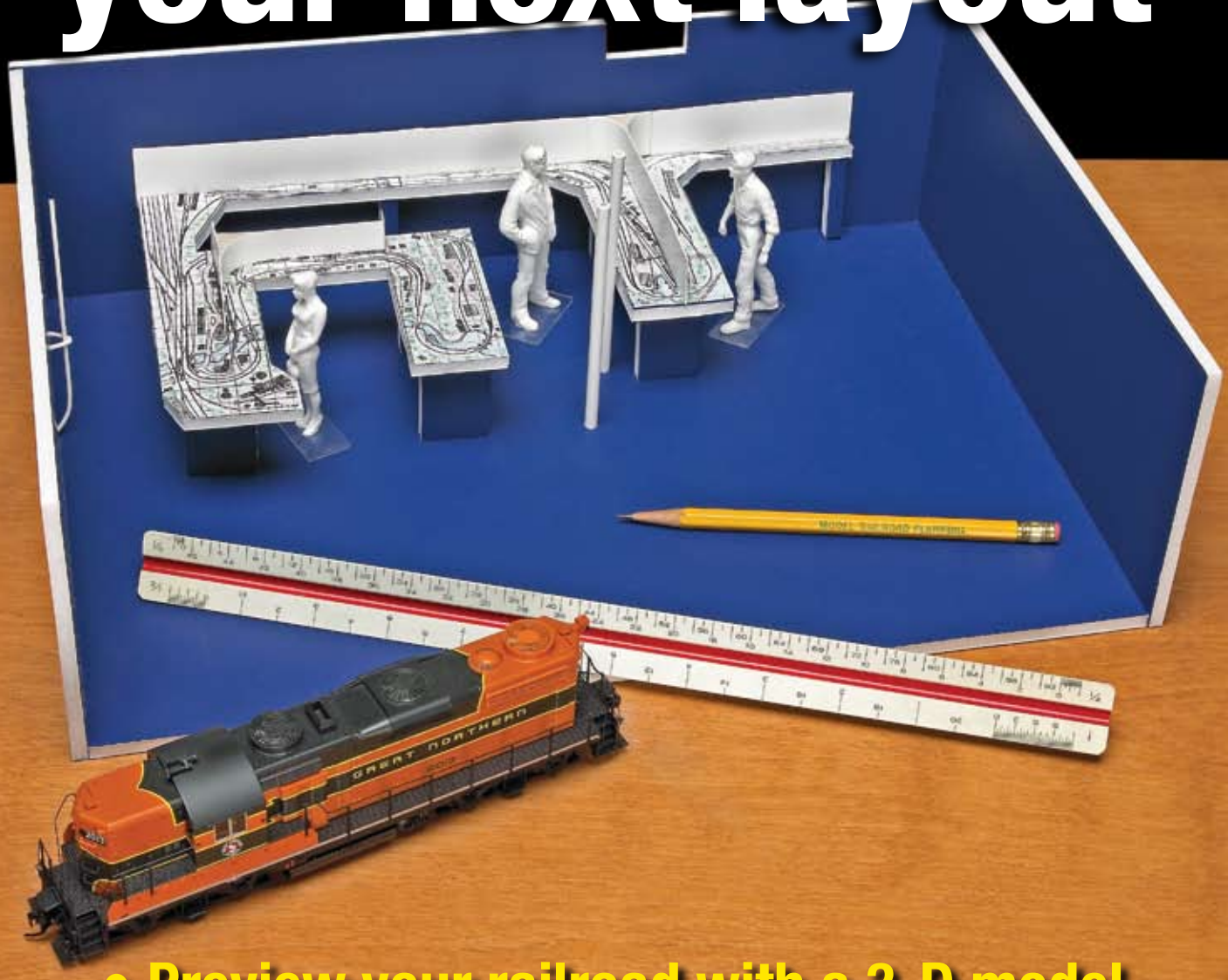
Model Railroader MAGAZINE

PLAN YOUR OWN LAYOUT • CHOOSE A MAINLINE SCHEME

A SUPPLEMENT TO MODEL RAILROADER MAGAZINE

Workshop tips

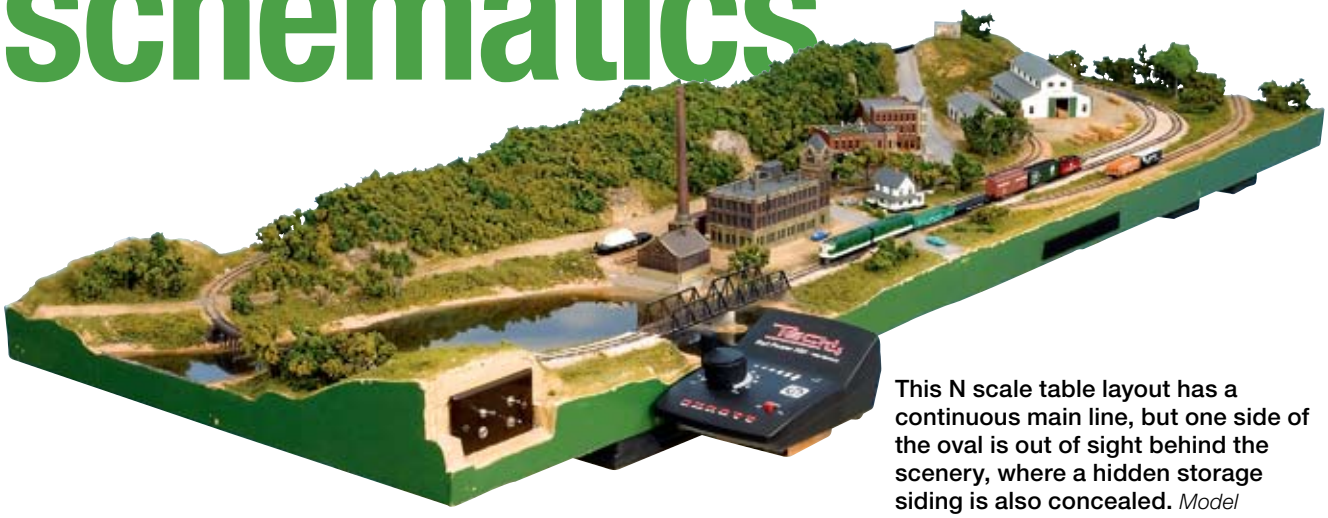
Design concepts for your next layout



- Preview your railroad with a 3-D model
- Choose a layout shape that works
- Ease the pain of sharp model curves

618168

Layout schematics



This N scale table layout has a continuous main line, but one side of the oval is out of sight behind the scenery, where a hidden storage siding is also concealed. *Model Railroader* photo

How to think of your track plan as a railroad

Most of us start out in model railroading with one of the most basic layout schematics, an oval or continuous loop. That's a great place to start, but it's not much like a real railroad. A railroad is a business, and outside of amusement parks and some subway lines, there's not much money to be made by running trains around in circles.

So among the first considerations in planning a layout is devising an arrangement that lets your model main line look and act more like a real railroad. That arrangement is what we call a layout schematic. These schematics come in several varieties, and none is, in itself, better than any other. The value of a schematic lies in whether or not it lets your model railroad accomplish whatever it is that you want it to do.

This brief overview can touch on only a few of the useful layout schematics. For more detail on this and several of the other topics in this booklet, see *Track Planning for Realistic Operation*, by John Armstrong, published by Kalmbach Books. – *Andy Sperandeo*

Point-to-point

A railroad, some people insist, runs trains from Point A to Point B, then has to turn them around to head them back to Point A. That's reality and that's the way they want a model railroad to work too. If you find yourself agreeing with that stance, then a point-to-point schematic may make the most sense to you.

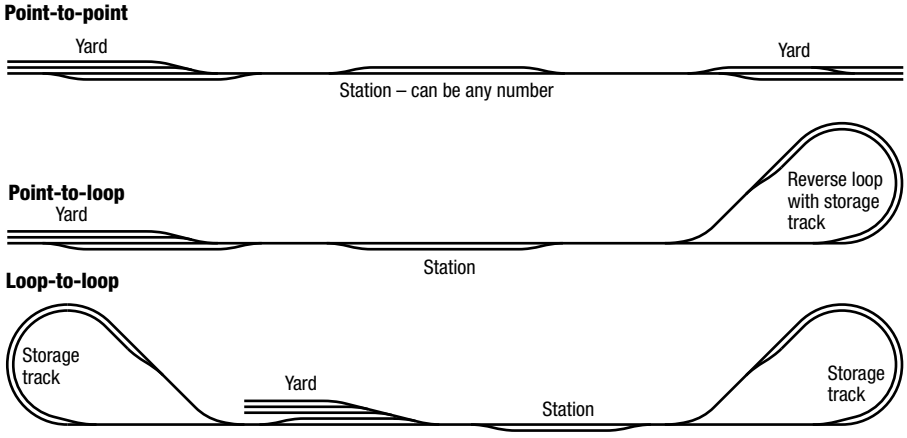
Using a point-to-point schematic, trains run across your layout from one terminal to another, passing through such stations or towns along the way as the layout's size allows. When a train reaches the end of the line, it needs to be turned around to return the way it came, and probably to be switched as well. Freight trains, especially, won't usually carry the same cars both ways.

The complaint that comes up with true point-to-point layouts is that it takes much longer to turn trains in an end-of-the-line stub terminal than to run the length of the main line, even at scale speeds. If the layout represents a slow-paced branch or short line, the share of time spent in switching will be appropriate. If you aim for a busier tempo, however, a true point-to-point will be too slow.

One solution is to replace the stub terminal at one or both ends with a reverse loop for faster turning. The point-to-loop schematic lets a train travel the main line once in each direction before having to be turned in the yard. With loops at both ends, a loop-to loop schematic, trains can run continuously, just as on an oval. Storage tracks on the loops will support a greater variety of trains.

Just as continuous loops are good for open-top-traffic, loop-to-loop schematics favor the operation of passenger trains. The same model consist can represent the east- and westbound versions of the same passenger train more convincingly than is usually the case with freight runs.

Point-to-point schematics



Illustrations by Rick Johnson and Theo Cobb

Continuous loops

The simple continuous loop or oval shouldn't be an object of scorn just because it's so basic. Many outstanding model railroads have been built on its foundation, and there are a lot of ways to put it to good use.

First let's recognize that any schematic that lets a train run continuously in the same direction fits this definition. It doesn't matter if the track crosses over itself like a figure eight or is otherwise stretched and folded. If it supports continuous running in the same direction, it's a loop.

One way to overcome the loopiness of a loop schematic is to hide part of it. The N scale loop layout shown on the opposite page is a good example. The scenic ridge along the back of the table hides the far side of the loop.

That ridge also conceals a double-ended siding or passing track, and both the hidden siding and the hidden section of the main line can be used as storage tracks.

Suppose a freight train appears from the right end of the layout running clockwise. To start with, let's stop using terms that refer to circular motion and say this train is westbound. It stops, sets out a car at the lumberyard, and picks up some others from the interchange track. When it's back together it proceeds west to the siding hidden behind the ridge.

Instead of letting that first train run, let's stop it in the storage track and start an eastbound train that's been waiting on the hidden part of the main line. It comes through the foreground scene in the opposite direction.

Now our simple loop layout takes on the linear characteristics of a railroad. We see a train come from somewhere off in one direction, pass by the place we're watching, and go away in the other direction. Time passes, and then a different train goes the other way. That's how a loop schematic can give the impression of real railroading.

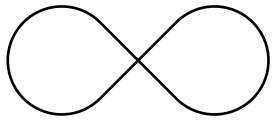
Of course, with just one scene to run through, this trick might get old fast. Still, if we had room to make our layout larger we could run trains through two or more scenes. We might even pass through a freight yard or big-city passenger station. As long as we're expanding, let's add more storage tracks so we can have a greater variety of trains running over our railroad. You can see where this is going.

A continuous loop is great for representing traffic like coal or ore in open-top cars, because the loaded cars can always be going one way, toward tidewater, the steel mills, or wherever, and the empties can always be going the other way back to the mines. If you can run your continuous main line along the walls of a basement or other large space, you have the popular and effective around-the-walls type of layout.

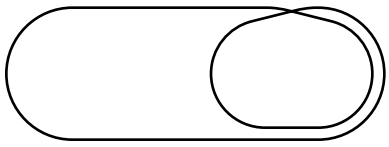
Continuous schematics

Simple oval

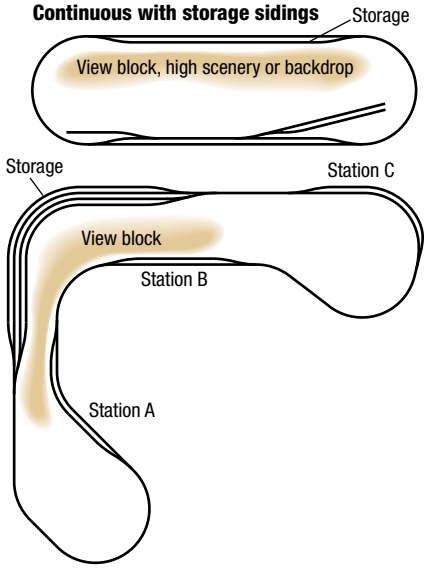
Figure 8



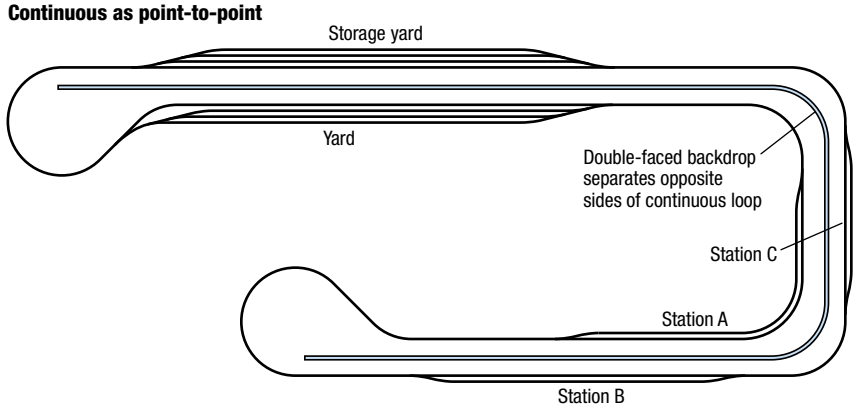
Twice-around



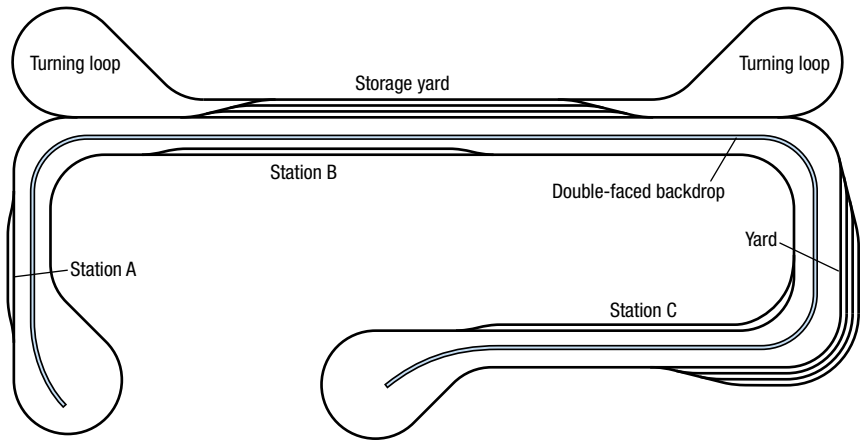
Continuous with storage sidings



Continuous as point-to-point

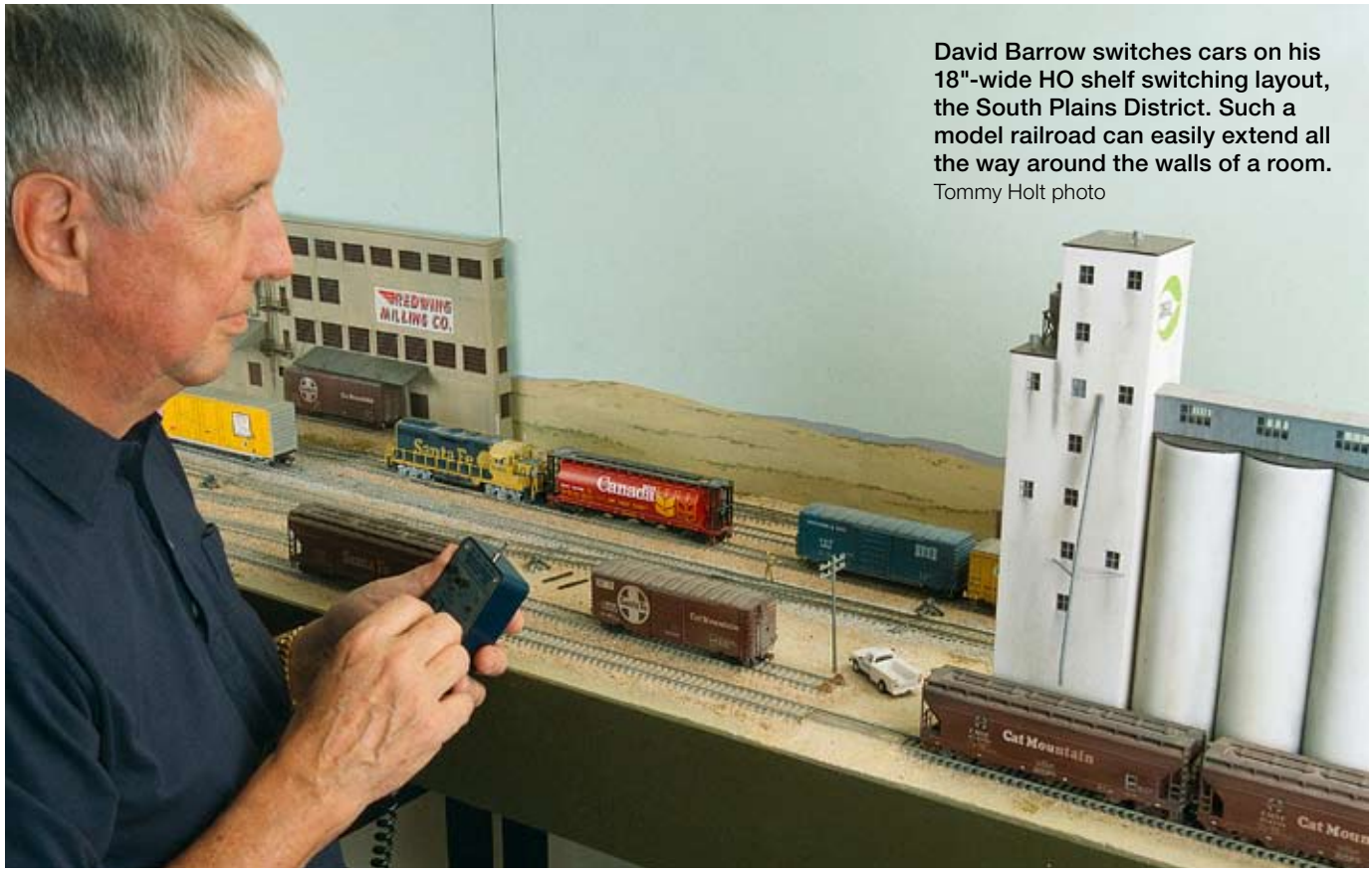


Continuous with turning loops



Combination schematics

There are many other possible layout schematics, and some of the most popular combine features of the basic continuous and point-to-point types. Just because your main line is continuous doesn't mean you can't operate it as if it ran point-to-point. And you can add reversing loops to a continuous schematic. That way you can run coal or ore trains in the continuous pattern and passenger trains loop-to-loop. The key is to choose a schematic that supports the kind of operations you want to model.



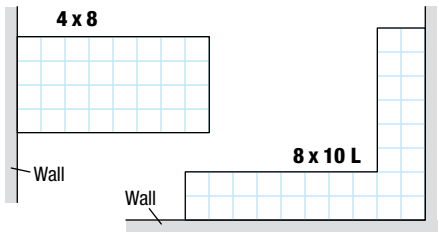
David Barrow switches cars on his 18"-wide HO shelf switching layout, the South Plains District. Such a model railroad can easily extend all the way around the walls of a room. Tommy Holt photo

Layout shapes

For effective and efficient use of space

Many of our first model railroads get built on the common 4 x 8-foot sheet of plywood, and especially in the smaller scales that can allow plenty of scope for newcomers to learn about the hobby. Experienced model railroaders usually want to move beyond such rectangular tabletops, both to use their train-room space more efficiently and to build larger layouts. We'll look at some other ways model railroads can be shaped and consider some of the advantages of these configurations. – *Andy Sperandeo*

Table to shelf



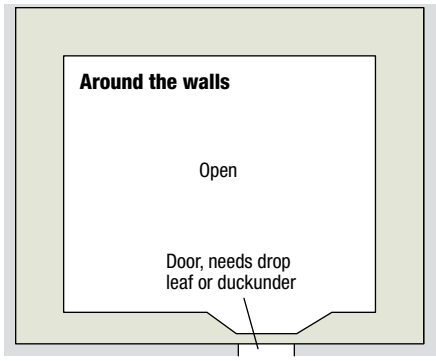
One of the problems with the 4 x 8 is that our effective reach-in distance is about 27" to 30". That means you need access to at least the two long sides and one end of the layout. The other end can usually be shoved against a wall, but that still means the layout table is going to take up a pretty big portion of a small train room.

A popular alternative is the shelf layout. If you split the 4 x 8 material lengthwise you can build an 8 x 10-foot L-shaped shelf layout 24" deep along two walls. A shelf of that width takes you out of the continuous-running business in scales larger than N, but it does give plenty of room for an HO scale switching or terminal railroad.

A shelf layout of that size takes up exactly the same square footage as the 4 x 8, but it leaves a bigger piece of open floorspace and gives the room a less-crowded feel. A shelf along the wall can use a backdrop to give a greater impression of depth to its scenes, and it's a good format for representing something as generally long and narrow as a railroad.

(For more on shelf layouts, see Iain Rice's article, "Tips for shelf layout design," in the 2007 edition of *Model Railroad Planning*.)

Around the walls

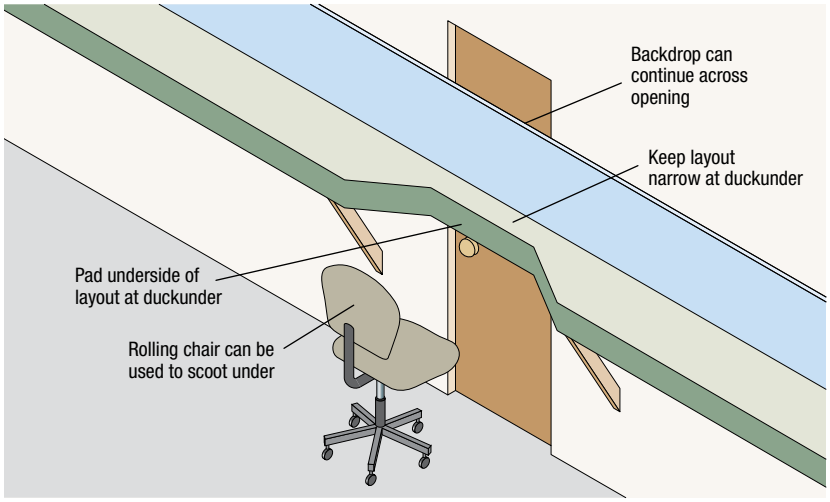


A logical step from the starting point of a shelf layout is to continue the shelf all the way around the room. That gets us back to the possibility of a continuous run and extends the linear arrangement of our railroad scenes. Another advantage of this layout shape is that you're inside the corner curves looking out, which tends to camouflage the unrealistic sharpness of model railroad curves.

You can build a model railroad around the walls of any size space, from a small bedroom to a two-car garage or a large basement.

If the entrance to the room is through a door in one of the walls, either a hinged layout section or a "duckunder" passage under the layout is required. The second illustration, from the book *Basic Model Railroad Benchwork*, by Jeff Wilson, shows a good way to ease the pain of a duckunder entry. Building the layout as high as you think practical also makes the entry easier and pays off in realistic viewing angles close to eye level. (See Tony Koester's article "Layout height: shoulder high to bird's-eye," in the 2007 edition of *Model Railroad Planning*.)

The ideal entry for an around-the-walls layout is by stairway from another level of the house, as down into a basement or up into an upper floor or attic. Even if the stairs are along the basement wall, determined model railroaders have been tunneling their main lines through stair risers for about as long as they've known about that big hole under the house. Coming down or up *inside* a railroad around the walls is about as good as it gets.

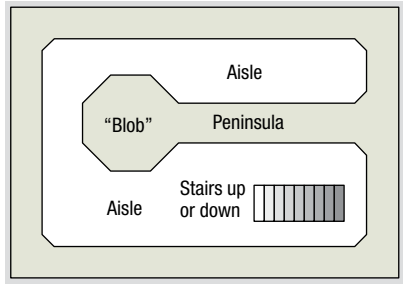


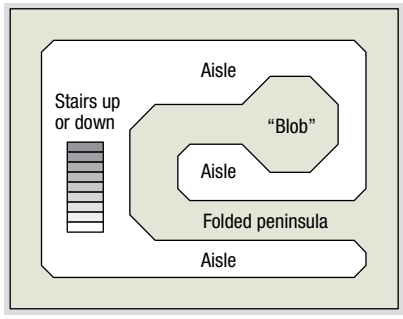
Around-the-walls with peninsula

For larger layouts the around-the-walls shape may be combined with a free-standing peninsula. This extends the railroad into what would otherwise be empty space in the middle of the layout room.

When the width of the room allows, you might think of using two parallel peninsulas. This can work, but it requires what master layout designer John Armstrong called "blobs" for turnback curves at the end of each layout arm. Since blobs can be hard to scenic realistically and hard to reach into, he argued for keeping them to a minimum. Instead of a second peninsula, bending one back on itself, as shown in the second illustration, is often preferable.

Peninsulas

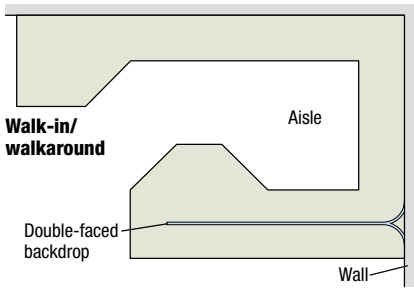


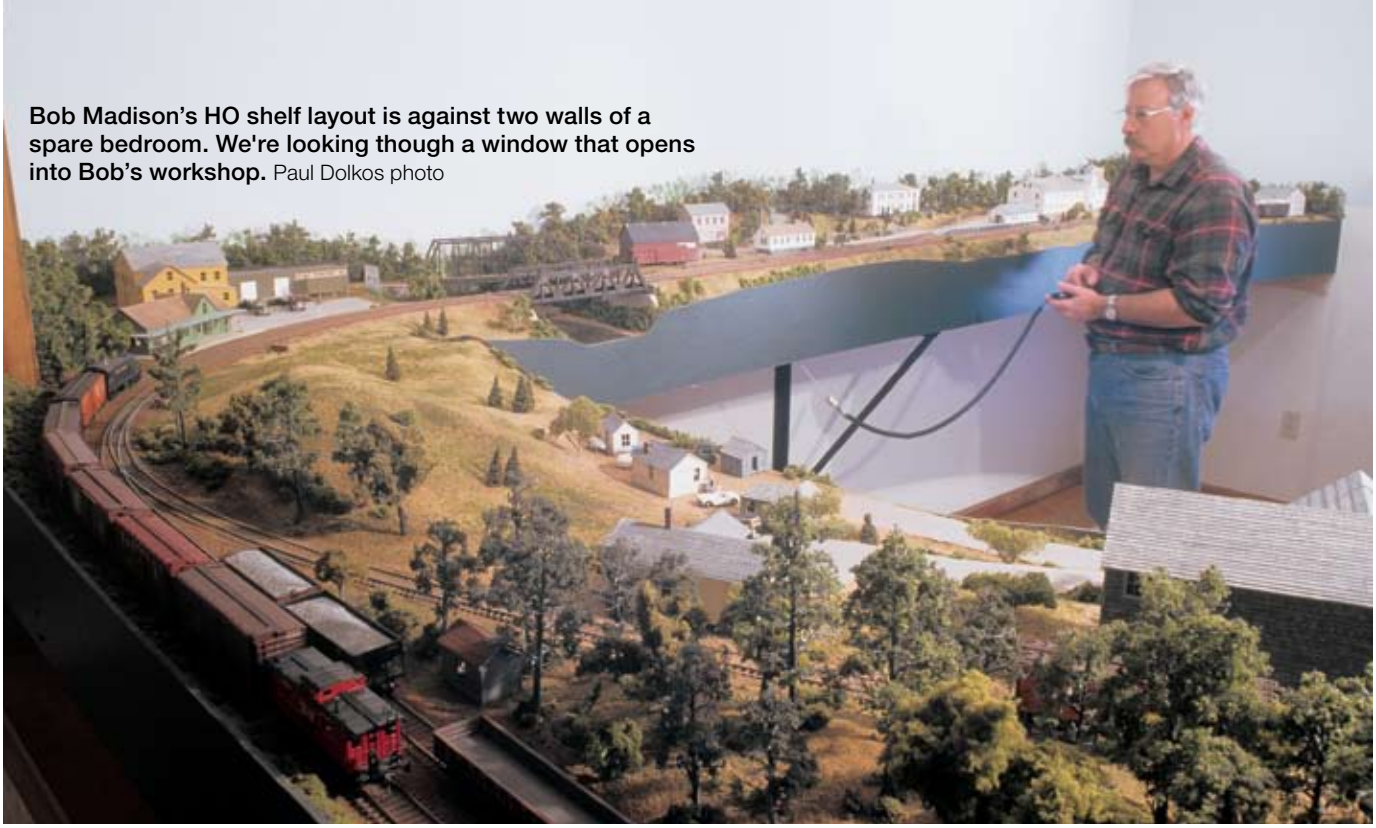


Walk-in/walkaround

If your layout can't go around the walls of a room, you can have many of the same benefits by using a walk-in layout shape. The roughly "G"-shaped design in the illustration allows the same kind of ready access to all the layout's scenes as you'd enjoy in an around-the-walls layout. If the main line is arranged so you can follow trains along the edges of the layout, you have a walkaround design: You can walk around with the train you're running.

You can even get some of the effects of a shelf layout by using a double-faced backdrop to divide the free-standing arm of the layout into two long, narrow scenes. In larger versions, the aisles can turn back on themselves, and because the backdrops don't let you see across the layout, you get the impression of traveling a long distance as you follow a train.





Bob Madison's HO shelf layout is against two walls of a spare bedroom. We're looking though a window that opens into Bob's workshop. Paul Dolkos photo

Layout locations

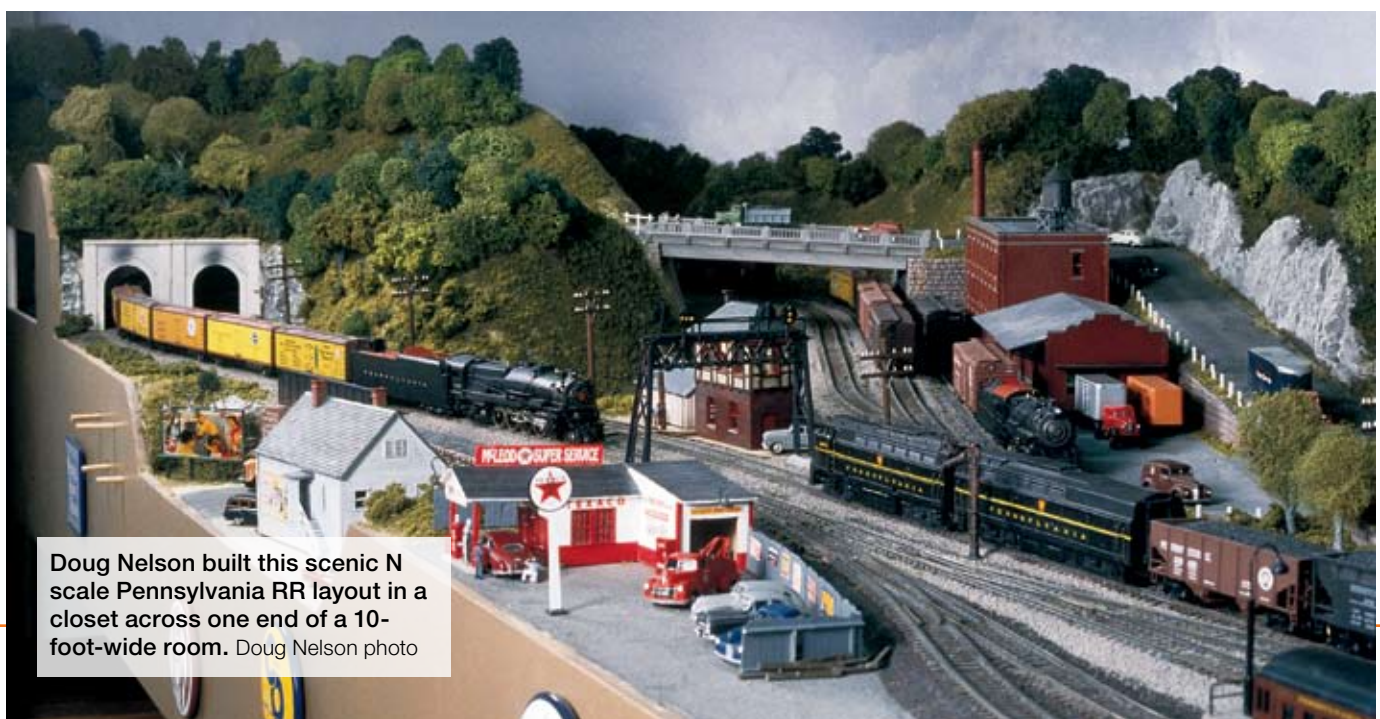
Living areas may not be the biggest but they are the nicest

Anyone can tell you that a giant basement or a wide-open attic would make a great place to build a model railroad. That's almost too easy. Here I'd like to make a case for some less expansive locations you might overlook.

Spare bedrooms and other relatively unused kinds of living space have many advantages. They usually come already finished, maybe even carpeted, and with the same lighting, heating, and air-conditioning as the rest of your home. If you want to spend a lot of time on your hobby, why not spend it in a really nice place?

Above we see an L-shaped HO layout in a spare room. Bob Madison's New Haven Ninigret Cove Branch extends 11 feet along one wall and 15 feet along the other, and is mostly about 24" wide. That leaves plenty of floor space available for other uses, even for other people's hobbies.

A layout this size can be completed and detailed to a high standard in much less time than a larger model railroad. And it's large enough for enjoyable operation, as Bob showed in his September 2004 *Model Railroader* article. – *Andy Sperandeo*



Doug Nelson built this scenic N scale Pennsylvania RR layout in a closet across one end of a 10-foot-wide room. Doug Nelson photo

An 11 x 13 foot bedroom was enough room for Mike Hamer to built this HO Boston & Maine layout featuring mainline operation and New England scenery. This is the view in through the doorway. Peter Nesbitt photo

Empire in a bedroom

When you can devote an entire room to a layout, you may be surprised at how much you can achieve. In the example shown here, Mike Hamer built an HO scale Boston & Maine layout complete enough to be featured as the cover story in *Great Model Railroads 2004*. In 11 x 13 feet, Mike's layout features mainline operations, plenty of local switching, a live interchange with the Maine Central, and realistic New England town and country scenery.

Mike's B&M can support a variety of train operations because of its wrap-around staging arrangement, with storage tracks out of sight behind low scenery and backdrops all the way around the room. This ingenious and space-saving system merited special attention in an article, "Surround staging," in *Model Railroad Planning 2001*.

Mike left space between his scenery and the wall for "surround staging" tracks that wrap around the room out of sight of layout operators in the center of the room. Peter Nesbitt photo

Can you spare a closet?

Maybe you can't devote even the walls of a room to a model railroad, but what about a closet? There's no end to the ingenuity of model railroaders in search of layout sites, and using one of the smaller scales can open up opportunities.

As the photos here show, Doug Nelson built a 32"-deep closet across the end of a 10-foot-wide room. That gave him room for a busy Pennsylvania RR layout in N scale. A layout height of 53" leaves room for in-closet storage above and below the railroad, and even for a small workbench at one end.

When it's time to use the room for other purposes, the folding closet doors conceal the model railroad and hobby paraphernalia. And if the family moves, closet space is a good selling point.

Doug's layout extends the width of the closet, but its 54" elevation from the floor leaves plenty of room for storage and a small workbench. Doug Nelson photo

This scene of mainline action on the HO scale portable layout of the Midwest Valley Modelers shows that scenic effects don't have to suffer because of sectional construction. There's no reason a sectional home layout couldn't look just as good. Ken Patterson photo

Sectional layouts

Build your railroad so you can take it with you

A friend of mine was hosting an operating session, and as we were about to get started he apologized to the group. "Sorry, but this layout is only temporary," he said. Someone else pointed out that all model railroads are temporary, it's just that some are around longer than others. If you know you'll have to relocate in the future, or even if you just want to be prepared for that possibility, you can build your layout in sections that you can dismantle, move, and reassemble.

When it's time to move house, a sectional layout will let you save much of the time, skill, and money you invest in your model railroad. With sectional flexibility you should be able to adapt much of what you've previously built to a new layout space, and sectional construction lends itself to expansion and redevelopment. You can even take advantage of sectional construction to perform tasks such as wiring and switch motor installation with the layout sections standing on their sides or ends instead of always having to work up from below.

Think sections, not modules. To some extent Ntrak and other modular layout groups offer great examples of sectional construction, but there's an important distinction between modular and sectional layouts. Modules all have to fit together with standard track connections at the ends of each unit, but each builder can construct any kind of scene on a given module. This leads to stereotyped track arrangements and frequent mismatches between adjacent scenes.

With sections you don't have to follow any standard track pattern because the pieces need to fit together only one way. The scenery can maintain its continuity from section to section following the theme of your model railroad. Assuming you're not planning to take your show on the road very often, you don't even have to leave breaks in the track and scenery at section joints. When its time to move, simply cut the rails and slice through the terrain at each joint. As long as you have some extra track and scenery materials on hand, you'll be able to "heal" the scars at the section joints when reassembling your railroad.

Here are two ways to build layouts in sections. They don't exhaust the possibilities, but they're enough to get you started. – *Andy Sperandeo*

Dominoes

David Barrow devised a sectional construction system using standardized rectangular layout segments. He likes to lay out track plans by fitting these sections together end to end and forming 90-degree corners, so the comparison to the game of dominoes was obvious. He's described his domino method in articles in both *Model Railroader* and *Model Railroad Planning*. The illustration shows the basic form of domino layout sections.

David likes a section two feet wide by four feet long but doesn't mind building them narrower, in widths down to 18" or even 12" when the situation calls for it. He sticks to a 24" maximum width to maintain a comfortable reach-in distance. He's tried building sections six and eight feet long, but prefers the four-foot length for its ease in handling.

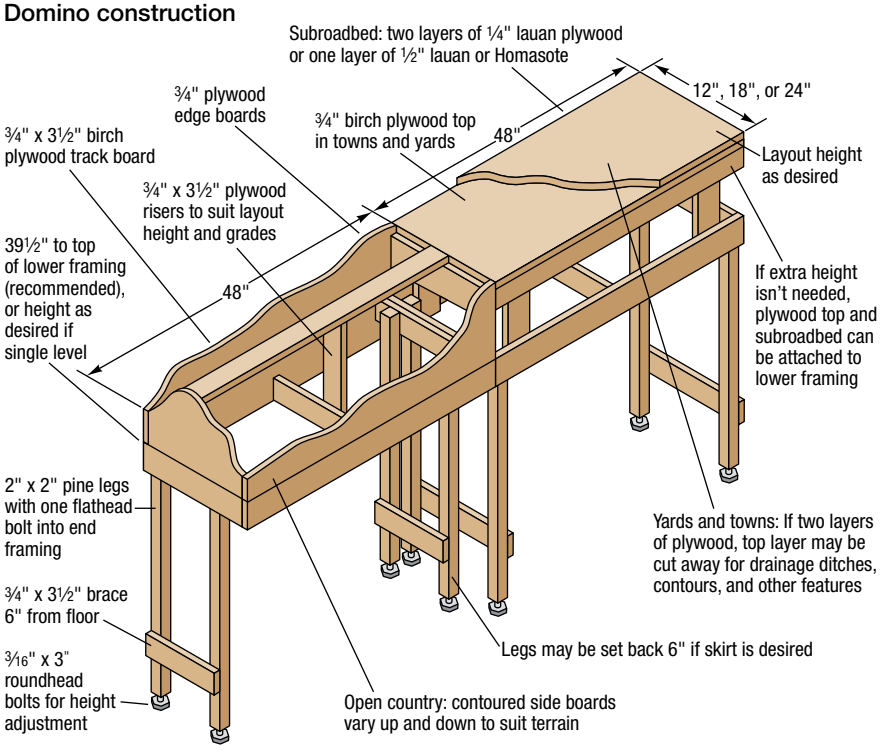
The concept calls for four legs supporting each section, and that adds up to a lot of legs for a layout of any size. David finds the legs convenient both for rearranging sections and for supporting a plywood or hardboard skirt.

The two levels of framing shown at the right in the illustration allow space for power supplies, switch motors, and electronic gear inside the framework. As the drawing indicates, the upper framing could be dispensed with if not needed.

The section at the left in the illustration shows a domino frame for scenery extending below track level. This also allows track to be built on grades for hilly or mountain railroads.

For more on domino construction, see David's "Domino planning basics," in *Model Railroad Planning 1999*, on sale at www.modelrailroader.com.

Domino construction



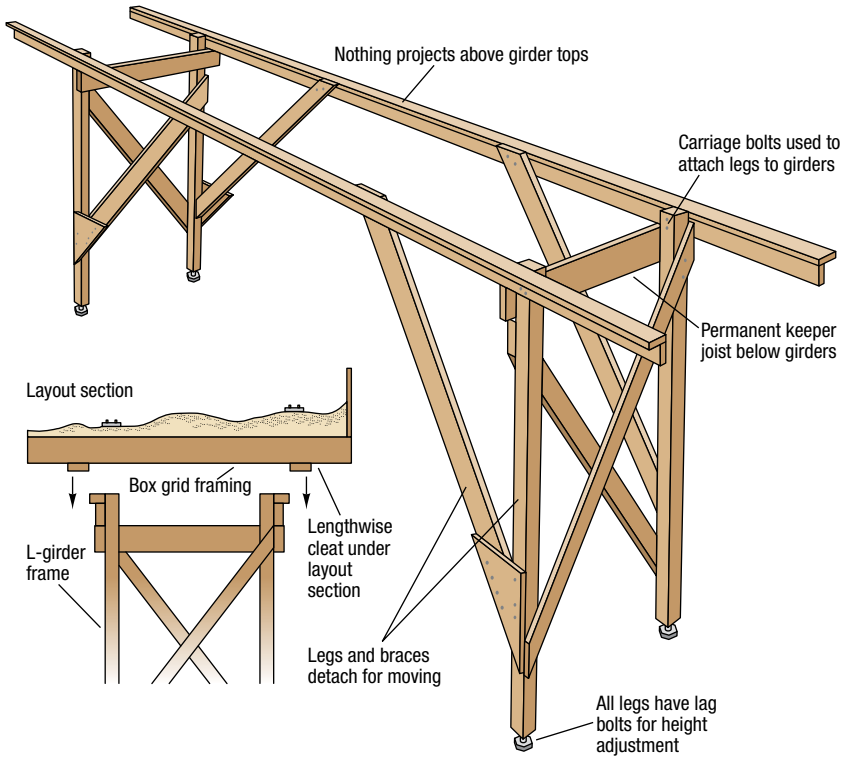
Grids on girders

Some find standardized sections like dominoes too confining and look for greater freedom in planning and building sectional home layouts. A solution that's often overlooked is included in Linn Westcott's landmark book, *How To Build Model Railroad Benchwork* (Kalmbach Books).

As shown at right, Linn's idea was to use L-girder framing to support a series of layout sections constructed of simple box grids. The width and length of the sections can vary, as long as they have a reasonable chance of fitting through the doorways of both the current and any future layout rooms.

Linn showed lengthwise cleats under the sections to fit along the girder flanges, but I'm not sure these would be necessary. The sections could simply be secured with screws up through the flanges from below. The L-girder framing itself could be unbolted for easy transportation and later reassembled at the new site.

Frame to support layout sections



Lee Nicholas uses through staging behind the scenes on his HO Utah Colorado Western as a "fiddle yard." One or two crewmen make up trains here for other operators. Lou Sassi

Staging tracks

How trains can come and go "beyond the layout"

In any layout planning discussion, staging tracks are bound to come up, and sooner rather than later. More and more hobbyists recognize the value of these out-of-scene storage yards that can represent main lines to distant cities, links with other railroads, and other kinds of "offstage" destinations.

One question that often comes up is "Which is the 'best' kind of staging?" Of course, there's really no single answer to that question. What matters is to understand the advantages and disadvantages of each of the many ways of arranging staging tracks.

Here we'll examine three of the most common staging yard arrangements, so you can pick whichever one or any combination that suits the way you want to run your model railroad. – *Andy Sperandeo*

Stub staging

The simplest and most straightforward kind of staging yard is a group of stub-ended storage tracks. Stub staging takes the least space for a given length of train, and that's always an important advantage. It's also likely to be the easiest to add to an existing layout or track plan.

Remember, sometimes a useful staging "yard" can be just one or two tracks. That can be enough to allow trains to come and go from a connecting line or an offstage industry.

Except when used as a fiddle yard – where trains are "fiddled" by hand to be turned and perhaps rearranged – stub staging is a one-way affair. Trains can leave and other trains can arrive, but generally a train that enters a stub staging yard is stuck there until backed out and turned between operating sessions. (Push-pull trains, self-propelled cars like RDCs, and other kinds of double-ended passenger trains are among the more notable exceptions to that statement.)

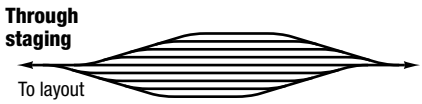
That can be an advantage, if you want locomotives and cars to go away and not come back in the same session, to help build the impression that they're traveling a long way. Because those trains can't return, however, you'll need more engines and cars to maintain a given train frequency in your operation.

Through staging

A double-ended yard with ladders at both ends can do the work of two stub-ended yards by representing both ends of a point-to-point line (see "Layout schematics" on page 2). That can save lots of space. The double-ended yard will be longer for any given train length, but you need only one of them.

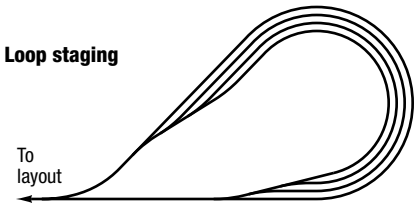
Trains can be re-used in an operating session, if you don't mind that they keep going in the same direction. This can be an advantage for open-top traffic, making it easy to have a parade of eastbound coal drags headed for tidewater and a similar succession of westbound hopper empties going back to the mines. Through staging also supports continuous running when you're in the mood for it.

If you want to have a fiddle yard where you conduct active staging, a through arrangment can be convenient. For examples, see Jack Ozanich's Atlantic Great Eastern and Lee Nichols's Utah Colorado Western, two HO scale systems featured in *Great Model Railroads 2006* (available at www.modelrailroader.com).



Loop staging

Reverse loops with staging tracks take the most space because minimum radius becomes a limiting factor. However, loops can often be built under layout turnback "blobs" (see "Layout shapes," page 4) that you may have anyway. Reverse loops let you turn trains easily to send them back the way they came, and that may not necessarily be unrealistic depending on the geographic location of your railroad. Reusing trains is appealing when you consider the time, effort, and expense you put into them. For that reason, loop staging can be especially desirable if your operations include a busy schedule of locomotive-hauled passenger trains.



Open staging

Many layout designers take it for granted that staging tracks of any kind should be hidden so that the trains going to or coming from someplace else will be out of sight. If we compare the scenicked portion of our layouts to a stage where the drama of railroading takes place, hidden staging is like the wings of the stage. Here the actors – our trains – wait for their cues to enter, or come back to when it's their turn to exit the onstage action.

All well and good, some experienced operators say, but running trains when they're out of sight always introduces a degree of difficulty. That's true even with high-tech control equipment, and operators have to deal with an unrealistic model railroad situation that has no parallel on the prototype. Better to let the staging sit out in the open, they argue, where it can represent some kind of holding yard or fueling point where crews might normally change.

Open staging makes the operation as easy as can be but has the drawback that the trains not in use are right there in front of us. Doesn't that make it harder to imagine that they're traveling farther across country to and from their destinations?

David Barrow, a proponent of open staging, built this double-ended open staging yard on his HO Cat Mountain & Santa Fe Ry. The near end represents the east end of the line as East Hill. The other end is called West Mesa to represent the western end of the railroad. Tommy Holt photo

A workable compromise, for those who have the space for it, can be to put the staging yard (or yards) in a separate room of its own adjacent to the main layout room. Operators can enter the staging room when they need to run a train in or out, but most of the time the staging – and its collection of stationary trains – is out of sight. Jim Richards' Athabaska RR track plan and Tommy Holt's Western Pacific First Subdivision layout are two examples of this approach featured in *Model Railroad Planning 2007*.

Test-fitting your model railroad

Photos by David Popp

Time to expand the layout? That's what I've been contemplating with my Naugatuck Valley N scale model railroad. When I'd originally sketched it on paper, the Naugatuck was to be built in three easy-to-manage phases. Though I'd really only ever intended to finish phase I, after completing it, I decided I could hold some nice operating sessions for three or four people if I also built phase II. The theory was that running trains on the Naugatuck would tide me over while I started my new HO scale layout. At least it seemed like a good idea at the time.

With phase II nearing completion, once again instead of digging into plans for a Soo Line layout, I've been playing with options for building phase III of the Naugatuck. Before getting started, however, I wanted to make sure the new section of the layout would fit comfortably in my available basement space.

A good way to do this is to "test-fit" the model railroad by building a scale three dimensional (3-D) model, a technique I learned from my brother who is an architectural illustrator. Building a 3-D layout model is an easy one- or two-evening project, and the finished model is good for bringing to light all those design and construction considerations that just don't show up on a paper-and-pencil track plan – considerations which are much easier to fix if you haven't actually started to build them yet!

Follow along as I explain how you can build a 3-D model to help with planning your next layout or adding on to your current one. – *David Popp*

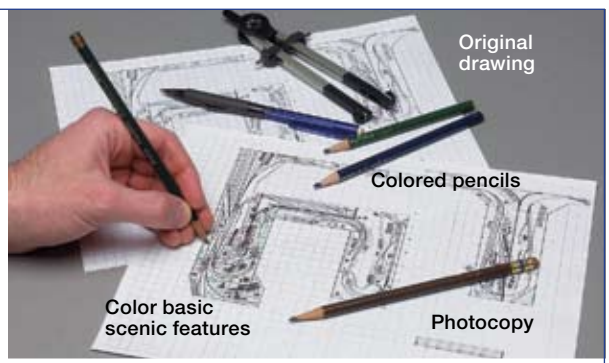
Preparing the track plan

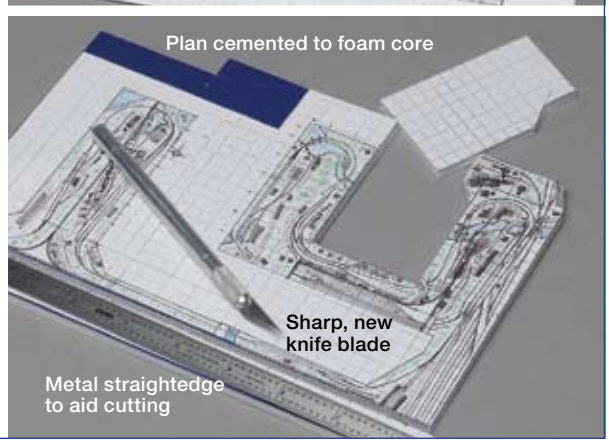
A 3-D layout model is handy to take to your friends' houses or club meetings for design input, so you don't want it to be so big that you can't use it effectively. For this reason I built mine in ½" scale – my finished model (shown in the photos) is roughly 12" x 16", making it easy to transport.

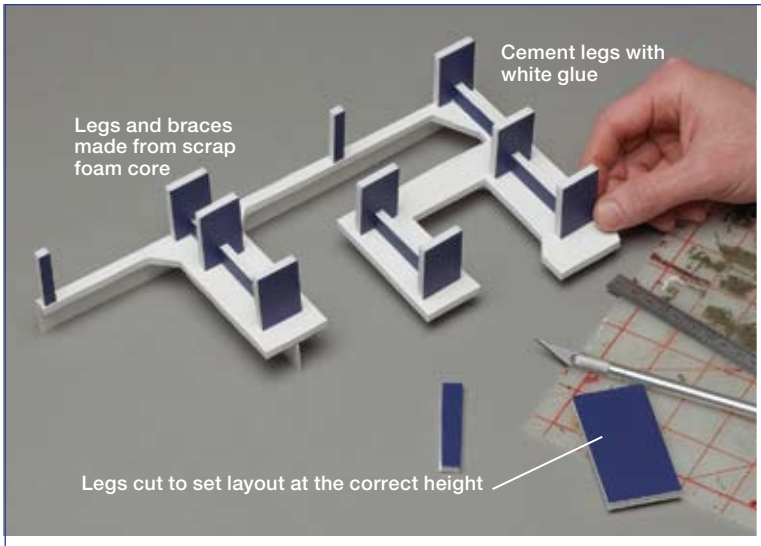
Part of what makes this a quick-and-easy project is that you've probably already drawn your track plan. If you need more information about drawing track plans, pick up a copy of John Armstrong's book, *Track Planning for Realistic Operation* (Kalmbach Books). Since you'll need to cut up the plan for this project, it's best to make a photocopy of it. Also, if you've drawn your track plan in a scale larger than ½", you can have it reduced at a copy shop such as Kinkos.

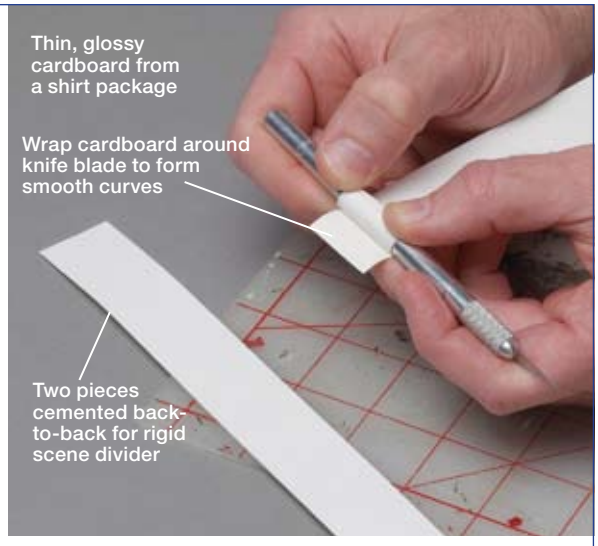
As shown in the upper photo, you can give your track plan a little more definition by using colored pencils or markers to fill in features such as water, roads, tree lines, and fields. Then mount the plan on a piece of common foam-core craft construction board using a quick-drying adhesive, such as a glue stick.

Next, cut the track plan from the foam-core sheet with a sharp hobby knife and a metal straightedge, as shown in the lower right-hand photo.









Legs and backdrops

The next step is to add the layout's support structure and backdrops. As shown in the left-hand photo, you can make a network of legs and braces from strips of scrap foam core. To get the proper 3-D effect, you need to make sure that the layout's base height is correct, taking into account the thickness of the foam core (7/32").

on which the track plan is mounted. My layout's base height is 42" (in ½" scale my model layout is 1¾" tall), so the foam-core legs are 1 17/32" tall.

This is also a good time to add any backdrops, especially if you're using them as scene dividers as I have. Backdrops are an important detail to include since they will give the proper sight lines when the 3-D model is viewed from eye-level.

Because backdrops are often curved, thin cardboard is a good material to use for this part of the project. To form smooth curves in the backdrop, try wrapping the cardboard around a tube or rod, such as the hobby-knife handle shown in the photo above. Once the curve is formed, cement the backdrop to the track plan using white glue. I left my backdrops plain white.

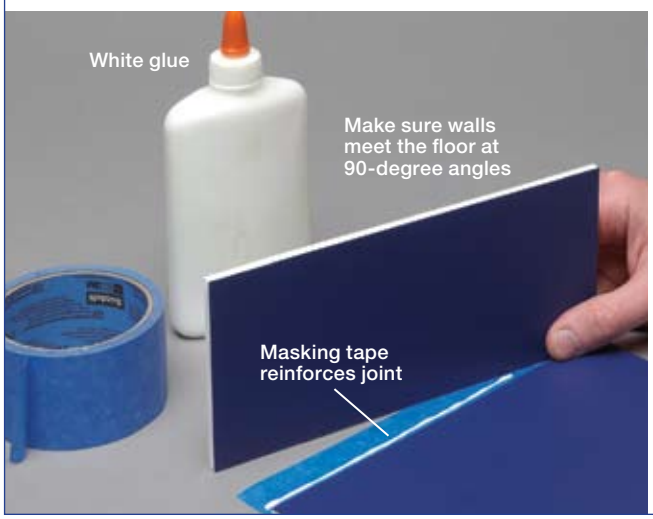
Build your room

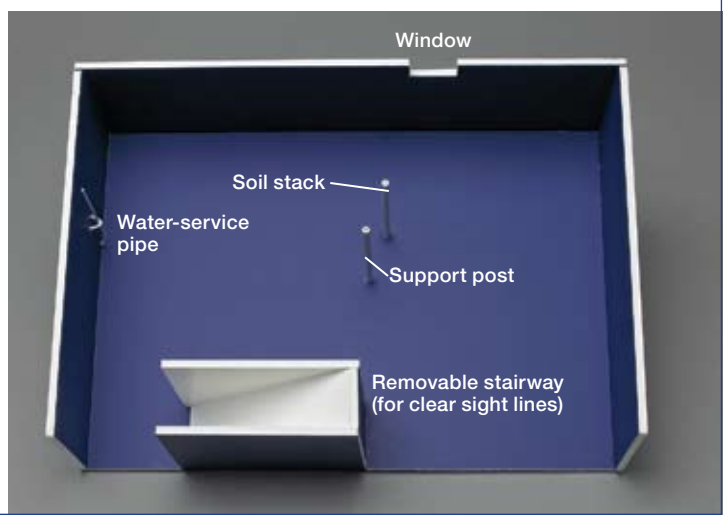
With the model layout finished it's time to build the layout room itself. You'll need the dimensions of your room for this part, though you've probably already taken them to draw your track plan. Build the room in a contrasting color of foam core to make the layout model easier to view.

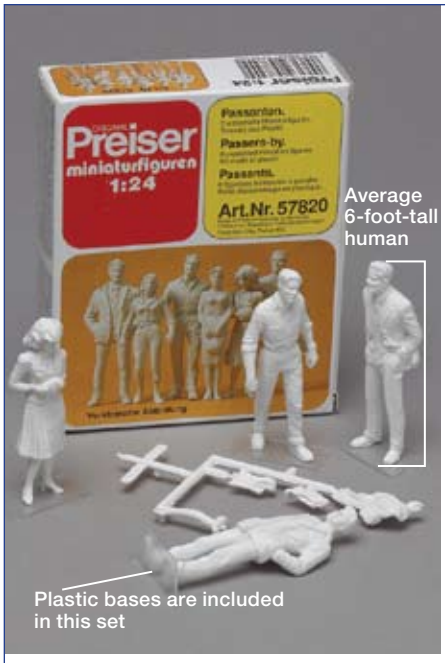
Start your room construction by cutting out the floor, following the dimensions of your room. Next cut the walls, and include any windows or doors. Also, be sure to take into account the 7/32" thickness of the floor when measuring the model's wall height. My basement walls are 96" tall; in ½" scale that's 4". I added the thickness of the foam-core floor to that dimension, making my model's walls 4 7/32" tall.

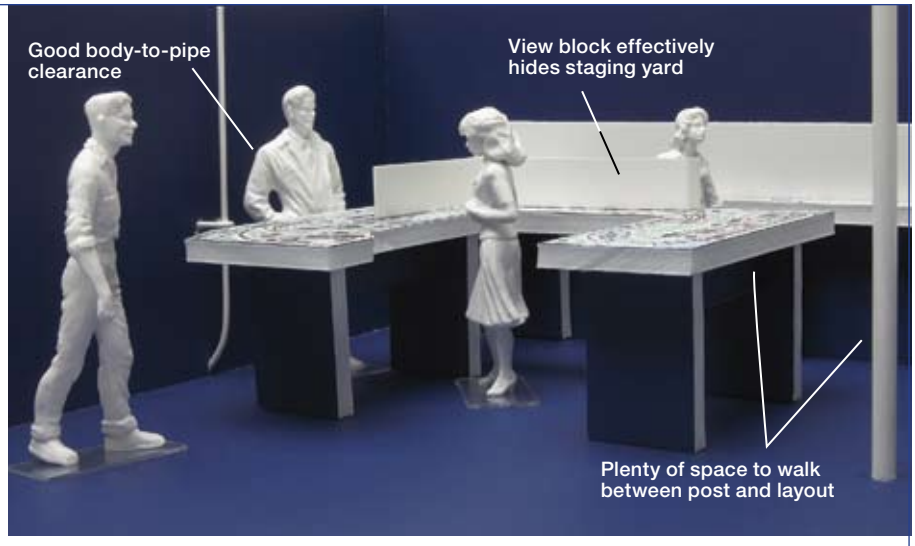
Cement the walls to the floor with white glue, and then reinforce the joint with 2" masking tape, as shown in the left-hand photo. Since the model of your layout room can be used over and over again until you've established the design you plan to build, reinforcing the corners with tape is a good idea.

At this point you should add any obstructions in the room. For me they included the stairwell, water-service pipe, support post, and soil stack, all of which are marked on the right-hand photo. I made the pipes and the post from 1/16" and 3/16" white Plastruct rods. I built the stairwell from more foam core but made it removable to get a better operator's-eye view of the finished model.









Adding the human element

Now comes the fun part – putting it all together. With the room complete, you can add the layout model, positioning it to get the best fit if your plan allows for some wiggle room.

The next step is to add a human element to your model by placing some scale figures in the room. You can make simple figures by sketching stick people or using photos of people approximately 2½" to 3" tall (5½ to 6 feet in ½" scale). Cement the images to some foam core scraps, cut them out, and stand them up in the 3-D model.

As an alternative you can do what I did and purchase a package of no. 57820 unpainted 1:24 proportion (½" scale) Preiser figures. The plastic figures in this set include a good selection of fairly typical-sized people, ranging from a scale 5½ to 6 feet tall. And the figures come with their own clear-plastic bases, so you can position them around the model at will.

Adding figures to your 3-D model lets you see what your layout room will look like full of operators, giving you a realistic idea of how comfortable or crowded your aisles are going to be. Figures are also helpful in determining clearance trouble points for people between the layout and objects in the room. The photo shows how my layout room will look with an operating crew.

This is really just the beginning of what you can do with a 3-D layout model. Once you've settled on a track plan and are happy with how the layout will fit in your room, you can take the project a step further by adding modeling-clay scenery contours. You can also add structures to the model, making them from pieces of stripwood or styrene. For me, however, completing the steps shown here was enough to determine that my track plan will work.

This is how David's layout looked when he started planning for the addition, which will continue along the wall in the upper right corner.

Easements

How to reduce the pain of sharp model curves

An easement is a transition of gradually decreasing radius at the entry to a curve. Easements minimize the offset between the ends of cars entering the curve, and so result in smoother operation and better appearance. See the "coefficient of lurch" diagram, adapted from *Track Planning for Realistic Operation*, by John Armstrong (Kalmbach Books).

Bent-stick method. In practice it doesn't matter if model railroad easements are mathematically perfect spirals – the simple "bent-stick" method shown here produces effective transitions. (For more detail, see the John Armstrong book just mentioned.)

This process for laying out an easement can also be used to draw a template that can be traced onto your subgrade material. I use easement templates drawn on illustration board and cut to shape with a knife.

What matters more than a perfect spiral is that the easement is longer than the longest cars that will use it, for example longer than the 85 scale feet of full-length passenger cars. That way a car can't have one end on the "tangent," the straight track, and its other on the circular curve.

On my HO scale layout with a 32" minimum radius, I use easements 18" (130.65 scale feet) long.

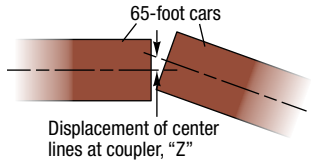
Leaving room. It's important to account for the space easements take in planning and laying out trackwork. That offset between the tangent and the circular curve is needed so the radius can decrease gradually, and half the length of the easement has to extend into the tangent, again to allow for the transition from straight to curve.

On my layout I use an offset of ½", so the center line of a tangent is 32½" from the center point of a minimum-radius curve. The last 9" (½ of 18") of the tangent approaching the curve will begin curving into the easement, so no standard turnout can be located in that length. Those who handlay their track can build special turnouts curving right into or through easements, which can definitely be an advantage. – *Andy Sperandeo*

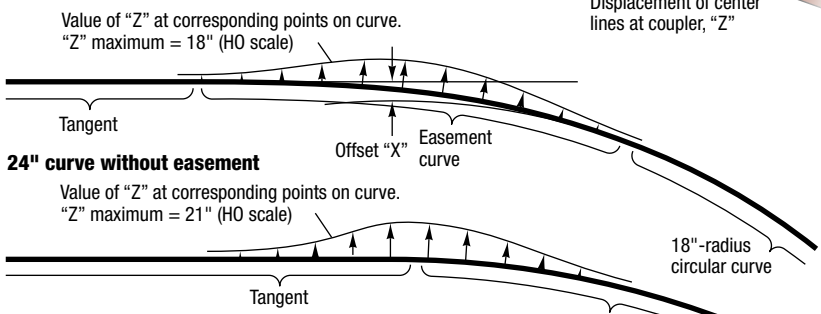
The coefficient of lurch

To study the effect of easements on smoothness of operation, master layout designer John Armstrong superimposed HO scale drawings of 65-foot passenger cars at various points along the entrance to curves and plotted the relative displacements of their couplers from the track center line. Not only is the maximum displacment less for the sharper curve with an easement, but the maximum is reached more gradually. This indicates a reduced lurch upon entering an eased curve at speed.

Note: These diagrams correspond to the situation with 35" and 46" radii in O scale, 24" and 32" in S scale, or 9" and 12" in N scale

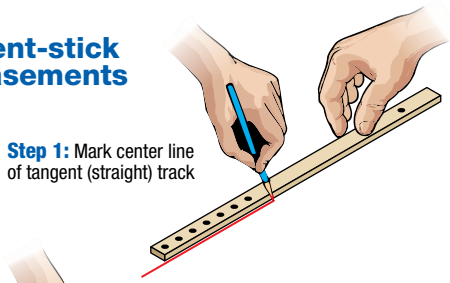


18" curve with short easement

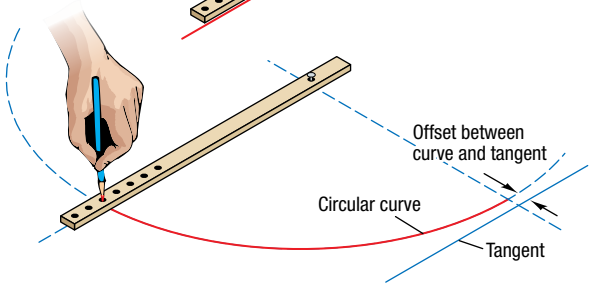


24" curve without easement

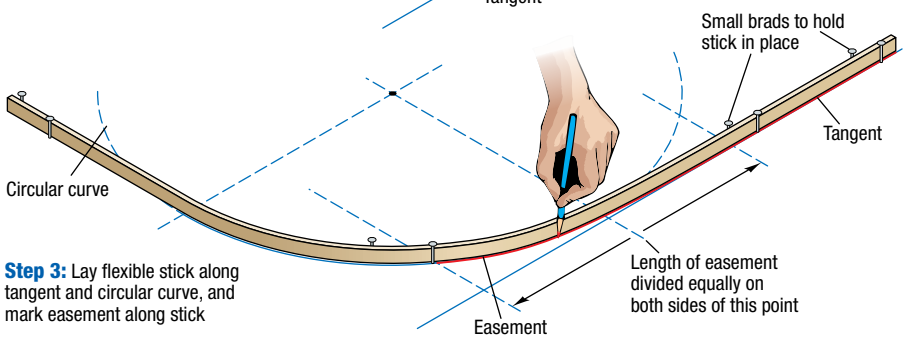
Bent-stick easements



Curve radius	Offset	Length of easement
16"	¼"	10"
30"	½"	18"
42"	⅝"	25"
54"	¾"	30"



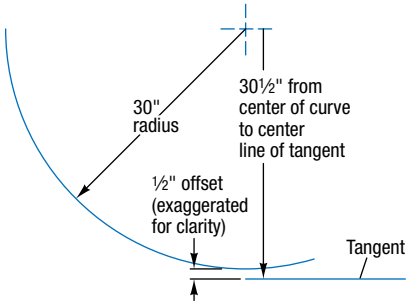
Step 2: Mark center line of curve using trammel. Leave offset between the lines where tangent is square with radius. Offset should vary with radius and length of easement: ¼" for 16" radius to ¾" for 54" radius (see table)



Step 3: Lay flexible stick along tangent and circular curve, and mark easement along stick

Room for easements

Allow for offsets at ends of curve



Allow for half of easement extending into tangent