# LAYOUT DESIGN Journal 43

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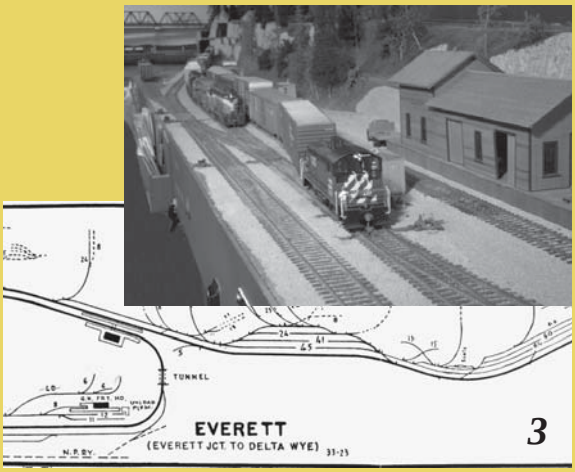
## Features

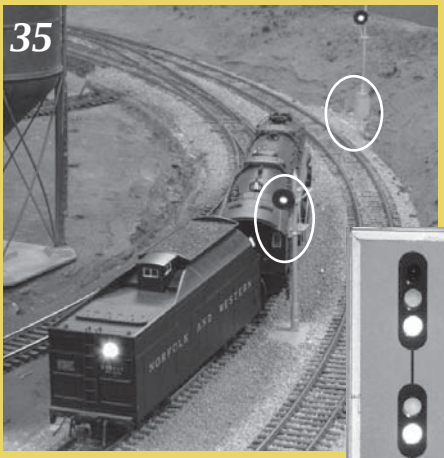


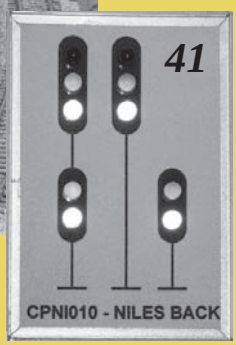
## News and Departments









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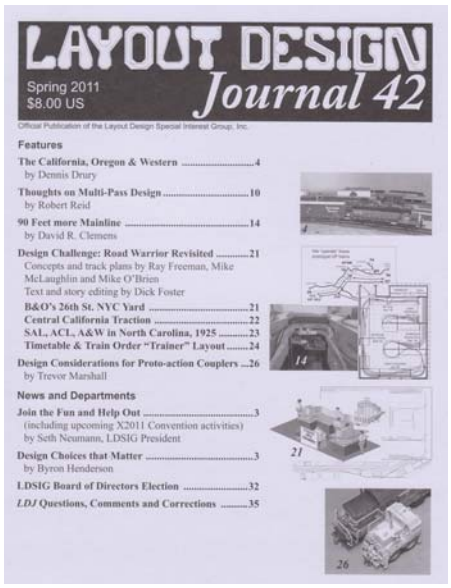
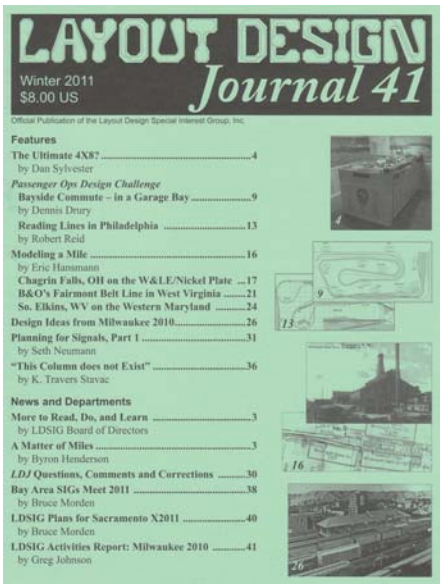


# Designing a “Three-way” LDE

## *Burlington Northern yard & wye at Everett, WA in HO*

### by Burr Stewart

The whole thing started back in 1984 when Atlas released a new series of “Kato-drive” HO diesels. I had been modeling in N scale at the time, and was frustrated with how difficult it was to achieve realistic switching. (N scale runs better today – *BH*) One brief demonstration of the smoothness of the new Kato drive and I was off and running with a new passion for realistic switching. One thing led to another and now I have a basement full of it. But for now, let’s talk about Everett.

#### Why a wye at Everett

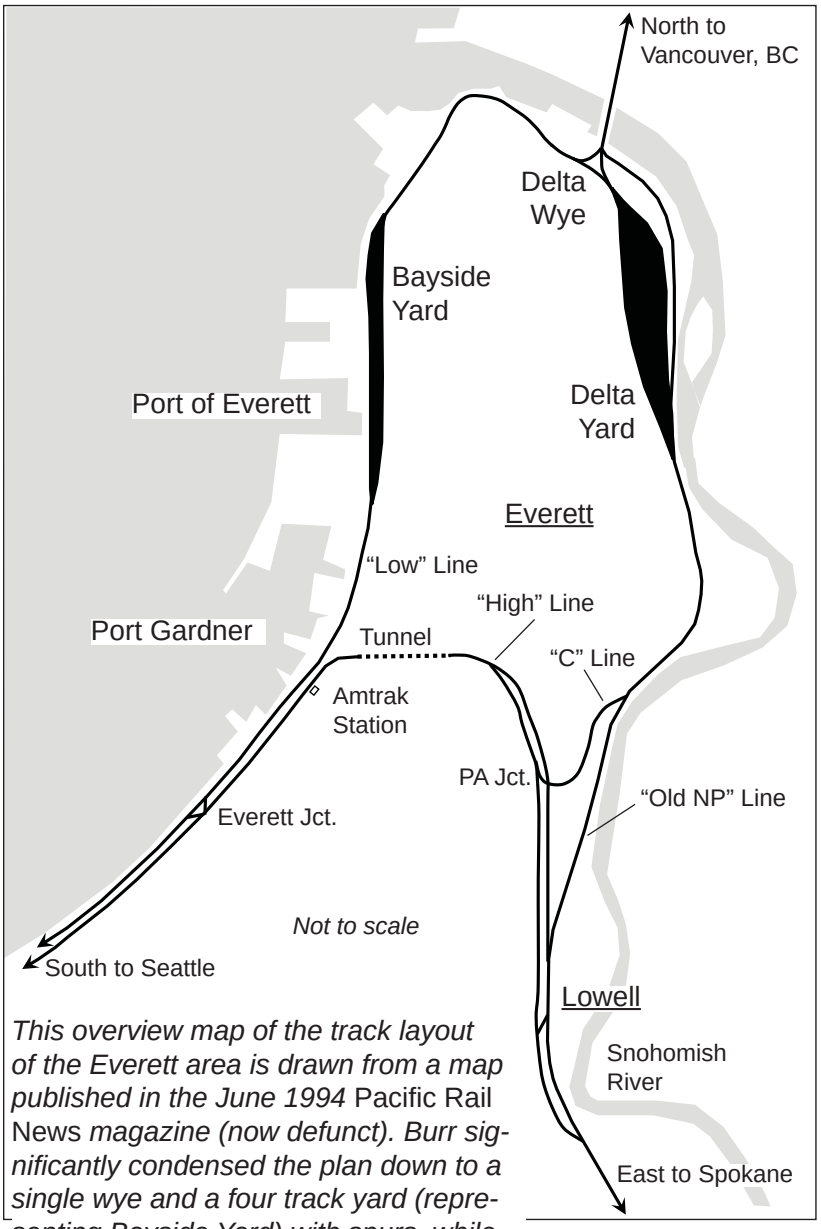
If you’re not familiar with the Pacific Northwest, the Great Northern Railway (GN) or the Burlington Northern (BN), Everett, WA is the place between Seattle and Vancouver, BC where the GN finally arrived on the shores of Puget Sound, connecting the Midwest with the growing natural resource markets of the Pacific Northwest and with steamship routes to the Far East, Alaska and so forth. I’ve heard that there was a gold rush in Alaska around the same time as the GN arrived, so suddenly the Seattle area became a transshipment point of great interest. The bottom line is that when the GN route reached the ocean at Everett, the railroad had no choice but to build a wye there and head the trains either south to Seattle or north to Vancouver, BC (see map at left).

I live in Seattle, so I started using my brand-new Atlas/Kato BN RS-11 to make up and break down trains in a small yard on a loop of track that I called Seattle. The south-bound cars headed to Tacoma, Portland and beyond, but what about the north-bound cars? Were they going to Vancouver BC, or Chicago? Could they travel together, or should they be made up in two separate trains in Seattle? What happened to them at the wye in Everett? Was it interesting enough to make part of my growing layout? Why have your trains go in only two directions when you can have them go in six?

#### Fitting Everett to an HO layout

Curiosity can really get the best of you. Traffic moving in two directions is plenty, at least for the modeled portion of a typical layout. But for lots of switching fun, Everett and its multiple routes can’t be beat. This is especially true if you’re a guy with a very smooth-running switching loco looking for just enough action to be interesting.

The 1990s-era map of the general prototype layout of the BN trackage at Everett (below) reveals two wyes and multiple yards. This allows the main “Delta Yard” to serve as an in-




*This overview map of the track layout of the Everett area is drawn from a map published in the June 1994* Pacific Rail News *magazine (now defunct). Burr significantly condensed the plan down to a single wye and a four track yard (representing Bayside Yard) with spurs, while retaining many of the prototype’s operating functions and options.*

### "Compressive Selection" at Everett

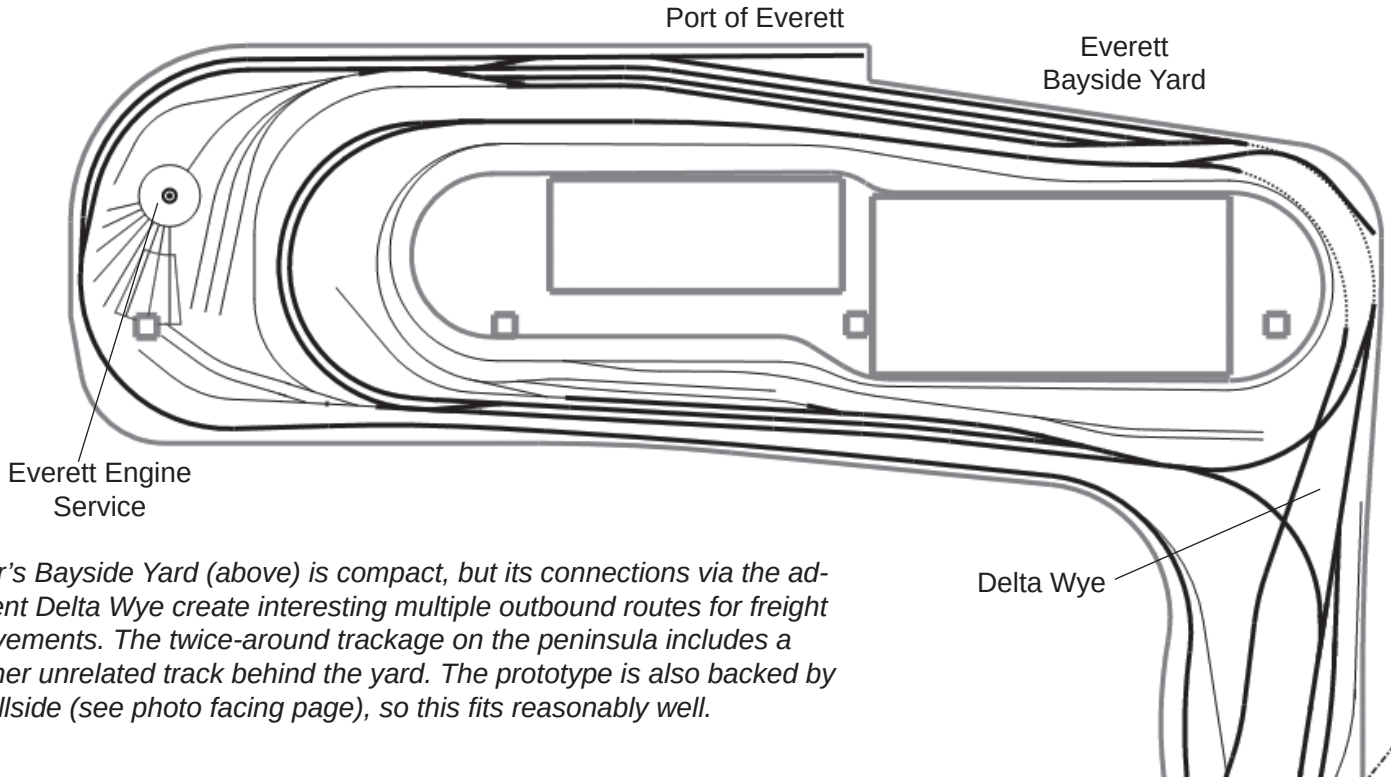
Most of us are familiar with the term "Selective Compression": reducing the size of a prototype element to better fit a model layout. Thus, an eight-track yard becomes five tracks or a structure with ten bays becomes only six bays wide when modeled.

For his model of Everett, Burr opted for what I call "Compressive Selection": he chose the more "model-able" segment of prototype to better fit his space. Rather than the massive Delta Yard, Burr focused on the more layout-sized Bayside Yard for his layout.

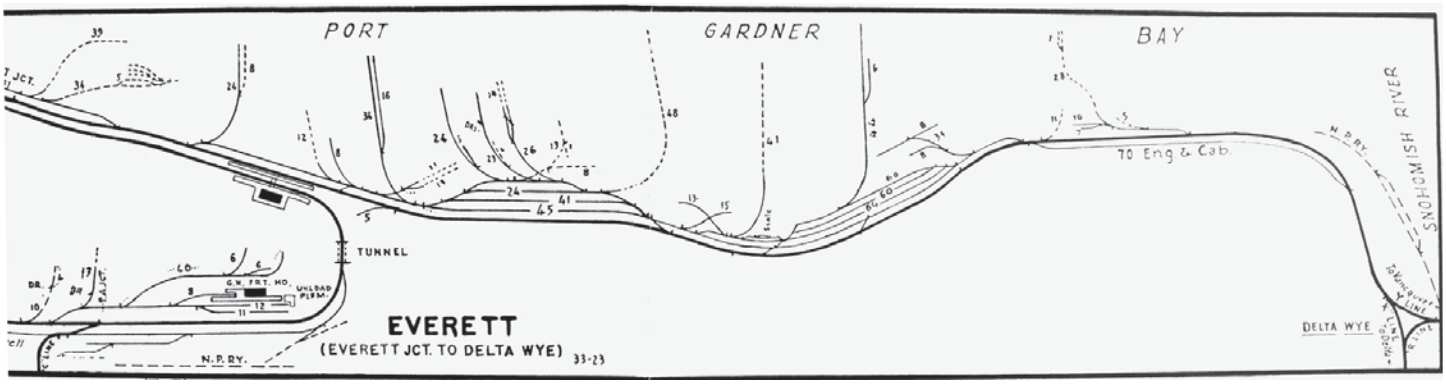
Layout Design Elements (LDEs) are a great way to design a layout. Choosing LDEs of a more modest scope can make the layout more practical while still retaining the flavor of the prototype. *– BH*

line yard for both east-bound and north-bound freights, and for passenger trains to bypass Delta Yard altogether. All of this could have been more faithfully replicated in N scale, but I was trying to shoehorn it into one side of a 20' long peninsula in HO scale, so I had to give some serious thought to what was vitally necessary to include.

I decided that my main needs were for a small freight yard to handle adding or removing local cars from both the eastern and northern mainlines. The best arrangement was to put the yard west and south of the wye. It turned out (as you can see from the GN-era track chart below) that the "Bayside Yard" fit the bill nicely and was a four- to five-track yard –




*Burr's Bayside Yard (above) is compact, but its connections via the adjacent Delta Wye create interesting multiple outbound routes for freight movements. The twice-around trackage on the peninsula includes a higher unrelated track behind the yard. The prototype is also backed by a hillside (see photo facing page), so this fits reasonably well.*




*Everett track chart from the GN Ry. archives shows the operating characteristics and capacities of the various tracks, especially in the Bayside Yard. Burr based his entire layout on track diagrams such as this, condensing wherever necessary. In this case, he narrowed his version of the Bayside Yard from the prototype five tracks down to four. (Published by the Great Northern Railway Historical Society, used with permission. **www.gnrhs.org**)*


# Lessons Learned: Building the Delaware & Susquehanna Railway

BY PHIL MONAT • PHOTOS BY THE AUTHOR

Five years ago, while preparing a clinic about the design and development of my 1,100-square-foot HO layout, the Delaware & Susquehanna, I was first surprised, then shocked to see how many alterations and serious track reconfigurations my proto-freelanced railroad had undergone in two decades. As I recalled the many fine layouts I've seen built in half—even one-third or one-quarter—that time, my shock changed shortly to shame: It had taken less time to build the prototype than I'd spent modeling it in my New York City home! Going over my design and construction drawings for that joint LDSIG/OPSIG clinic, I realized that the process revealed a continued refinement of goals and desires. Mine were naturally shifting, not only as I aged but especially as I learned more about model railroad design. That said, more than a few really dumb choices had been made early on. Avoiding those would have saved me quite a bit of time. When some modelers I respect suggested discussing that process in these pages, this questionable waste of a good tree began to take form.

### Some Basics

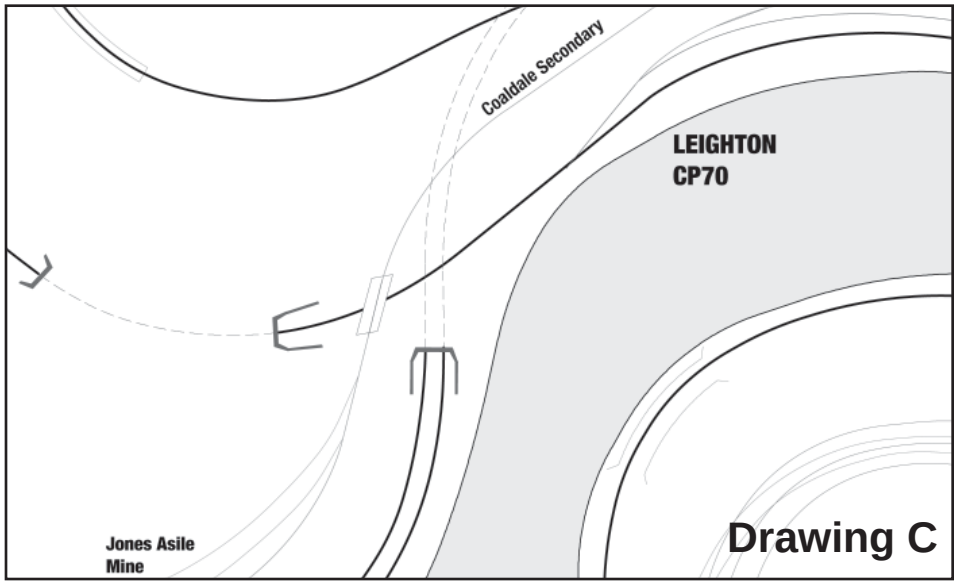
I am one of the few folks who live in New York City and have a basement. I had built a smaller layout in this space, but in 1987 I tore it all down and did that well-known and very essential environmental upgrade: new walls, ceiling, carpet and recessed lighting, among other things. As many have said, don't hesitate or scrimp on this, it will reap immeasurable dividends in the future. As I was drywalling away, I started development of the railroad's design. It was not based on any specific geographic area or railroad, only on a feeling of what I wanted.

### That Ol' Givens and Druthers Thing

What did I want? Well, I wanted a modern layout that represented what I saw at trackside today. I knew I needed to keep the railroad loosely in the Northeast, because I felt the track densities and sheer number of rail lines in this area better support the average model railroad, where we often try to jam as much track as possible into a scene. A cursory glance at a railroad map today will clearly show the maze that enveloped the northeastern portion of the United States. In illustration of this, the area I ultimately selected to geographically place my railroad had, in fact, two prototype mainlines (LV and C&NJ) running the length of a gorge, one on either side of the river.

I love too many different railroads to model just one specific prototype and I did not wish to be restrained by such a choice. In addition, I'm a fan of green trees and I wanted those lush mountainsides to be helpful in hiding track that is not prototypically plausible (it's a bit of a

FIGURE 8: A “triple 53” TOFC flat flows smoothly through the super-elevated 48” radius curves at Glyn Onoke. Large radius curves ensure reliable operations and enhance realism, especially important when operating long, modern 89-foot equipment.




DRAWINGS C (above), D (facing page): These drawings show the challenges in creating believable scenes across multiple levels.

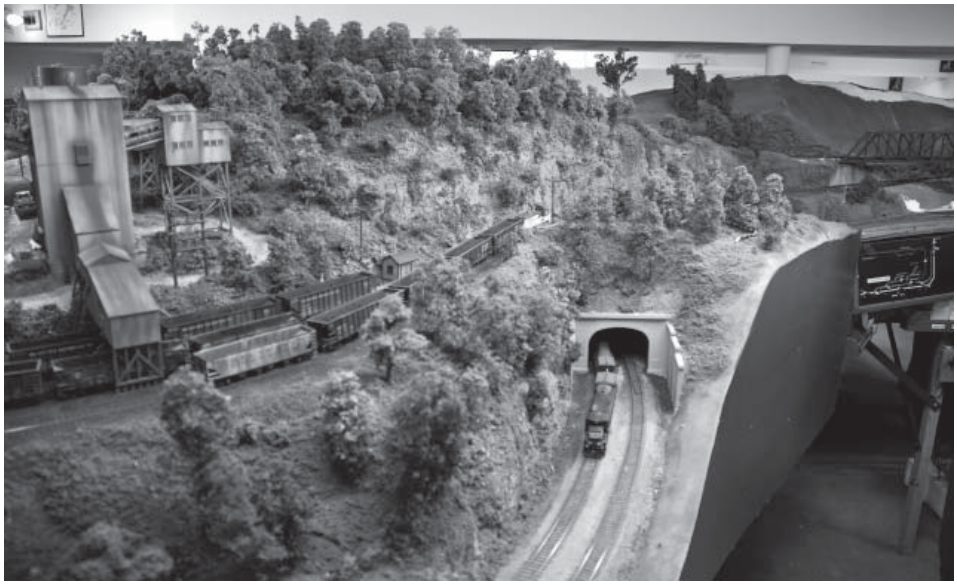


FIGURE 9: Creative “landform masking,” helps hide different tracks at varying elevations, taking advantage of natural sloping landscapes and copious amounts of deciduous trees (See drawing C above).

concept, it does provide me with a 500-foot mainline without going to multiple decks or using helixes.

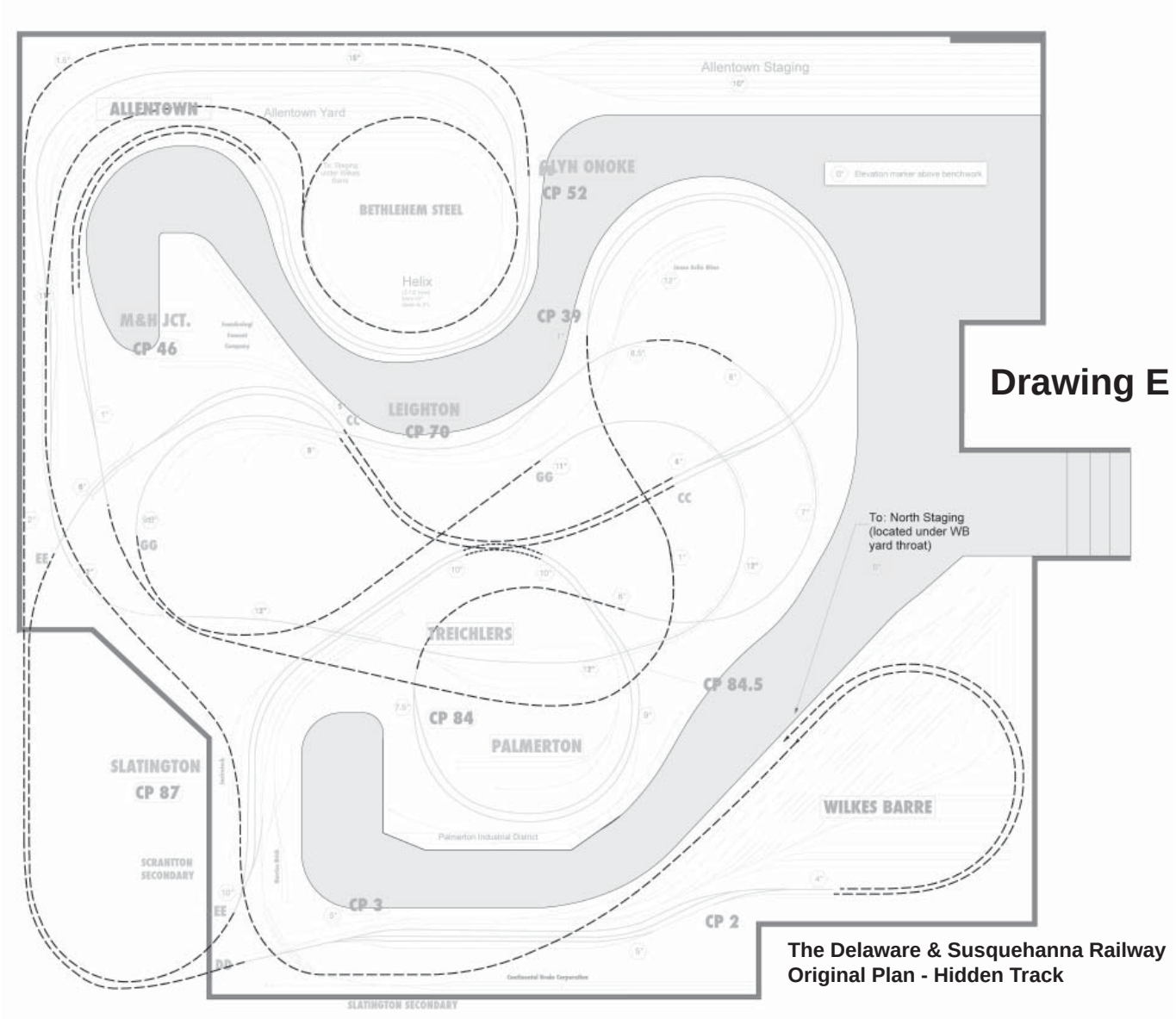
In my case, the large track radii required for modern equipment and long trains was also a key ingredient in this choice. The large open areas and especially the huge center peninsula of my design (*See drawings A and B*) accommodated 40- to 48-inch visible curves with superelevation and easements essential to the smooth operation of long trains of 89-foot cars, as well as supporting that critical concept of prototype-looking track (*See figure 8*). It also gave me my holy grail of a long mainline run, as well as my other desire: some deep scenes with a viewable depth of five to eight feet (enough to allow natural perspective to come into play).

This approach obviously solved my primary concern, mentioned above, about the difficulty of scenicking multiple decks. Instead of having to look at shelves with trains stacked on top of each other, however, I now was faced with looking at multiple tracks stacked on top of each other, within one deck! At many places on my layout, track alignments exist that would be prototypically implausible and in some cases downright toy-like. Tracks jammed too close to each other without sufficient vertical or horizontal separation, tunnel and bridge supports abutting each other, insufficient drainage and landform elevation angles on the terrain are the chief items that would cause a railroad civil engineer to faint.

The obvious solution is in the scenery and in the techniques of landform masking. By careful attention to landform shapes, tree lines and masking hillsides, in addition to following the prime rule of scenery—drainage, drainage, drainage!—I was able to hide most of the flaws and disguise most of these areas almost completely (*See figures 9 & 10, drawings C & D*). In drawing C,

FIGURE 12: Directional consistency is a wonderful thing but this type of multi-pass design makes that extremely difficult to achieve. Here, all three levels are visible at once, using scenery to blend them together. However, the train at the bottom is southbound, while the two above are both northbound.

FIGURE 13: Deep scenes with perspective were a design goal, but that often runs afoul of the “three foot reach” rule. Scenicked pop-up access hatches are an obvious solution for maintenance, but I made sure all operationally active areas are within aisle reach. An access hatch is raised at right, while fellow modeler Jack Funt works an industry in Treichlers.




**The Delaware & Susquehanna Railway**
**Original Plan - Hidden Track**

*Lightweight Benchwork Ideas*

# Benchwork from Gatorfoam™

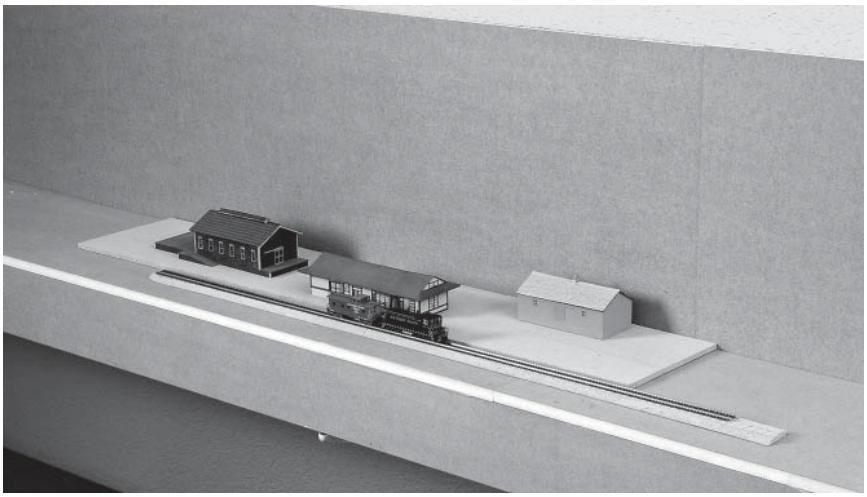
## *Flat-top and open-grid sections from lightweight material*

**by Greg Johnson, LDSIG Board Member**

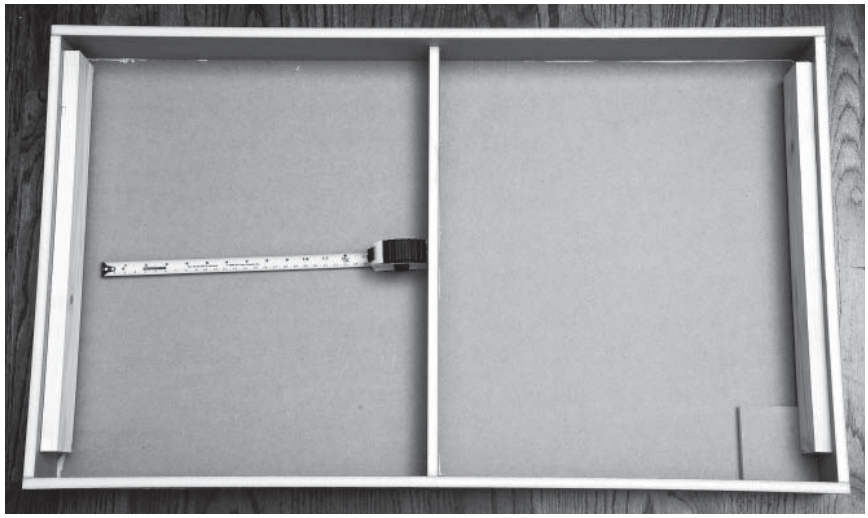
***"... most of the strength of heavy-duty benchwork [is] to support itself – not the trains ..."***

Why do we make our benchwork and sub-roadbed so heavy? Is it because we want to walk on top of it? Is it because we don't want it to sag? Perhaps it is because we want it to be perfectly flat. Unfortunately, most of the strength of heavy-duty benchwork ends up existing primarily to support *itself* -- and not the trains that run on it.

The traditional sandwich of ½" Homasote over ½" or ¾" plywood for HO or N scale sub-roadbed is really overkill unless you actually want to be able to climb on your layout. I've built large layouts with Homasote and there is that comfortable firmness of those light grey sheets of compressed newspaper (Homasote) over plywood. However on my previous Allegheny Terminal HO layout (*Great Model Railroads* 2010) I tried using Gatorfoam™ as a replacement for the plywood and most of the wood sub-structure under one of the towns.



*This is a view of a 12" x 72" section of a Gatorfoam "box" with the backdrop piece in place. It is resting on top of 12" shelf brackets.*



*The underside of this 21" x 36" box shows the pine fastener reinforcements at each end and a square gusset/corner brace in the lower right corner as well as the additional ½" x 2" Gatorfoam rib in the middle.*

### Experiments with Gatorfoam

I had already built several very large steel mill structures with 3/16" thick Gatorfoam and because of its great strength, light weight and rigidity, I tried it on a new townsite approximately 7' x 2'. Gatorfoam worked great and eliminated most of the downsides of the Homasote/Plywood method.

### Taking the plunge -- literally

Before I used the ½" Gatorfoam, I put it to the test by dunking it in our swimming pool for a few days and then checking its condition. The 12" square piece was unaffected by the water and still was perfectly flat. I was sold and built the new town base out of ½" Gatorfoam. Due to its rigidity, I just supported it randomly (16" to 24" spacing) on the ends of 1" x 4" boards used as joists.

On my new N scale layout, I decided to make all of the sub-roadbed and most of the benchwork out of ½" Gatorfoam, with the actual roadbed of .218" Homabed. So far it is working out great.

I know that in the real world, the ground is usually not perfectly flat. But I want to establish the grades and changes in elevations myself. I don't want a wavy piece of plywood or out-of-tolerance ½" sheet of Homasote creating the topography for me. The Gatorfoam is perfectly flat. So I am starting with a "zero elevation" that I can count on.

### Making the cut(s)

Although very lightweight, the best method for cutting Gatorfoam is with power tools. Virtually any type of electric saw can be used as

*Lightweight Benchwork Ideas*

# "Bridge-based" Plywood Benchwork

## *LDSIG collaboration leads to very lightweight sections*

**by Joe Brann**

*Layout Design Journal* #40 (Fall 2010) contained two very informative articles on benchwork by David R. Clemens. His first article described the many benefits of "doorminoes", a benchwork concept derived from David Barrow's "domino" benchwork scheme. David Clemens's doorminoes use readily available hollow core doors as the platform for a model train layout. In David's second benchwork article he discusses Frank Robertson's more traditional benchwork made from 1" x 3" framing lumber. One of the themes that ran through these two fine articles was lightweight benchwork.

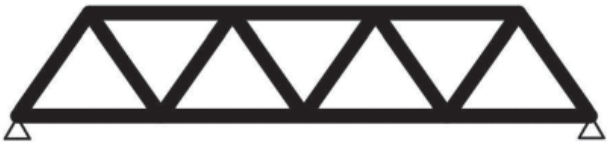
At the time when *LDJ*-40 arrived at my home I was in the process of constructing benchwork for Bruce Notman's new layout. Bruce, a well known stalwart at the LDSIG desk in the SIG room at many conventions in the past, and his wife moved from Minneapolis to the Orlando area in October 2009. They currently reside in an apartment in Winter Springs, Florida. Bruce and I, and well-known "Layout Doctor" Bruce Metcalf (former LDSIG Coordinator), also a resident of the Orlando area, formed a design and construction team to address the development of the Notman layout.

One of Bruce Notman's principle "druthers" was lightweight benchwork, as he wants to leave no lasting trace of the layout in his apartment, even to the impression of layout legs on the flooring. The base of the J-shaped layout is approximately 12.25' long, the west leg is approximately 7.3', and the east leg is 5.2'. The N-scale layout is 12 inches wide in most areas, with an 8.5 inch wide removable extension segment on the east leg of the J.

### Getting started -- building a bridge

It was decided to build the benchwork in five sections of 2" wide strips of 5.2 mm thick (~.20") Luan plywood. I had a familiarity with using Luan plywood as a benchwork construction material and was comfortable with that decision particularly given Bruce Notman's "druther" of lightweight benchwork.

My experience with using Luan plywood for a model train layout benchwork came several years ago when I built the large, irregularly shaped peninsula on my Susquehanna Valley Line HO-scale model railroad. Bruce Metcalf convinced me to use Luan plywood as the framing material for that peninsula. Since I was not concerned about the weight of my benchwork on that project, I used 4" wide strips of the Luan plywood versus the lighter 2" wide strips proposed for Bruce Notman's layout.



*Warren truss architecture is a series of repeated triangular sections. When used in a bridge some of the diagonal elements are in compression and others are in tension.*

It was further decided that the basic design for Bruce Notman's benchwork would consist of an outer frame with internal diagonal elements. For any benchwork section, or subsection, that is rectangular in shape with diagonal bracing the framing is similar to a Warren truss as depicted above right.

In a Warren truss some of diagonal elements are in compression and others are in tension as a load is applied to the bridge floor. In our application of the Warren truss architecture to Bruce's benchwork we utilized that concept except in the horizontal plane in order to prevent inward collapse of the outer truss members.

### Applying the theory

Luan plywood, especially in narrow 2" wide strips, is rather flexible. The use of diagonal elements versus simple perpendicular cross members is the means by which structural stability and strength was achieved. An important factor in achieving good structural stability and strength is that the angle between the internal diagonal elements and the horizontal truss member is in the range of 45 – 60 degrees per NMRA Data Sheet D6c.6 "Steel Bridges: Trusses, General". Larger angles are

***"... diagonal elements versus simple perpendicular cross members ..."***

*Lightweight Benchwork Ideas*

# "Low Impact" Gatorfoam™ Sections

## *Lightweight benchwork and "Instant Studs"*

**by Ted DiIorio**

Moving and tearing out a layout can be a traumatizing experience. 4 years ago I had to face doing just that when I had to move and tear down my Lehigh and Hudson River N-scale layout that I had been working on for 7 years. At the time this was happening I was not sure when the next move would come and this got me thinking about building the next layout in sections. Building in sections would make it theoretically possible to move the layout, if I had to move again.

### Next step, plywood sections?

When I started planning my new layout after settling into my new home I was looking into using furniture grade plywood to build my sectional layout. My friends Dave Ramos and Craig Bisgeier both have used plywood ripped down to dimensional sized boards (mostly 1X3) with much success. Plywood used this way is cheaper and more stable than using dimensional lumber. You get quite a few 1X3s out of one 4X8 sheet of material. I'll go into this further later in the article.

Now, a lot of things in my life changed at this time, so I was looking into doing something different on the new layout also. I changed scales from N-Scale to HOn3 and finally to modeling the Maryland & Pennsylvania RR on two 2 decks in HO scale, and will be utilizing all the Gatorfoam bench work already built for earlier layout concepts.

### Light weight and low impact – Gatorfoam

Along with wanting to make the layout sectional in case of a move again, I also wanted it lighter in weight so it would be easier to move. Also, as many of my friends who have helped me in the past would tell you, I have a real phobia about drilling and fastening objects into finished walls of my basement. I wanted to have a way to support the light weight bench work without fastening it to the walls.

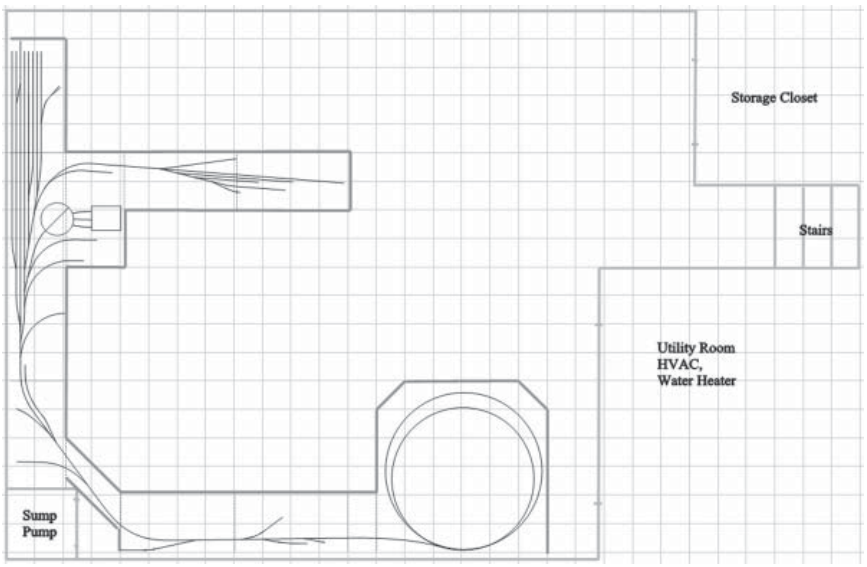
Around the time I was thinking about all this, Sam Swanson came out with an article in *The Light Iron Digest* (#54, 2008) on his super-lightweight bench work that he used to build his HOn30 modules.

He used Gatorfoam, which is a foam product that comes in 4X8 sheets, like plywood, and is laminated on both sides with a very thin wood veneer. This gives the Gatorfoam a lot of strength.

### A "ripping" good time

My friend Ted Pamperin uses Gatorfoam for all his sub-roadbed and I was able to play with a piece of it at his place and thought that it should work in sectional bench work built similar to how Sam built his modules. Ted had leftover Gatorfoam and he graciously let me have to use and experiment with.

We cut the Gatorfoam into 2'X4' pieces so I could fit them into my car. I marked these into nominal 3" wide strips (right) and ripped the sheets down into the




*(Top right) Cutting guide for 2X4 foot sections built from nominal 1X3" framework cut from 4X8 foot sheets (Gatorfoam or plywood). This does not include the section "tops" of additional Gatorfoam or extruded (pink or blue) foam.*

*(Above) This benchwork for this early version of the lower deck of the author's planned Ma & Pa layout could be built from less than two sheets of Gatorfoam ripped into nominal 1X3s plus extruded foam subroadbed. We hope to feature more on the final design in a future issue of the* LDJ.

# Planning for Signals, Part 2

## *Design considerations for model signals*

### by Seth Neumann, President, LDSIG

I introduced a number of prototype signaling schemes in Part 1 of this series in *LDJ*-41, Winter 2011. Now it's time to turn to implementation on the layout itself.

As with most things in model railroad design, the first question is determining what you would like to accomplish: in this case, what signals you want to model and how they will work. Will these signals be required to operate as on the prototype, or are they simply there to complete the scene? Or are signals needed for a purely model railroading purpose, such as marking the boundaries of DC blocks or indicating the alignment of switches entering staging?

### Functional versus cosmetic

One of the challenges on our layouts is that the distance is so short between locations such as sidings, junctions, interlockings and other real-life elements which require signaling. So for a truly operational scheme, there may not be enough running room between these signal locations for protection signaling such as Automatic Block System / Absolute Permissive Block (ABS/APB) or control systems based on signaling such as Centralized Traffic Control (CTC). (See *LDJ*-41 for descriptions of these systems).

But those aren't the only reasons for signals, as I discussed in Part 1. Signals set the location and era of your railroad. Some signals are needed because they're in the classic photo of the location even though placement on the model is not particularly functional. As an example, a friend's railroad features Dunsmuir, California where there is a prominent cantilever signal in the middle of the yard. This signal appears in many prototype photos from the transition era, so it's an important visual element on the layout.

However in the layout as built, the signal protects a switch which is very rarely used during an op session – so this signal can be seen as more cosmetic than functional. In a case like this, you may not need to make the signal functional or even lighted[1]. In other cases, signals may simply be used to indicate the status of a switch (photo below) as a very simple quasi-interlocking rather than implementing a more complete signal system.

Signals may also be used as visual indications of block limits to operators (for example, on DC-based layouts), even though the signals have no protective or control function in operation.

***"... what signals you want to model and how they will work."***

### Interlocking plant

An "interlocking plant" or tower can be very simple but provide both the prototypical and model rationale for signals. Interlocking signals are absolute signals (that is, they may not be passed if displaying a STOP indication) so the rules for operating are simple. [See Part 1 in *LDJ*-41 for the definitions of Aspect, Name, and Indication as related to signaling. – *BH*]

Bill Darnaby has written (*Model Railroad Planning* 2010) about installing interlocking towers on his Maumee route. This is a typical

*Eventually Rick Fortin's HO ATSF Coast Lines, Valley Division, 4th District layout will be controlled by CTC. But for now, these signals indicate the position of the switch points where double-track becomes single-track at West Los Molinos. Because the town is long, this helps an approaching engineer know that the switch points are lined properly at the far end. Byron Henderson photo.*

*[1]For this article, I'm using "lighted" to indicate a signal that is made functional in some way electrically. But this could include semaphores and ball signals, which may be electrically moved by servos or switch motors, but aren't necessarily "lighted", per se.*

# Signal Repeaters

## *Solutions for visibility and vision issues*

### by Seth Neumann, President, LDSIG

In many cases, it will be possible to mount your signals on the layout so that they may be easily viewed by operators in the aisle and also are "aimed" appropriately for the scale crews imagined to be in the locomotive. Occasionally the slight "cheat" of angling the signal toward the aisle can help without compromising appearance on the layout.

But there may often be situations where the scale signal simply cannot be seen by operators in the aisle. In this case, signal repeaters may be used to provide a visible signal aspect to the crew. (This may also be helpful in N and Z scales, where near-to-scale signal aspects are very small).

#### Signal repeater solution

So what are signal repeaters and why would you want them? They are extra signals that are mounted above the backdrop (or in the fascia) such that they may be seen even if: the primary signal is on hidden track, the primary signal points in a direction that can not easily be seen by the operator, or another operator is standing in your line of sight to the layout.

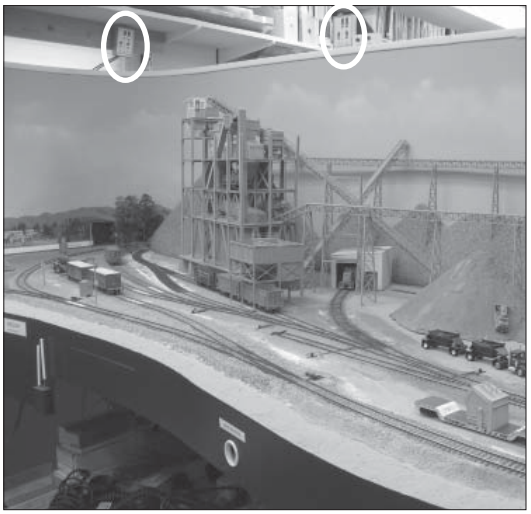
Repeaters may mimic the look of the signal type in use on the layout, or may be of a different type for easier viewing and interpretation.

#### Repeaters on Niles Canyon

My prototype, the UP's Oakland Sub from Niles Jct. to Radum and the Milpitas Sub, was fully signaled in my 1999 modeled era. I've been working on implementing signals and a modern form of Centralized Traffic Control (called Digicon) with fellow modeler (and *LDJ* volunteer) Steve Williams taking the lead in implementing a JMRI application called CATS (Computer Automated Traffic System).

By early summer, Steve had CATS working fairly well and we decided it was time to start experimenting with signals. Unfortunately, no one is currently manufacturing an accurate model of the Union Switch and Signal (US&S) type H2 searchlight signals with the correct ladders and bases, although BLMA has indicated they will be available in 2011.

I didn't want to go to the expense of quality layout signals if they were not accurate and I didn't want to wait to start using signals in my operating sessions, either. So we decided we'd need signal repeaters above the layout in any case and we could implement the signal system with the repeaters initially – and then later install the layout signals when BLMA released them.



*Signal repeaters on the author's layout (white ovals) are above the backdrop and easily visible to operators in the aisle. All photos by the author.*

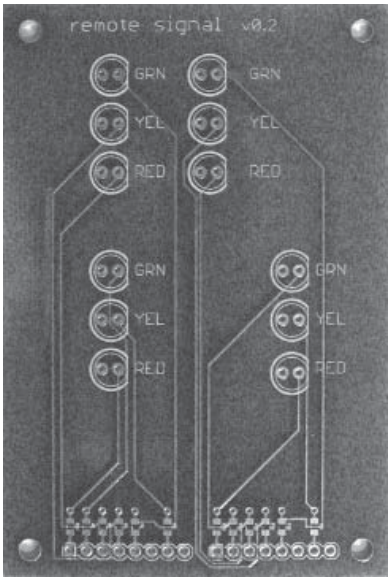
We planned color light signals for the repeaters (stop light style signals, or "Type D") so color-weak operators (page 42) can follow them (unlike the actual prototype H2 "searchlight" style). The signals do not look like the prototype; they are schematics on faceplates with LEDs mounted in styrene boxes (photo page 42).

#### A little help from my friends

I mentioned my repeater project to LDSIG-member Dave Falkenburg and he offered to design a small circuit board for me that would provide a mounting for the LEDs and resistors for the "Control Point Triad" of three signals seen at each end of every CTC controlled siding: a high double signal, a high single signal and a low single signal. (Photo at right)

The board would be reversible so that by flipping it over and mounting the components from the back it would handle either end of a siding. After a quick round of reviews, Dave had my circuit off to a quick-turn fabrication house. In another two weeks I had my boards for about $20 each, comparable in cost with building them from perf board and much easier to build.

I fabricated the boxes out of .040" Evergreen styrene, but I was having trou




*The front side of an unstuffed circuit board shows locations for mounting the LEDs. These will show through the cover of the assembled repeater box.*