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# Introduction

By the time you read this, the model railroad featured in this book will have been around for more than a decade—but that wasn't my original plan.

In the first few days of my career at *Model Railroader* magazine, my Naugatuck Valley N scale model railroad started with a lone Micro-Trains Line New Haven boxcar. That boxcar prompted me to spend a few evenings researching the New York, New Haven & Hartford in the David P. Morgan Library at Kalmbach Publishing Co. Within a couple of weeks I'd immersed myself in the history of a railroad that featured main lines running through tree-covered hills and past red brick factories and neat white houses that lined Connecticut's Naugatuck River Valley in the 1950s.

As for the New Haven of the '50s itself, it possessed a great collection of colorful four-axle Alco diesels and sleek Budd Rail-Diesel Cars (RDCs). Operation on the Naugatuck line included short commuter trains, plenty of local switching work, and several daily freights. Even in my initial digging around, it was easy to see that the New Haven's Naugatuck Valley operation was perfectly suited for a small layout.

Being hooked, I drew up several ideas for track plans, one of which I set out to build as a small project railroad for the magazine. The idea was to write an article entitled "How to build a railroad in your apartment and still get your security deposit back." (Which I did, by the way.) I began construction on the layout in the living room of the small, one-bedroom apartment that my wife and I rented while we built our house in southeastern Wisconsin. In all fairness, the layout in the living room was an even trade, as my wife's grand piano took up the entire dining room!

Unfortunately, the time came to move into our new home before the layout was finished, so I brought it to the house and used one corner of the basement to complete it. I had every intention of writing that one article and then moving on to design a more ambitious layout for my new basement.

The trouble was the Naugatuck wouldn't leave. That one article turned into nearly 30 installments of the monthly Step by Step column. Those columns generated all sorts of outside interest, and suddenly people were sending me bits and pieces of New Haven information, which prompted further research on my part. The new information helped me to expand the layout, which ultimately produced more articles and invited more outside comments.

Ten years later, the Naugatuck Valley RR occupies a significant portion of my basement. It's been featured in dozens of articles, several books and videos, and it's been visited and operated by people from all over the world. The Naugatuck even gets its own occasional bit of fan mail.

It's been said that a model railroad is never finished, and for us as hobbyists, that's a great thing—there's always something else to do! Like many model railroads, my layout has grown over time, just as my own interests in the hobby have evolved, which leads to the reason for writing a second edition of *Building a Model Railroad Step by Step*.

I've come to find that instead of calling the layout done and starting over on a new project, I've really enjoyed expanding my existing layout and adding to its operation. For me, that's been an exciting new piece to my model-railroading journey, and so I've included new material in the book dedicated to those topics as well as revised other subjects with updated information.

I know full well that no one will ever build the exact same model railroad I have built. However, I hope that as a reader, you'll take away some project or point of interest that inspires you in your own modeling projects.

Best wishes on your endeavors!

*David*



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## CHAPTER ONE

# Getting your layout started

Building your own layout is a fun and rewarding way to enjoy model railroading and share it with others. This New Haven train crosses a bridge over the Naugatuck River on my finished N scale layout.

Want to build a layout? Welcome to one of the most exciting aspects of model railroading! Building a model railroad is a rewarding, fun, and creative project.

Not sure where to start? If you look at building a model railroad as a whole, the project can seem intimidating. However, rest assured that no one builds a layout in one evening, typically not even in 100 evenings. Instead, model railroading is a lifelong hobby. When viewed this way, it's easy to see that a finished layout is actually made up of hundreds of individual projects, completed an hour or two at a time.

Photo 1 illustrates my point. I built the red brick factory building in a couple of evenings sitting at the kitchen counter several years ago. The bridge and the stone abutments were another set of two-evening projects. After I'd installed the finished bridge and added it to the layout, it was about a month before I laid the track over it. It was then nearly 12 months before I added the water under it—a project that took an entire week, working 45 minutes a night. In fact, everything you see in the photo was built and added to the layout a little at a time, which brings me to the purpose of this book.

You don't need to know a lot to get started. Much of the model railroading process is really on-the-job training. You'll learn needed skills as you go, and your modeling expertise will grow with each new project. The chapters of this book provide the information you need for each step in the process and include concise projects broken down into bite-size pieces. The examples all take place on my N scale railroad; however, you can use this information to build a layout of your own design in whatever scale you wish. (More on that later.)

I won't lie to you: Model railroading, like anything else, can have moments of frustration. My wife refers to the times I stomp up the stairs after a setback as “those hateful hobby moments.” But even frustrations can be great learning experiences. The best advice I can offer when a project isn't going well is to walk away from it for a bit. Go get something to eat or drink, relax a little, then come back and evaluate what's happened. Often, after my emotions have calmed down, I can see where the problem is and correct it before moving on. Taking time to work carefully through a project almost always pays off with success.

So if you like model railroads, but haven't a clue on how to get started, this book is for you. Or if you've been into model railroading for a while, but just haven't gotten around to building a layout yet, this book is also for you. And if you're not sure about the skills, tools, and techniques you need to build your dream layout, this book is definitely for you.

## Essential layout-building tools



You may be pleasantly surprised to know that it really doesn't take a whole woodworking shop full of equipment to build a model railroad—even when using the proper tools for each project. Though more-specialized tools can speed up the process considerably, you don't need them if you have the time and patience to work carefully with basic tools.

Throughout this book, sidebars describe some of the basic tools you'll need to complete various projects. Taking time to find the right tools can help make a project a success and prolong the life of your tools. Here are a few common-sense tips that will help you get the most out of your layout-building tools:

- If purchasing a cordless tool, buy an extra rechargeable battery. Cordless batteries typically recharge quickly, so while you use one battery, you can recharge the other one.
- Always follow the manufacturer's safety recommendations when operating power tools, and use proper eye and ear protection when necessary. Also, take your time when using these tools.
- Clean tools and return them to their proper places when you're done using them. This keeps them ready to use and makes it easy to find the proper tool the next time you need it.
- Store tools in a portable tool cart, caddy, or tackle box. This makes it easy to move tools from your workbench to your layout.
- Use specialized cutting tools, such as rail and sprue nippers, only for the materials they are designed to cut.



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## CHAPTER TWO

# Building benchwork and adding backdrops

Building model railroad benchwork is easier than you might think. With just basic carpentry skills and a few common tools, you can build all the benchwork your layout will need, one portable section at a time.

A great model railroad starts with solid benchwork. Much has been written on the subject, and you can build benchwork from a variety of materials including wood, steel, plastic, and foam board. In the end, it seems there's almost as much variety in benchwork construction as there are model railroads.

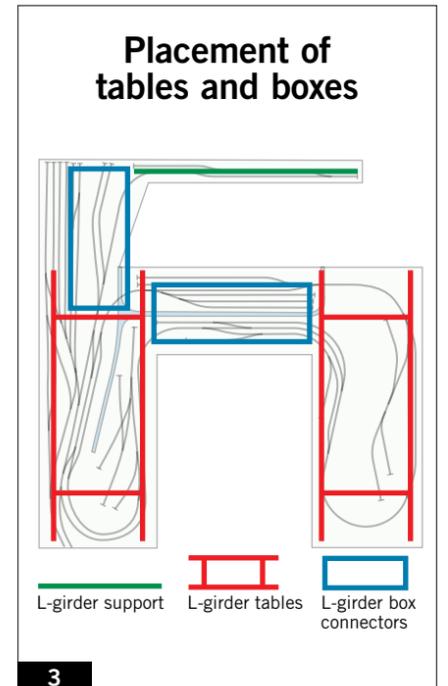
However, if you're a person that moves often (like me), you'll want to consider building your model railroad so it can move with you. I've taken down more than my fair share of layouts due to moves, and it's a frustrating experience to have to start over from scratch each time. With that in mind, we'll look at a simple method for building benchwork in freestanding sections. These can be combined to build a variety of model railroad designs yet can be made portable enough to move without much effort, 1.

Along the way, we'll also look at using foam insulation board as a base scenery layer as well as explore how to make easy-to-use backdrops from sheet styrene.



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Moving and expanding a layout is easy to do when it is supported by a benchwork system of tables and boxes.



3

Illustration by Jay Smith

## PROJECT 1: Creating easy, versatile benchwork

When I set out to build my N scale Naugatuck Valley RR, it was to be a simple project layout for the magazine, built in my apartment while I waited for our house to be constructed. (For the story of its origin and track plan, see the January 2003 *Model Railroader*.) Because we were getting ready to move, I made the layout portable, building it on a 32"-wide hollow-core door and supporting the entire affair with an inexpensive folding table. (The 18" x 48" extension had its own support leg.)

True to its portable design, the little model railroad followed obediently to my new, empty basement. When I decided to expand the layout, 2, I knew I'd have to raise the height and mount the layout on more substantial benchwork—the folding table had to go!

The benchwork can be completed in four simple steps, starting with making tables and boxes.

### STEP 1 Making tables and boxes

There are a number of ways to build benchwork for a model railroad, and books such as Jeff Wilson's *Basic Model Railroad Benchwork* are a great source for getting started.

I used a variation on the L-girder theme, developed by former *Model Railroader* editor Linn Westcott in the 1960s. An L girder is made from two pieces of lumber, usually a 1 x 2 flange glued and screwed on top of a 1 x 3 or 1 x 4, forming an L-shaped beam. This easy-to-build structural member supports a great deal of weight and is useful in a variety of benchwork designs. It uses less lumber yet is strong and provides a number of options for joining other boards to it.

Since I was using hollow-core doors for the main portions of the layout, I chose to build a system of supporting tables and connecting boxes using L-girder beams, 3.

The tables are freestanding and include a storage shelf. These benchwork sections support the hollow-core door components of the layout and use the 1 x 2 L-girder flange as a screw cleat.

The connecting boxes are also made with L girders. These support

the framed layout sections that join the hollow-core doors. The boxes are bolted to the support tables with ¼" carriage bolts and wing nuts, so if need be, the layout benchwork can be quickly disassembled and put back together.

The combination of support tables and connecting boxes form a solid benchwork system, with the versatility of easily adding new sections to the existing layout.

### STEP 2 Constructing tables

The benchwork support tables are made from 1 x 2 and 1 x 3 clear (knot-free) pine lumber. Though clear pine is more expensive, it's a high-quality construction material, making it easier to build straight, level benchwork. The dimensions I used support 32"-36" hollow-core interior doors, 4, but you can change the measurements to accommodate any type or size layout.

I did all the construction in sub-assemblies, and most of the fabricated parts are glued and screwed together. Be sure to drill pilot holes for all screws to avoid splitting the wood. The legs, L-girder frame, shelf, and braces are attached to each other using ¼" carriage bolts with washers and wing nuts.



CHAPTER FOUR

# Constructing scenery

Without trees, grass, and hills, a model railroad would simply be track nailed to bare plywood. Detailed scenery brings a model world to life.

Scenery is what makes a model railroad believable. Rocks, hills, trees, and rivers are the elements that take a layout beyond being a nice collection of scale model trains, 1. Common features like pine trees or prairie grasses that merely subsist in the background of everyday life are, incredibly, the catalyst for transforming a model railroad into a miniature world.

As with any part of the hobby, you can't build picture-perfect scenery without some practice and patience. I've had my share of "do-overs," and I've known several modelers who have gone back and torn out the first sections of scenery they'd built because they'd learned so much more by the time they got to the other end of the railroad. That's actually a pretty common occurrence, and it's the great part of building scenery. Like what you did? Keep doing it. Don't like it? Rip it out and try again.

The best part of making scenery is that there are real examples of it all around you. Emulate what nature does, and you are on your way to building a great-looking layout.



Rubber rock molds from manufacturers such as Woodland Scenics are made from real rocks to help reproduce sharp details, such as the eroded faces on these outcroppings.

## PROJECT 1: Casting rocks

Nothing says "impressive" quite like a rugged mountain range full of jagged rock faces. Although mountains appear solid to us, many are just individual layers of rocks, stacked one on top of another. If you keep this idea in mind, then adding impressive rock features to your layout is not a difficult task, 2. Whether you need a whole mountainside or just one or two outcroppings along a cut or low hill, making rock features is actually quite easy. Thanks to readily available materials such as Hydrocal plaster and rubber rock molds, you can cast your own highly detailed rocks and add a little mountain majesty to your layout.

### STEP 1 Using rock molds

One of the easiest ways to create realistic rocks for your layout is to cast your own formations out of Hydrocal. This is a fine type of plaster that's easy to use, becomes lightweight when dry, and

reproduces sharp details well. These properties, along with the fact that it's easy to color, make Hydrocal an ideal choice for molding projects.

To form the rocks themselves, you can use rubber molds. Woodland Scenics and other manufacturers offer molds in a variety of sizes and shapes. These molds produce realistic results because they are usually formed from actual rocks. They are also inexpensive and can be used repeatedly with proper care—some of my rock molds are more than 15 years old and still going strong.

You can also make your own molds from latex rubber or other materials. One easy alternative molding method is described on page 43.

Casting rocks is a relatively fast project and a lot of fun. There are two common methods—straight casting and casting in place—and each has its own advantages. Straight casting is a little easier than casting in place. It simply means that you cast the rock, let the plaster harden, and remove it from the mold to use later, 3.



When casting rocks, proper mixing tools, Hydrocal plaster, and molds produce good results. *Bill Zuback*

Casting in place requires more finesse. To do this, as the plaster starts to set, press the mold onto the layout while the rock casting is still soft. This allows you to wrap the rock around unusual shapes. Once the plaster sets (about 30 minutes), you can remove the mold.