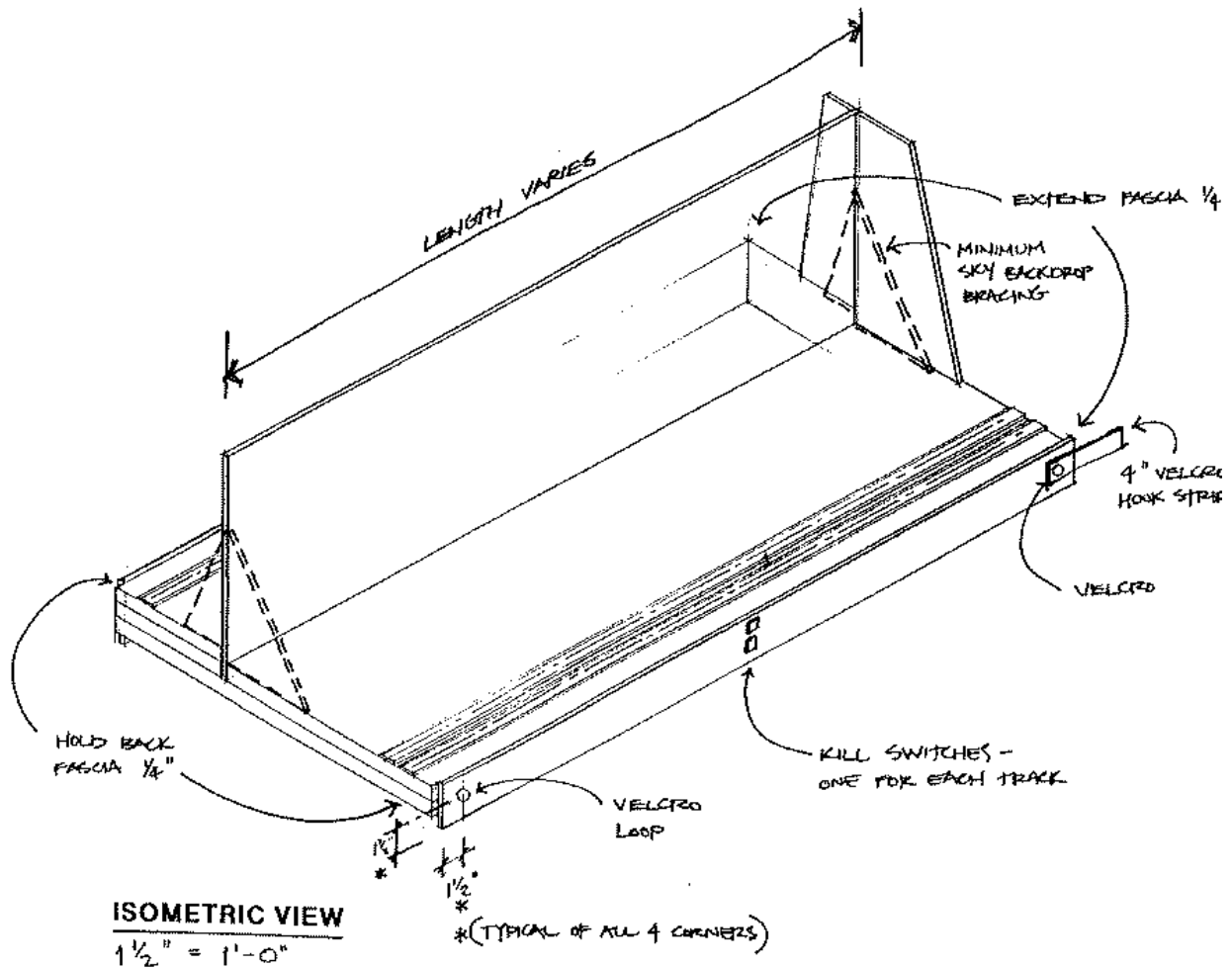
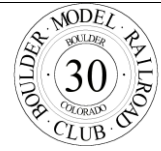
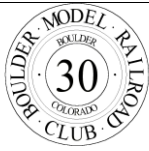
Model railroading has been around for the better part of a century. Today, the hobby enjoys perhaps its largest and strongest following, and this trend shows no sign of reversing, at least in the foreseeable future. A glance at the new manufacturers and products contained in the pages of the hobby's various magazines quickly bears this out.

Perhaps one of the primary explanations for the continued expansion and improvement of model railroading is the willingness of model railroaders to seek out, and incorporate into the hobby, new ideas, new techniques, and new modeling materials. This open minded approach, shared by the vast majority of modelers, has done more than keep interest in the hobby from stagnating, it has continuously pushed it forward from year to year, and decade to decade.

Model railroaders have always embraced new materials and techniques either as replacements, or enhancements, to existing practices. The purpose of this clinic is to take a look at a material, extruded foam building insulation, that falls squarely into the latter category.

The use of extruded foam panels in model railroading goes back about 20 years, but it has only really come into its own in the past 5 years or so. From all indications, extruded foam is destined to become one of the primary layout, and layout module, building materials, as more and more modelers are exposed to its versatility and ease of use.

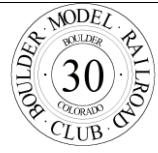
This clinic will introduce you to the material itself, discuss the use of extruded foam as both a scenery and benchwork material, examine the basic tools and techniques for working with foam, explore carving and finishing foam into fantastic, light weight scenery, and, finally, look at both the pros and cons of foam insulation as a modeling material. Hopefully, by the end of this presentation, you'll be encouraged to give foam a try in your next model railroad project!



**Let's get started!**

### What exactly is Extruded Foam Insulation?:

- A solid, panelized construction material used primarily in the building trades to insulate building walls and foundations.
- The material is lightweight, has structural integrity, and is easy to cut, carve, and "form" using basic modeling tools.



- The material is generally available at lumber yards and home centers, and is most commonly found in 2' x 8' and 4' X 8' sheets.
- Panels can most often be found in 1/2", 3/4", 1", 1 1/2", and 2" thicknesses.
- Extruded foam insulation is produced by:
  - Dow Chemical (blue foam)
  - Owens-Corning (pink foam)
  - Amoco (green foam)
- Contrary to popular rumor, all share the same characteristics, regardless of color.

### **What exactly is Extruded foam insulation?** (Continued)

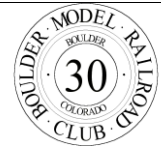
- Now that we've defined what extruded foam insulation is, here is a very important note about what it **is not**:

Foam "bead board", packing styrofoam, floral/art foams, etc. are **NOT** extruded foams. They are not rigid and do not possess the physical characteristics needed for carving rock- work and forming scenery contours. More importantly, these foam products lack the structural integrity needed to be used as benchwork!

### **Basic "Tools of the Trade":**

The following is a list of the tools and materials most often used when working with extruded foam:

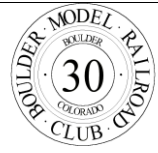
- Sharp, straight edged knife with a 6" to 8" blade (ie: kitchen knife, boning knife, etc.)
- Serrated edge knife (ie: steak knife, bread knife)
- Whet stone
- Single edge razor blades
- Hack saw blades (blade only) - 24 and 32 teeth per inch



- Standard carpenters hand saw
- Table saw (optional, but useful if available)
- Stanley "Surform" tool
- "X-acto" knife with chisel blade and #11 blade
- "Hot Wire" cutting tool
- Coarse sand paper
- Hand held wire brush - short bristles
- Drill mounted wire brush (reference the entry for "vacuum cleaner" below)
- Face mask or respirator
- Bamboo "ka-bob" skewers approximately 10" length
- *Water base* adhesive (Construction adhesive PL300, latex contact cement, rubber cement. etc.)
- Pre-mixed lightweight, non-shrinking, spackling compound
- "Sculptamold" and / or molding plaster
- Latex and / or acrylic paints
- Dry pigment paints
- Assorted paint brushes
- Vacuum Cleaner!! (the bigger, the better especially if you opt to use a drill mounted wire brush!)

Not all of the above listed tools are required to successfully model with foam. As you begin to work with the material, you'll identify those tools with which you are most comfortable. It is also likely that you'll come up with additional tools or materials that meet a specific need. Don't be afraid to experiment.

**NOTE OF CAUTION:** If you choose to experiment with any **solvent based** materials, do so on scrap foam. in a well ventilated area, with **extreme caution**. Solvents **will** attack extruded foam, often in a very aggressive manner!



## Basics of Working With Foam:

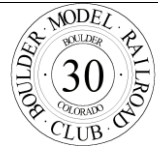
### *Uses:*

- Use foam as a **Scenery Material** in conjunction with conventional wooden benchwork.
- Land forms
- Carved rock work
- Basic landforms, with applied plaster rock castings
  
- Use foam as **Basic Benchwork, as well as Scenery Material**
- Remember, the panels have structural integrity
- Probably best in smaller scales - Z, N, HO
- Laminated panels, laid flat for around the walls shelves up to 30" wide.
- Wider applications, use strips on edge (ie: 1"X4") to build an interlocked open grid. Then laminate flat foam panel "table top" onto top side of grid for layout surface.
  
- **"Hybrid"** of foam panels and lightweight framing such as shelf standards and brackets or light dimensional lumber.
- Bookshelf or around the walls layout designs
- Double deck layout designs (especially useful when vertical clearances are an issue).
- Finish panel fronts with Masonite or wood veneers

### *Techniques:*

#### **Cutting the Foam for Basic Shapes:**

- Carpenters hand saw
- Score with sharp knife, and snap (similar to styrene modeling techniques)
- Table saw

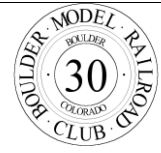


- Hack saw blade for curved cuts

#### **Gluing and Laminating:**

- Use only water based adhesives
- Apply glue to each panel to be laminated and press together
- If using latex contact cement, follow package instructions
- Use bamboo skewers to secure panels while adhesive dries; or
- Apply weights to panels while adhesive dries; or
- Apply clamps (even out pressure as much as possible) while adhesive dries

**IMPORTANT NOTE:** White and Yellow Carpenters glues require air to dry. Extruded foam panels allow very little air to pass through them. Accordingly, carpenters glue will take a considerably long time to fully set up (possibly up to several months). Once dried, these glues are very effective in bonding the foam, however, if you are in a hurry, you may wish to opt for a latex contact cement. In fact, a latex contact cement, rubber cement applied as a contact cement, or construction adhesive formulated for extruded foam application is **recommended** for use in laminating this material.

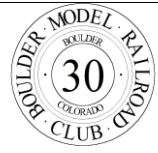


### Shaping Scenery Contours:

- Recommend removing panel tongue and groove before gluing
- Laminate panels to the desired thickness for the scenic feature
- Horizontal (like a layer cake) for rolling scenery
- Vertical for cliffs and canyons
- For large hills, consider creating "rings" (full or partial) instead of using solid panels. Stack and glue the rings (diameters decrease as you go up) to create a hollow basic lull shape
- Even more light weight
- Less expensive (use the cut out material elsewhere)
- Great for tunnels - just leave the top layer or two unglued for an access hatch
- Hollow interior can conceal hidden track
- Use hacksaw blades, wire brush, Stanley Surform tool and coarse sandpaper to "rough in" scenery shapes
- Hack saw blades and wire brush (especially a drill mounted one) will remove a lot of material **fast**.
- Use the Stanley Surform and sandpaper to begin to "finesse" the land contours, cut in water courses, lay in roadways, and shape the track sub-roadbed
- Use spackling compound or Sculptamold to fill in small cracks that may be visible at the joints between layers.

### Laying Track on Foam:

- Extruded foam can be used as a sub-roadbed material.
- Chose a material thickness appropriate for the scale you are modeling. It's recommended that a minimum of 3/4" thick material be used regardless of scale.
- Use foam blocks for risers, and glue in place once grades have been established.
- Use " All-Thread" rods with nuts and sheet stock (metal or plastic) cross members to create adjustable risers.



- If creating embankments, underfill sub-roadbed with chunks of foam, glue, and contour.
- Use bamboo skewers or a length rigid steel wire to "drill" holes for track wire leads through the foam sub-roadbed.
- Alternatively, plywood or other more conventional material can be used for sub-roadbed in conjunction with foam benchwork.
- Track can be glued directly to foam using straight pins to hold it in place while the water based adhesive dries.
- Contour ballast slopes using a Stanley Surform, sand paper, or a hot wire tool.
- Use an X-acto knife with #11 blade to "slice in" track drainage ditches.

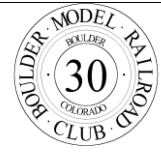
***Very realistic roadbed profiles are easily achievable with foam.***

Track laid directly on foam can be noisy if you are also using the foam as benchwork. It tends to have a "sounding board" effect. If this is a concern, glue a cork, Foamcore, Homasote, or Upsom Board roadbed to your foam sub-roadbed. This additional step will deaden the sound considerably.

"Standard" track ballasting techniques work the same with foam.

Glue (construction adhesive) a 1/4" plywood square to the bottom side of the foam sub-roadbed to serve as a mounting pad for switch machines and other turnout control mechanisms.





**IMPORTANT NOTE TO TRACK "HANDLAYERS":** Extruded foam won't hold spikes! If you're spiking down your rails, you'll need to use a more conventional roadbed material (such as Homasote or Upsom Board) in conjunction with your foam sub-roadbed. On the other hand, if you use a Pliobond or PC tie technique for fastening your rails, you can use foam, cork, or Foamcore for your roadbed.

**NOTE OF CAUTION:** Extruded foam panels and hot soldering irons do not mix well! Be very careful when soldering on or near foam. If at all possible, solder your lead wires to the base of your track rails at the work bench, and feed them through the lead holes as you lay down the track. If your wire lead hole is a little off, just poke a new one with the skewer or steel wire!

## Creating Fast, Lightweight Scenery

Extruded foam is an excellent scenery material

- As a base for applying additional finishes such as rock castings (or a Sculptamold skim coat, though this step is really not required as we'll cover below).

or

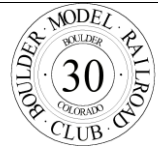
- As a final scenery material in itself. Extruded foam can be carved into very effective rock work, with very little practice and excellent results.

### Basic Ground Cover (Earth, Grass, etc.):

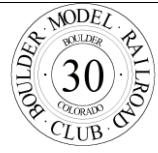
- "Water Soluble" scenery techniques work great with foam
- Paint foam with an earth colored latex "primer coat"
- "Classic" zip texturing with powdered paint, plaster, and ground foam for basic cover
- "Modified" zip texturing with thick, liquid acrylic or latex paint and ground foam cover
- Build up layers - ie: "dirt", "grass", "weeds", "shrubs", etc.
- Work in rocks and boulders (real, plaster, or carved foam) as you build up the basic cover

### Rock Work:

- **"Traditional":**
- Plaster rock castings will work fine with foam
- Attach to foam with Sculptamold using tooth picks or bamboo skewers pressed into the foam and cut to length to act as "re-bar" to help secure casting to the foam base.



- Color with paints or non-solvent washes
- **"New Wave":**
- Carve your rocks from the foam itself!
- No added weight
- Simulate all rock types
- Easy to create very effective sedimentary strata
- Highly realistic results using a few simple tools



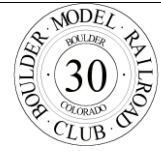
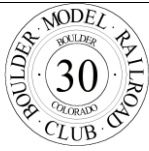
### **Tools, and associated applications, for foam rock carving:**

- Hacksaw: Basic shaping
  - Carve in strata, especially coarse sandstone layers
  - Texture surfaces
- Single edged razor blade: General carving
  - Texture surfaces
- X-acto chisel blade: Ledge carving
  - Carving square cleavage rocks
  - Carving quarried faces
- Surform tool: Shape / texture surfaces
  - Soften / blend textures
- Coarse sandpaper: Shape / texture surfaces
  - Soften / blend textures

Make sure your tools are sharp and **Watch Your Fingers!!**

### **Coloring Carved Foam Rocks:**

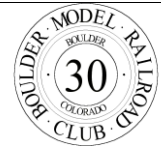
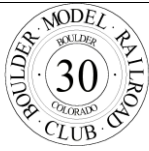
- Don't use solvent based paints or washes (ie: Floquil, Diosol).
- Use acrylic or latex paints.
- Thin down latex paints to flow into carved details.
- You'll need to paint at least a base coat, water based washes don't work on "raw" foam.
- Recommend " Apple Barrel" acrylic craft paints
- Inexpensive (retail price is about 75 cents for a 2oz. bottle)
- Cover well, blend well, and thin well
- Flat finish



- A whole "rainbow" of colors
- Recommend using a paint brush rather than an air brush
- More control - ie: individual rock faces
- Paint on a primer coat using a light, neutral color
- Fill in "blue spots"
- Use a spray bottle with water to blend colors as you paint

**Other Scenery Items Carved From Foam:**

- Bridge Abutments and Piers
- Concrete and Masonry
- Retaining Walls
- Brick or Stone Building Walls
- Use a semi-dull X-acto #11 blade when scribing bricks or blocks. This is the only time a dull tool should be used with foam!
- Coke Ovens, Kilns, and Brick Stacks
- Mid and Background Trees (both conifers and broad-leaf)
- Hopper Car Loads



## Pros and Cons of Modeling With Extruded Foam:

No modeling material or technique is without both pros and cons, and extruded foam is no exception. Here are a few as we see them:

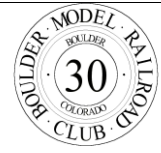
### Pros:

- Readily available.
- Lightweight.
- "One Step" benchwork and scenery.
- Extremely versatile.
- Easy to work with.
- Fantastic results with a little practice.
- Compatible with many (not all!) other materials and techniques.
- Pliable, with no "chipping" (white spots).
- "Dry" cleanup.

### Cons:

- Cost (relative).
- Messy - cutting, carving, and forming create statically charged chips.
- Not compatible with solvents and solvent based modeling materials.
- Need to be careful with soldering irons and other hot tools and materials.
- Can be damaged if poked or prodded, especially with tools / hardware.
- "Blue spots" if your paint job is less than thorough.
- Won't build into the kind of benchwork you can walk on.

## Recommended Readings:



1. "The Latest on Foam-Board Layout Construction" Bill Darnaby, *Model Railroader*, March, 1995. Just what the title suggests.
2. "Hot Wire Foam Layout Construction" Bill Darnaby, *Model Railroader*, June, 1994 Basic information on using foam in layout construction. Specific information and techniques for building and using a hot wire tool.
3. Modeling the Clinchfield RR in N Scale, Kalmbach Publishing "How-to book" reprint of the Clinchfield project layout series which appeared in *Model Railroader* in 1978 and 1979. Probably the first in-depth coverage of foam modeling to appear in the mainstream hobby publications.
4. "Foam for Modeling" Sam Powell, *Model Railroader*, October, 1993 Basic information on using foam to model masonry structures.
5. How to Build Realistic Model Railroad Scenery, Dave Frary, Kalmbach Publishing. The definitive book on water based scenery.
6. "Ron Hatch's Midwestern Narrow Gauge" Ron Hatch, *Railroad Model Craftsman*, Sept, 1994. A 4'x8' HO<sub>n</sub>3 layout built entirely of foam, benchwork and scenery. Side bar discusses techniques used in building the layout that weighs a total of 70 pounds.
7. BMRC N Scale Module Specifications, <http://bcn.boulder.co.us/recreation/bmrc/bmrcindex.html>

Even if you're not ready to build an entire layout out of the stuff, we recommend you give extruded foam a try in your next layout or scenery project. We think you'll find it's an excellent material to work with!

**Happy Lightweight Railroading!!**

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## **N Scale SIG Module Specifications of the Boulder Model Railroad Club**

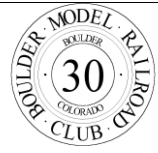
[BCN home page](#) | [Recreation Center](#) | [BMRC Home Page](#)

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*FOAMRAIL*

### **N SCALE "LOW-TECH" MODULAR LAYOUT**



By the N-SIG of the

## **BOULDER MODEL RAILROAD CLUB**

*This is a guide book, not a rule book.*

1. [PHILOSOPHY](#)

*Why are we doing this anyway?*

2. [STRUCTURE](#)

*Building what used to be called benchwork.*

3. [TRACKWORK](#)

*Or track fun, depending on your point of view.*

4. [ELECTRICAL](#)

*How we get 'em to run.*

5. [SCENERY](#)

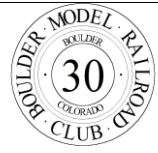
*Thoughts and ideas.*

6. [PUBLIC SHOWS](#)

*Have fun!*

7. DRAWINGS

- a. [Isometric View](#) (17 Kbytes)
- b. [Section](#) (18 Kbytes)
- c. [Wiring Diagram \(Molex\)](#) (20 Kbytes)
- d. [Wiring Diagram \(Automotive\)](#) (121 Kbytes)
- e. [Molex to Automotive Conversion](#) (121 Kbytes)
- f. [Corner Module](#)
- g. [Switching Module](#)



## PHILOSOPHY

"I think you're going to like this," a friend told me one day over lunch. "A few people from the Boulder Model Railroad Club are starting an N-scale modular group and their approach is very appealing. The idea is to have as few rules as possible and let everyone do their own thing."

It sounded interesting, controlled anarchy. I liked it already. It got better, my friend told me. "Another concept of this group is to make everything about the modules very "low-tech"; make them really easy to build. For instance, the base will be made of foam building insulation board, so that an hour after you get the urge to build a module, you can be done with the base and ready for the fun stuff: track and scenery. And instead of building legs onto the module, we'll just set the foam base on folding tables to set up for a show."

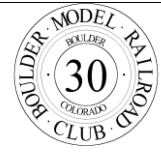
This was also a winner for me. I've seen a lot of layouts that got bogged down at the benchwork stage because the builder really wanted to jump right into the creative, fun stage of creating the railroad, but ended up in an elaborate engineering project that was more like work than play.

"The approach to track," he continued, "is to model the most commonly seen track configurations in the real world. That means there'll be a backdrop down the middle of the module with a single track on one side and a double track on the other."

Once again, I liked the approach. This arrangement of track would allow me to model the aspects of railroading that are interesting to me; a single track mainline running through the mountains on one side, and a passing siding or an urban switching area on the double track side. With each successive idea I found myself being drawn into this concept more and more.

"A side benefit of having this arrangement," my friend elaborated, "with the backdrop running down the middle of the modules, is that it gets the operators out with the public at shows, instead of back inside the layout. This makes it easier for people to ask questions and meet the builders of the railroad. The end modules are loops connecting the two sides of the modules. This has the benefit of allowing the modeler to build the module to any length, whatever fits your scenic requirements, or the size of your car's trunk. Also, any number of people can join up their modules at a show without worrying about getting the right number of modules on each side of a loop."





This idea was incredibly simple; just right for me.

"You'll never guess how the modules are held together." he said, smiling. "Velcro! We were meeting at one of the member's houses trying to figure out how to connect them when the host's wife asked why we didn't just use Velcro. At first we all looked at her a little funny, and then we realized that it was a great idea."

This was very ingenious, I thought. Like everything about the modules, it's easy, fast, and low cost. This concept of "low-tech" was sounding better and better. My friend continued his explanation. "The Velcro holds the modules together, and a Masonite fascia board that overlaps one end of the module on each side keeps them in alignment.

"One of the guys built the first module in two hours and another one added scenery to it in another couple of hours so we'd have a prototype to work with, and also to show people just how fast and easy this system really is. Since then members have built a number of modules including end loops and there are more on the way. After doing a few we've found that setting up for shows only takes about thirty minutes before we're off and running!"

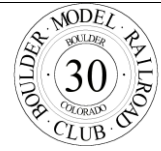
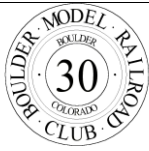
The next Sunday afternoon I was in the mood to have some fun, and I had a few hours, so I decided to try building one of these modules. Including my trip to the lumber yard, I was finished with my blue foam base in two hours, and I was only into the project for about fifteen dollars, with enough material left over to build another four foot module or share it with a friend.

Since I'd finished the base so quickly, I decided to start on the scenery. Cutting the river into the foam was simple and took very little time. I just carved out what I wanted until I was happy with the result, and if I carved away too much, I just glued some foam back on.

I loved the way I didn't have to plan too much in advance; I had an idea of what I wanted it to look like, and then I just cut away at it with a serrated knife and a Stanley Surform tool. I had to admit, I was having a lot of fun!

## **STRUCTURE**

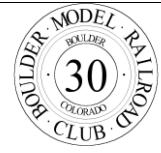
*Guidelines for building what used to be called benchwork.*



1. While almost any material could be used for the base of the module, the blue (or pink, or green) Styrofoam, which is extruded high-density rigid insulation, has many advantages. (Note that this is *not* the white beadboard insulation, which has no structural integrity.)
  - A. It is lightweight, making it easy to transport
  - B. It is easy to carve and shape for scenic contours
  - C. It is inexpensive, and comes ready to use in the 2'-0" module width
  - D. Making changes later is also easy, whether carving it away to add an electrical switch, or changing the scenery

For cutting the foam board to size use any tool that cuts wood, a basic hand saw works well. For gluing foam to foam you must use a compatible adhesive such as water-based (latex) contact cement, rubber cement (used as a contact adhesive), or a construction adhesive that's made for use with foam such as PL-300. Just don't use solvent-based glues, they'll melt the foam. For gluing the Masonite and the cork roadbed to the foam you can use wood or craft glues such as Elmer's or TiteBond (note: these wood glues require air to dry so they can't be used to glue foam to foam, no air gets into the joint).

2. The modules are all 2'-0" wide (except the end loops) but may be any length you want. 4.9" (the length of the bridge track) is the shortest, and 8'-0" is probably the longest practical size, but anything in between is fine (see the drawings at the end of this guide).
3. The single track mainline is 1" higher in elevation than the double track mainline. To build up this additional elevation its easiest to simply stack a layer of 1" thick foam on top of the base layer. Be sure to use a foam compatible glue.
4. The modules are set on folding "banquet" tables for display at public shows so they don't require any legs of their own. If the scenery of any module drops below the base of the module, then the tables are simply spaced apart at that point. The module itself must be able to span this gap between tables.
5. The sky backdrop is made from 1/4" thick "Foamcore", a white paper-faced foam panel available from art supply stores or "Gatorboard", a plastic-faced foam panel. It runs the length of the module, separating it into a 16" deep scene on the double track side and an 8" deep scene on the single track side.
6. The front faces of the module are made from 1/8" thick tempered Masonite hardboard. This durable material supports the foam module base up off the



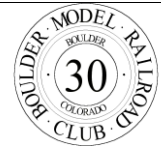
table, allowing space for electrical wiring to run below. The Masonite is also offset 1/4 inch at the ends as a means to align the modules with each other (see drawings at the end of this guide).

7. To fasten adjoining modules together, a 4 1/2" long strip of Velcro "hook" strip is fastened to squares of Velcro "loop" that are attached to each end of the module faces (see the drawings at the end of this guide). You will need 2 strips of hook material.

## **TRACKWORK**

*Or track fun, depending on your viewpoint.*

1. Except at the interface at the ends of the modules, the track configuration can be almost anything you want. The only constraint is that the minimum radius for the mainline tracks is 20". See the drawings at the end of this guide for track centerline locations and alignments at the ends of the modules.
2. Before the track goes down we need some roadbed to put it on. Standard 1/8" thick N scale cork roadbed like that made by Midwest works just fine for our modules. It comes as a strip that has been slit down the middle. Just separate the two halves and glue the square edges together along the track center lines.
3. Mainline tracks can be any manufacturer you want. Minimum flextrack rail size is Code 55 which allows most equipment to run on it. At each end of the module the rail size must transition to Code 80 to mate with the connector or "bridge" track.
4. Each end of the module must have a removable connector track to bridge the joint between modules. Use a standard Atlas 4.9" straight track (Code 80 rail) for this. You will need 3, one for each mainline track. Since these bridge tracks are 4.9" long, the ends of the mainline track rails must be held back from the foam ends of the module exactly half that length (see the drawings at the end of this guide). Be sure to cut back the ties on the mainline tracks to allow for the rail joiners. The mainline tracks should be straight for the first inch or so, so there won't be a kink where the bridge track joins.
5. Any turnout (track switch) on the mainline tracks must have a live metal frog and positive acting points. Turnouts used between mainline tracks should be number 8 or larger. All other turnouts and for that matter all track that is not part of the mainline can be any size and configuration you choose.



6. Gaps must be cut in the rails in several locations to prevent shorts and to create "kill" sections of track. The kill sections are created by cutting the back rail of each mainline track a few inches from each end of the module (see the wiring diagram at the end of this guide). Other gap locations are: both rails on branches off of the mainlines, both rails on crossovers between the mainlines, and the rails that diverge out of all live metal frogs. Of course all of the resulting rail sections must have power feeders - see the "Electrical" section below.

## ELECTRICAL

*How we get 'em to run.*

1. Refer to the wiring diagram at the end of this guide. Note: All electrical connections must be soldered. The modules get moved and bumped so any other type of connection can become loose over time.
2. Each module has an eight wire electrical "bus" running the length of the module below the foam base. There is a lot of flexibility in what connectors to use for wiring modules together. Our first attempt used 9 pin Molex plugs, but we found that they were hard to plug and unplug and the pins tended to pull out. We are now converting over to 4 pin automotive plugs, designed for being hooked and unhooked. Both schemes are described below. These schemes are incompatible (however, [we have a conversion diagram](#)), so decide on one scheme and use it consistently!

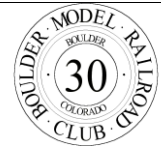
Molex plugs:

- A. The bus wires must be 18 gauge or heavier (smaller gauge number) stranded wire, and must be 6" longer than the module on each end.
- B. The bus has Molex plug connectors at each end. These are available from Radio Shack:

Radio Shack #274-229 9-pin male connector at the right end\*

Radio Shack #274-239 9-pin female connector at the left end\*

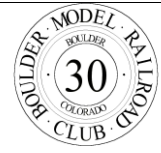
\* when viewed from the double track ("front") side.



- C. The bus wires to Molex pins #1 through #6 are for track power. There is no bus wire #7 so Molex pin #7 is unused. Pin/bus wires #8 and #9 are used for accessory power such as building lights. All of the pins must be soldered, not crimped. Make sure to put the right pin in the right hole and use care in installing them into the plastic plug housings since the can only be removed with a special tool.

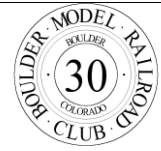
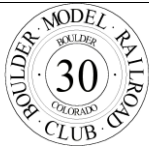
Automotive connectors:

- D. The bus wires must be 18 gauge or heavier (smaller gauge number) stranded wire, and must be 6" longer than the module on each end.
  - E. The bus has automotive connectors at each end. These are available from auto parts stores and Radio Shack (#270-027). They are used for connecting trailer lights and other accessories to a vehicle. They are polarized and intended for quick connect and disconnect, yet are weather resistant. When viewed from the double track ("front") side, the "female" (1 pin, 3 socket) connector is at the left side and the "male" (1 socket, 3 pin) connector is at the right side.
  - F. The bus wires to the double track side go to one pair of conductors and the bus wires to the single track side go to the other pair, distributing the power between the two pair. Make sure to attach the right feeder wire to the right conductor.
3. A "kill" switch for each mainline track (ie: 3 switches) should be installed in the Masonite fascia boards. This allows a section of track to be turned off in an emergency and can be used to regulate the spacing of trains when several are being run at once. The following conventions for switch location and wiring are used so that all modules are the same and in an emergency anyone can use the kill switches without having to figure out how they work first.
- A. The kill switches need only be single pole single throw (SPST) toggle switches. "Miniature" or "Sub-miniature" switches such as Radio Shack #275-624 or #275-634 are fine. Push button switches should not be used since their use can cause the lightweight modules to be pushed out of alignment.
  - B. The kill switches should be mounted near the center of the Masonite fascia board such that toggle up is on and toggle down is off. The switches on the double track side should be mounted one above the



other. The one on top is for the back track and the one below is for the front track.

- C. (Molex) The kill switches get wired between bus wires #2, #4, & #5 and rails #2, #4, & #5 (see item 5A below).
  - D. (Automotive) The kill switches get wired between the brown and green bus wires and rails #2, #4, & #5 (see item 5B below)
4. Track gapping to form separate electrical blocks is only required in a few places - see item 6 under Trackwork.
5. Track wiring:
- A. (Molex) The "front" of the module is the double track side. The closest rail (the front rail of the front track) is wired to Molex pin/bus wire #1; the next rail back is wired to bus wire #2; and so on back to the farthest rail (the rail closest to the face on the single track side) which is wired to bus wire #6. Don't forget those kill switches.
  - B. (Automotive) The "front" of the module is the double track side. The closest rail (the front rail of the front track) and the front rail on the second track is wired to the single pin on the "female" connector; the next rail back and its equivalent on the second track is wired to the socket next to the pin on the "female" connector; the rails on the single track are reversed - rail #5 is wired to the other conductor on the edge of the connector and rail #6 is wired to the inner conductor. Don't forget those kill switches.
  - C. Each piece of rail should have its own feeder wire soldered to it. Don't rely on rail joiners to conduct electricity, even if they're soldered. This also applies to each piece of rail in turnouts; they should have individual feeders too.
  - D. Track feeder wires may be 26 gauge solid wire if they're short (4" or so). If the feeders are longer, they should be heavier gauge wire.
6. Other Wiring (Molex):
- A. The power pack must connect to the modules at some point. Since the end loops are always used, they are the best place to have a connection strip. We've also found that a connection point is good at a corner module (if you have any). At this point Molex bus wires 1, 3, and 6 tie together and wires 2, 4, and 5 tie together forming the two track feeder connections. Bus wires 8 and 9 should also have connection terminals for lights and switch machines.



- B. Turnouts (track switches) can be manually or electrically operated. For electrically operated switch machines power comes from bus wires #8 and #9. These two wires are connected to the constant D.C. voltage of the power pack. This varies from pack to pack but is usually 12 to 18 volts.
  - C. Lighting for structures and other things on the modules can also be fed from bus wires #8 and #9. Just be careful that your miniature bulbs are rated for the voltage.
  - D. There is no wire to terminal #7 on the Molex plugs. Its just extra.
7. Other Wiring (Automotive): Each outer automotive conductor ties not to the conductor next to it (for that would create a short circuit, but to the the one after that. There is no auxiliary power bus, so lights, track switches, etc. will need their own power feeds.

## SCENERY

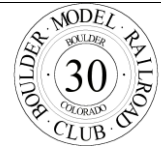
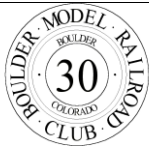
### *Thoughts and Ideas*

Working with foam insulation board as our module base has many advantages when it comes to creating scenery.

- Its so easy to carve and shape contours that you can create finished scenery in a very short time. A serrated kitchen knife and a curved Stanley "Surform" tool are among the easiest ways to carve and shape basic contours. Final smoothing and blending is quickly done using 60 or 80 grit sandpaper.
- To color your foam "ground" any latex house paint works well to provide a basic earth color, or you can use any plastic compatible hobby paint.
- For scenic texturing and ground cover most traditional methods work well, just avoid anything with a solvent base. The book *How to Build Realistic Model Railroad Scenery* by Dave Frary from Kalmbach Publishing is an excellent guide to water-based scenery.

## PUBLIC SHOWS

One of the reasons to build a FoamRail module is to connect up with other modelers at public shows. Other than making sure there are a couple of end loops and some folding tables to put everything on, the coordination is pretty simple. Just take along a few things:



1. Your module.
2. 3 bridge tracks with rail joiners.
3. 2 strips of Velcro.
4. Some scrap Foamcore board and shirt cardboard along with a knife or scissors to cut it. This is to shim the folding tables (and the occasional wayward module); remember, these tables are our foundation benchwork, so they need to be level even if the floor isn't.
5. A power pack. We frequently find ourselves running 4 or 5 trains with multiple locomotives simultaneously, so a pack with at least 2.5 amp rating is recommended.
6. Some stanchions and rope to create an operating aisle around the layout and to keep little fingers from helping the trains along.
7. And last, but not least, some locomotives and rolling stock. *Have fun!*

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