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CHAPTER FOUR

Climbing between decks

The author's layout is a continuous spiral ascending to the west (left) except in towns, which were kept level to ease car-spotting chores while looking like their flatland prototypes. The grades between towns are generally less than one percent except here on notorious – on the model as on the prototype – Cayuga Hill, which still causes westbound High Speed Service freights to slow dramatically, and occasionally to "double the hill" across the Indiana-Illinois state line.

One size definitely does not fit all when it comes to adding one or more extra "stories" to a model railroad. My own railroad has two main decks, but there are three decks where the east- and west-end hidden staging yards reside below or above the two scenicked decks. The railroad is essentially a continuous corkscrew that slowly gains elevation as it progresses from east to west – except for yards and towns, where the railroad is dead level, **1**. But there are other ways to get between decks, and you can even build completely separate decks with or without a "virtual" connection if that best meets your needs.

Types of multi-deck layouts

There are two basic approaches to multi-deck layout design: the continuous spiral, which climbs steadily as it circles the room (this includes the so-called mushroom design), and the level-deck approach where the two decks are either connected by a helix or train elevator, or not connected at all. Let's examine each type.

The continuous climb

My layout (page 26) and Bill Darnaby's Maumee Route (photo 1 in chapter 1) are both examples of railroads that climb continuously in one direction. Mine climbs westbound, thus favoring superior eastbound trains; the Maumee climbs eastbound. With modest grades, neither climb-direction approach is problematic. Railroads with heavy tonnage predominantly in one direction, such as from coal mines to tidewater, should be designed to move tonnage downgrade.

My railroad is not built on a continuous grade; I kept the towns level to avoid having cars roll away when spotted at industries or on storage sidings, an important consideration with today's best free-rolling trucks. Bill's Maumee features some minor undulations to reflect the gently rolling terrain typical of northern Ohio.

My HO edition of the Nickel Plate's St. Louis line was designed to accommodate single steam locomotives on westbound (upgrade) trains. I hoped that by keeping most grades to 1 percent or less, a single Mikado or Berkshire would handle trains of 20 to 30 cars, a figure that turned out to be somewhat optimistic on two counts: achievable gradient and locomotive performance.

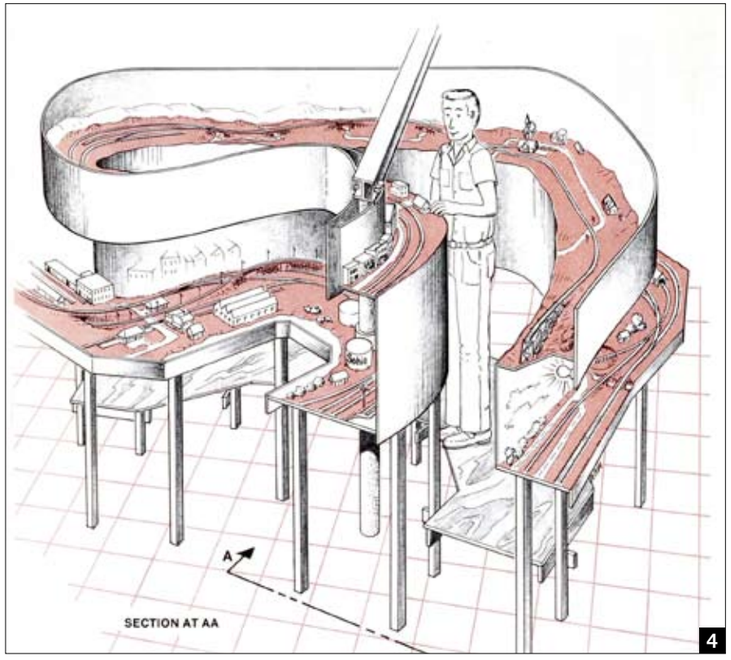
I'm now in the process of equipping the freight-car fleet with better trucks and wheelsets; Bill recommends InterMountain metal wheels in Accurail truck sideframes. Meanwhile, increased use of up to three first-generation diesels (Electro-Motive Division GP7s and Alco RS-3s) on freight trains or shorter trains behind steam has the situation under control on my layout.

▲ The summit of the westbound climb out of the Wabash Valley on the author's layout was originally planned for the corner in the left rear of this photo. He had to ease the grade by extending it another 30 feet so that steam engines could handle at least 20-car freights up Cayuga Hill.

Clearance between the lower and middle deck at Frankfort is a bare minimum – a 10" opening between the valance and fascia in what will be downtown Frankfort, Ind. It's tight but workable.

But let's consider the math: The grade between decks is directly related to the length of the mainline run per lap around the train room. I have roughly 250 feet of run per deck, and that means I could climb 1 percent times 250 feet (3,000 inches), or 30" by the time the main line reached the second deck.

But I can't employ all 250 feet of main line to climb between decks, as each town is level. Assuming a passing track of about 18 feet to accommodate 30-car trains plus caboose and locomotive(s) in three towns on the lower deck, that's 3 x 18 = 54 feet (648 inches) less mainline run than we assumed, so about 2,350 inches remain.



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This sketch from John Armstrong's "Meet the mushroom" article in the October 1987 issue of *Model Railroader* shows how upper scenes overlap lower ones as the main line climbs. Note that the floors climb too.

And subtract the long classification yard at Frankfort, a loss of another 125 feet. So I actually had about 850 inches of mainline run in which to climb. At 1 percent, I could gain .01 x 850" = 8.5" between decks. Oops!

Fortunately, the NKP had a notorious grade west of Cayuga, Ind., so I could bump up the gradient to match the prototype's 1.29 percent there. The goal was to allow most 25-car trains to climb that hill without undue strain, but longer trains or poor train-handling skills would cause the train to stall, necessitating "doubling the hill" – cutting the train in half and taking it to the summit at Humrick, Ill., in two pieces.

I quickly discovered that neither I nor the NKP got to "vote" on the actual grade. It had to be determined by running test trains up the hill to see what was actually feasible. As a result, the summit was moved about 30 feet farther west to ease the grade, **2**. This actually aided clearance below the top-deck, west-end staging yard, but it hurt clearance above downtown Frankfort, **3**, as the middle-deck main didn't climb as rapidly.

Other mainline runs between towns had to have the grade steepened slightly to achieve a more desirable deck separation. My goal was about 15" to 16" from railhead to railhead, and I achieved that in most areas. But I continue to seek ways to improve the performance of the steam fleet with minimum car weights and better wheelsets.

Growing mushrooms

The so-called mushroom design is complex enough to warrant an entire book, let alone a chapter, but I'm going to skirt over it in one relatively short section. Instead of spending a great deal of time discussing what a mushroom is and how to build one here, I'll refer you to two of the leading experts on the subject, the late John Armstrong, **4**, and Joe Fugate. Joe sells a set of four DVDs (model-trains-video.com) that documents how he built his spectacular mushroom-style HO layout, which accurately depicts Southern Pacific's Siskiyou Lines set in the 1980s. His layout was featured in the January and February 1997 issues of *Model Railroader*. If you're even remotely considering the design and construction of a mushroom-style layout, reviewing Joe's helpful DVDs and Web site should be considered required homework.

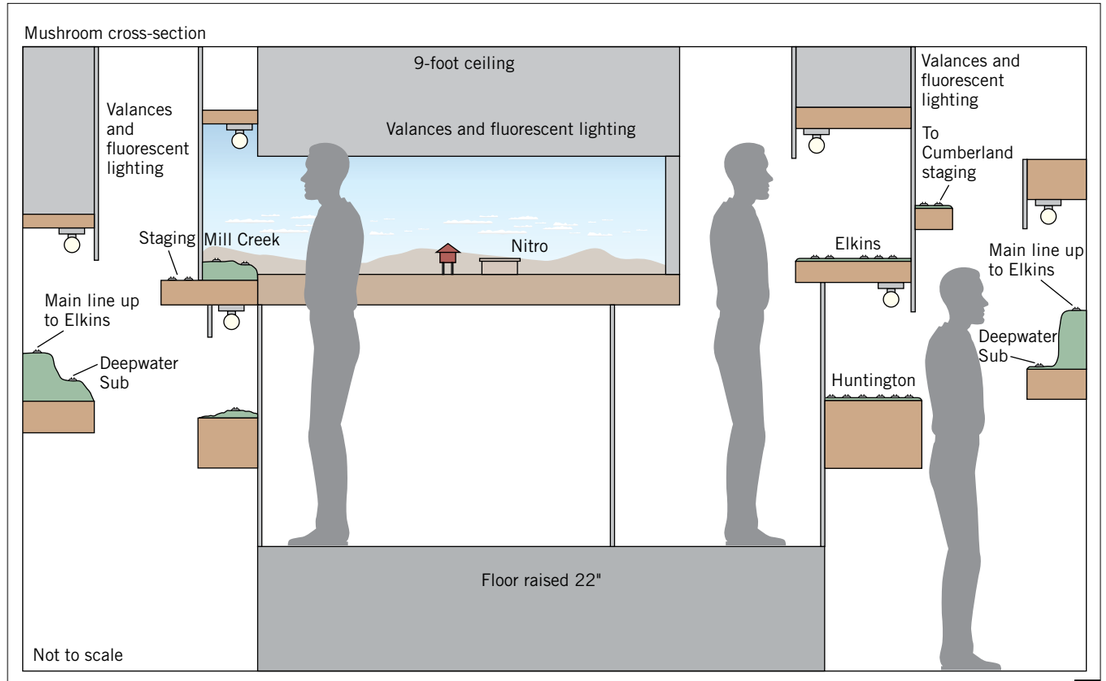
The late Jerry Bellina was another practitioner of the mushroom method of layout design. The cross-section drawing of his layout in **5** and **6** should give you some sense of what his mushroom layout looked like. Henry Freeman described Jerry's innovative railroad in *Model Railroad Planning* 2003.

This approach holds great promise for the modeler who has high train-room ceilings. The need for extra ceiling height becomes apparent when you consider the primary objective, which is to retain the same floor-to-track elevation. As the railroad climbs enough for the second deck to fit above the lower deck, the floor also must rise about 12" to 18". Your train-room ceiling must therefore be high enough to accommodate that much floor rise.

Other prerequisites for those contemplating the construction of a mushroom layout are the ability to understand three-dimensional concepts presented in two-dimensional drawings and the knack of building a floor system that becomes higher in tune with the ever-climbing main line.

The basic idea is that one never sees the other deck along the spine of the railroad, as the railroad is viewed from only one side. This doesn't work for a perimeter wall, of course, so the goal is to build one or more peninsulas, a task made easier by the fact that each peninsula is only half as wide as a conventional peninsula owing to the overlapping upper- and lower-deck scenes.

Moreover, unlike with conventional multi-deck layouts, the modeler doesn't have to stoop to see lower deck scenes or stand on tip-toes to see upper ones, as the floor gets higher at the same rate that the railroad ascends.



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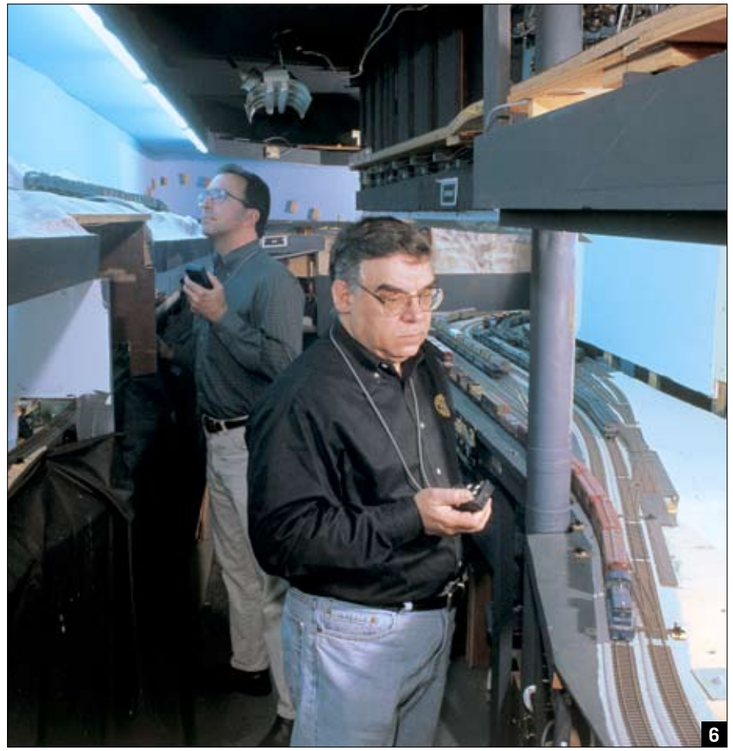
▲ This cross-section drawing shows how the central area of Jerry Bellina's mushroom layout had a raised floor to accommodate upper-deck scenes. Lower-deck scenes were viewed from the main floor, and exterior-wall segments were of standard multi-deck design.

► Henry Freeman (foreground) runs a train through Huntington, W.Va. Elkins Yard is directly above this scene but accessible from a raised floor on the other side. Scott Dunlap's train is climbing to the upper deck.

Ceiling height

The ever-increasing floor height of a mushroom plan means that a high ceiling is required. Assuming you start out with a yard at, say, 40" above the floor and the second deck is 16" higher, that means the floor for the second deck is also about 16" above the base floor to retain the same 40" viewing height. Add around 7 feet (84") to that for adequate headroom and you have a floor to ceiling height of about 100", more than eight feet. And the railroad will probably still be climbing as it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Paul Dolkos

CHAPTER FIVE

Height compromises

The Nickel Plate located its east- and westbound yards on either side of the main line at Frankfort, which translates to a long reach-in for the westbound yardmaster on the author's HO layout. A step along the skirting makes the reach easier to handle.

There's no way that a roomful of modelers of different stature are ever going to agree on the "best" elevation for a model railroad. What is eye level for a six-footer is going to be rather high for a five-footer. Even if we were all the same height, there still wouldn't be an optimum height, as what works well for realistic viewing is probably too high for easy construction, maintenance, and operation. Try reaching across a dozen yard tracks to uncouple a car when the yard is six, five, or even less than four feet above the floor, **1**. And, even if we find some way around that impasse, the instant we decide to add a second deck means that one of the two decks, and probably both of them, are not going to be at what we'd consider an ideal height.

Testing, testing …

The only way to become comfortable with layout height decisions in advance of layout construction is to build some full-size mock-ups of various benchwork height and depth combinations. Just as it's critical to test-run locomotives with typical trains both up and down the grades you plan to use (will the engines you want to use pull a desired train up the desired grade, or come back down without surging or sliding?), it's equally important to see for yourself what a given layout height looks like, **2**.

In *Model Railroad Planning* 2006, Steve King recommended using a typical bookcase that employs removable pegs to change shelf height to test various benchwork elevations, **3**. The string shows how the track elevation increases and then decreases before climbing again at various stations along the main line as well as on branch lines.

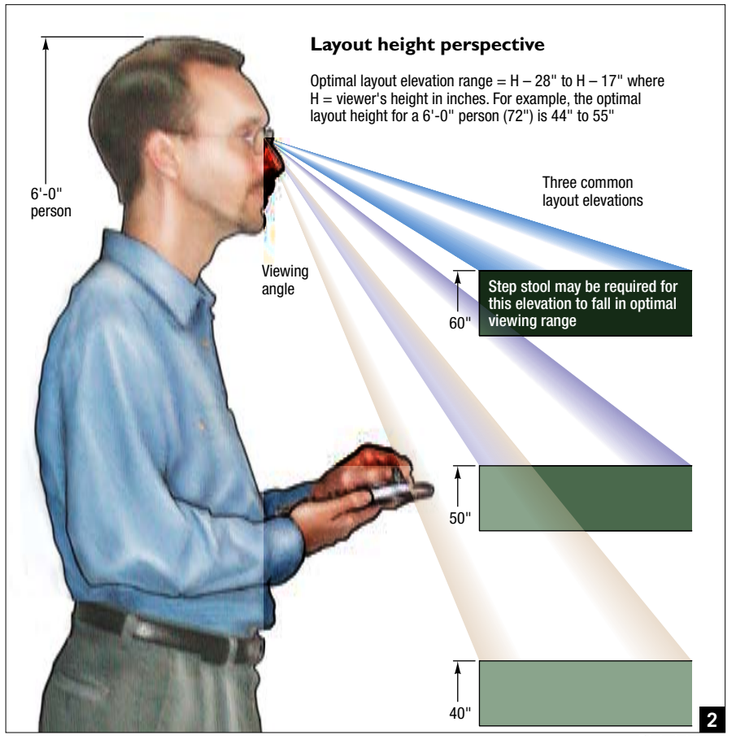
Steve placed rolling stock and structure models on each shelf so he could better visualize how the railroad would look at each major elevation. He could also try reaching and seeing over foreground models to uncouple cars on a track toward the rear of each scene.

Most bookcase shelves are around a foot deep, which is acceptable for many N scale scenes and some larger-scale scenes. My NKP layout uses 16"-wide benchwork and subroadbed, **4**, except in classification yards and in towns where an aisle-side, L-shaped depot or industry requires a wider footprint. In the latter towns, I typically added an 8"-wide (24" total width) "bump out," **5**, to accommodate the structure.

Busy Frankfort yard, with its separate, side-by-side east- and westbound yards, ranges from 38" to 47" wide, **6**, the latter requiring a raised step along the skirting, **1**, so the westbound yardmaster can more easily reach in to uncouple cars. Charleston yard is only 24" wide, but its 68½" height required a raised floor and step, **7**.

What others have done

Ken McCorry has one of the largest home layouts ever built, **8**. His lowest



Rick Johnson

▲ Three common layout elevations from 40 to 60 inches show that a step stool may be required even for a six-footer to view and operate a layout within an optimal height range. The drawing also hints at lower-deck viewing limitations caused by upper decks.

▶ Steve King used a bookcase, tape, and string to visualize the rise and fall of his N scale Virginia Midland layout. By moving shelves to proposed deck heights, he could determine in advance whether this would create viewing or operating restrictions.

Steve King

main deck is 36" above the floor, and the upper main deck is at 54", a spacing of 18". However, he has staging yards and secondary lines that are only 26", and Keating Summit towers above the floor at 75".

When Ken recently reflected on his layout's design, he commented that he "would probably increase the spread between the main decks by 4" to make access easier. As the depth of a scene increases, the height between them should also increase to allow room for your body to fit between levels."

1

Bill Schneider

CHAPTER SIX

Layout lighting

The realism and enjoyment of a scene depends on how well it is lighted. Poor (dim, reddish, uneven) lighting makes it hard to see or operate a model railroad. Bill Schneider has ensured that this town scene on his New York, Ontario & Western HO layout is evenly and brightly illuminated from end to end with a twin-tube fluorescent fixture attached to the upper deck. He painted the underside of the top-deck structure sky blue to reflect light.

Lighting is perhaps the most important – yet poorly designed – support system on any model railroad, and that goes double for multi-deck layouts. If the layout is not designed from the outset to accommodate excellent lighting on the lower deck, fully half of the mainline runs of one's trains will be relegated to the shadows. Manually uncoupling cars will be difficult in the gloom. Those who think a string of white Christmas tree bulbs or lengths of rope light are adequate are deluding themselves. The resulting illumination is reddish, dim, and uneven. Those of us who are, or one day hope to be, 60 years of age and counting will have lost a significant percentage of our dim-light vision by then, and we'll need a lot of candlepower to compensate.

Safety first!

Please, if you're not well versed in wiring 120-volt AC circuits, hire an electrician to install your lighting and other AC power circuits. Like hiring a plumber to move a water heater that stands in the way of your proposed main line, hiring a professional electrician is money well spent. He or she can help ensure that you will meet all applicable local electrical code requirements, and the electrician may actually find ways to save you money while improving your lighting plan.

Types of lighting

In *Planning Scenery for Your Model Railroad* (Kalmbach Books), I noted that lighting deserves a chapter of its own, so here goes. As I noted there, it's a story that's still being written and is likely to change dramatically in the next few years. We are already seeing efforts to phase out the inefficient incandescent bulb that has been a mainstay of home lighting since Thomas Edison's day. Compact fluorescent bulbs are cited as the wave of the future, but they contain mercury and hence create disposal concerns.

What's next? Light-emitting diodes (LEDs), which will play a major role in home and layout lighting, are already coming onto the market, but at relatively high prices. We're already seeing them used extensively for vehicle lighting and even for railroad block signals and crossing flashers. Increasing use of LEDs in home-lighting applications will cause prices to drop, and they will offer energy-bill savings, less heat generation, and longer life (see www.ledlight.com).

For the short term, however, fluorescents, **1** and **2**, clearly offer numerous advantages – a linear light source along a linear right-of-way, more light per watt and hence less heat in the railroad room, longer life than incandescents, and choice of "flavors" (colors) of light, to name a few.

In fact, lighting designer Gerry Cornwell of Gerry Cornwell Lighting has given an eye-opening clinic in which he begins with a terse statement that fluorescents are the preferred method of layout lighting. He then convincingly demonstrates why that statement is true for most layouts (there is no universal solvent, of course)

Ceiling and under-cabinet fluorescent fixtures ensure that Jack Burgess' Yosemite Valley RR is not only brightly and evenly lighted but also that the entire room is illuminated with the same "color" of light. This makes it easier to get good color photos and avoid pockets of off-color lighting. The workbench and spray-painting areas also must have the same type of lighting.

Jack Burgess

2