

UNION PACIFIC

Beating the problem of too little space with a multiple-tiered layout

The economic pressures that have caused the railroad industry to change have also affected model railroaders. Emulating today's prototypes, which have become bigger and longer, has become even more challenging because the high cost of housing has made obtaining ample layout space increasingly difficult. Thus, layout builders are opting for alternatives less grand than modeling the modern Union Pacific.

Yet, that need not be. You can usually find enough space to accommodate the modeling of a modern railroad. There are two keys. The first is recognizing the difference between area and space. Area (i.e., 4' x 8') is the way we have thought about our model railroads since the inception of the hobby. Space, however, is what we actually use. In reality no model railroad can exist without extending into the third dimension. Model railroads have only recently begun to exploit all available layout space — roughly corresponding with the changes in prototype equipment and operation. John Al-

len's floor-to-ceiling scenery on his Gorre & Daphetid was one early example in the modeling field; John Armstrong's multilevel layout plans were another.

The second key is to analyze objectively some of our social conventions about housing. The space in most of our homes has been partitioned into single-purpose rooms. How much of the space in these rooms is used? Not as much as you might think. If you look at any room, you'll see that about 20 percent of it is always unused: the space in the 16" between the ceiling (normally 96" high) and the tops of doors and windows (80" high).

Above-the-doorway layouts have been built, but they're not common. Plans for a few appeared in *MODEL RAILROADER* Magazine back in the late 1940s and early 1950s, when homes were smaller and space restrictions precluded single-purpose layout rooms. The Union Pacific (UP) track design blends this old idea with modern concepts of space utilization and accessibility to create a sizable

layout in a modest-sized multipurpose room.

FROM THE TOP DOWN

The top level of the UP is a walk-under layout that can be fitted into the above-the-doorway space of an 8' x 9' room. The track arrangement is basically a twice-around continuous oval. A wye connection to a descending helix allows operation of the top level as a reversing loop.

A high-level layout introduces considerations not encountered in conventional model railroading. The "up" location for all top-level trackwork means that it will be viewed at both an angle and at a distance that precludes close inspection. With no need for detailed appearance, common sectional and flex track components can be used, which, of course, provide construction and maintenance advantages. In fact, this is an instance where turnouts with integral top-mounted switch machines would be more desirable than other types.

The viewing angle also means that the undersides of cars and locomotives will be more noticeable. Painting such elements as bright metal axles, bottom surfaces, and even the near sides of the rails will help prevent jarring false notes in the overall appearance of the railroad.

The station area trackwork cutting diagonally across the room is supported by the helix, while the track along the wall is supported by brackets. Many commercial shelf-bracket systems are available for mounting these sections. Spacing and mounting details depend on the particular system used, but two general principles apply. First, the brackets should be fastened to the house framing studs, not just to the wallboard. Second, the roadbed and scenery should be kept as light as possible.

The top-level trackwork can be simplified a bit. Assuming the layout will be extended downward, turnouts A and B can be eliminated at the cost of removing continuous run capability. Turnouts C and D form a lap-siding connection that increases the flexibility and capacity of the station passing tracks. Removing these turnouts converts the station trackage into a conventional passing siding.



John C. Illman photo

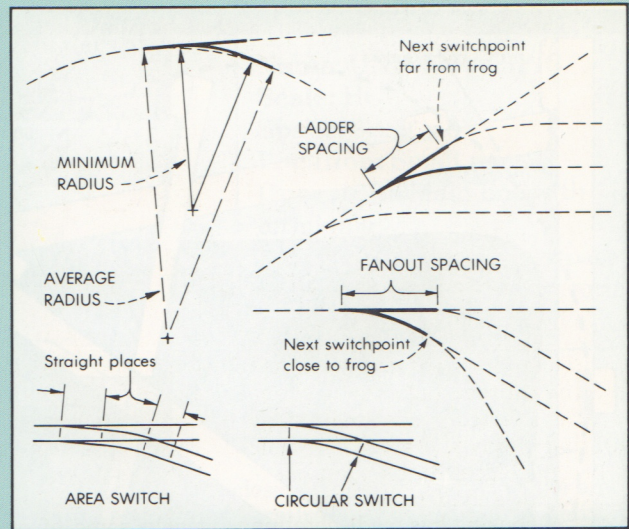
Two Union Pacific SD60s and a C30-7 crest the summit of the Blue Mountains in Oregon. Such a setting, with rises in elevation, is perfect for a multiple-tiered layout.

TURNOUT DATA

Linn Westcott, late editor of *MODEL RAILROADER*, developed the following data by converting prototype turnout dimensions from the American Railroad Engineering Association (AREA) to HO (1/87) scale:

Switch number	Frog angle	Average radius	Minimum radius	Ladder spacing	Fanout spacing
8	7.15°	83.2"	67.2"	14.4"	10.4"
7	8.17°	63.7"	49.9"	12.6"	9.1"
6	9.53°	46.8"	35.0"	10.8"	7.8"
5	11.42°	32.5"	24.1"	9.0"	6.5"
4.5	12.68°	26.3"	19.3"	8.1"	5.5"
4	14.25°	20.8"	16.8"	7.2"	5.2"
36"r	10.86°	36.0"	36.0"	9.6"	6.8"
30"r	11.88°	30.0"	30.0"	8.7"	6.2"
24"r	13.28°	24.0"	24.0"	7.8"	5.6"

- Switch number is the usual identification method for model railroad turnouts.
- Frog angle indicates the amount of divergence between the intersecting rails in a turnout.
- Average radius is the minimum radius circular curve in which the indicated turnout will fit with a perfect match at each end.
- Minimum radius is the radius of the curved leg of the turnout between the points and the frog.
- Ladder spacing is the distance between the straight track portions of two turnouts for yard tracks to have a spacing of 13 scale feet (1.8" in HO) when led off the curved portions of the turnouts. A crossover would require twice the ladder spacing.
- Fanout spacing is the minimum distance between two consecutive turnouts, but be careful that parallel tracks leading



from such an arrangement are not too closely spaced.

Turnout numbers 4.5 or 5 are usually compatible with other minimum radii on the layout. The minimum radius through the curved portion of these straight-frog turnouts may mean, however, that some long-wheelbase steam locomotives will require modification to work reliably. Because turnouts larger than number 5 are not usually needed for compatibility with other layout radii, appearance becomes the determining factor in choosing which size, if any, to use.

THE TERMINAL LEVEL

More under-utilized space is found on the walls of a conventional room. Replacing pictures, plants, and other decorative paraphernalia with shelf and modular layout components can add length and breadth to a model railroad such as the UP. The space equivalent of a conventional layout is gained by vertically stacking multiple shelves. The illustration on page 13 shows how a passenger station, freight yard, and small engine terminal can be added while preserving walk-in access.

Mating modern UP equipment with a modest layout space must be performed carefully to ensure successful train operation. The helix is drawn as a 24"-radius circle, but it should be constructed as a slightly egg-shaped combination of Atlas Custom line No. 4 turnouts and 22"-radius curves. The Atlas turnouts are recommended because they have a No. 4.5 frog (see the table), more compatible with long rolling stock.

The most critical track is the wye connection between turnout "E" and the passenger arrival track. The reverse curve in this area will determine the length of passenger cars that can be operated successfully. The effect of the reverse curve can be minimized by using constant radius turnouts for the wye connections and rearranging the reverse curves so the straight section between them is as long as possible.

The passenger trackage is arranged so that all backing movements while turn-

ing trains are made downhill. The movements involved are: (1) backing downhill from the arrival track through the wye connection to the helix turnout "E," then (2) moving clockwise up the helix past the other wye connection, and (3) backing downhill into the departure track.

The freight yard is designed to be worked by a switch engine pulling cuts of cars uphill (clockwise) out of the yard onto the helix, and then pushing them downhill back into the yard. The engine terminal is connected to the helix uphill from the freight yard so that it can be used as a switcher pocket. The level track alongside the enginehouse can also be used as a yard lead if it isn't being used for locomotive storage.

You can use long trailer flats and passenger cars in such tight quarters, but exercise care in preparing track and equipment. Rails have to be checked for correct gauge and carefully aligned in both the horizontal and vertical planes. Equipment has to be properly weighted, wheels checked and gauged, bolster pivots checked for horizontal and vertical motion, and couplers adjusted or modified for wide swing.

If all this sounds as though it's too much effort, the UP can still be modeled by backdating everything to the era of 40' and 50' cars. Some of the larger steam engines of that era have been available in ready-to-run versions capable of operating on the radii shown. The trailer-train theme can be preserved by using shorter flatcars capable of holding only one trailer, or the entire yard

can be reoriented by replacing the trailer facilities with railroad-served industries like warehouses and icing plants.

THE LIVING LEVEL

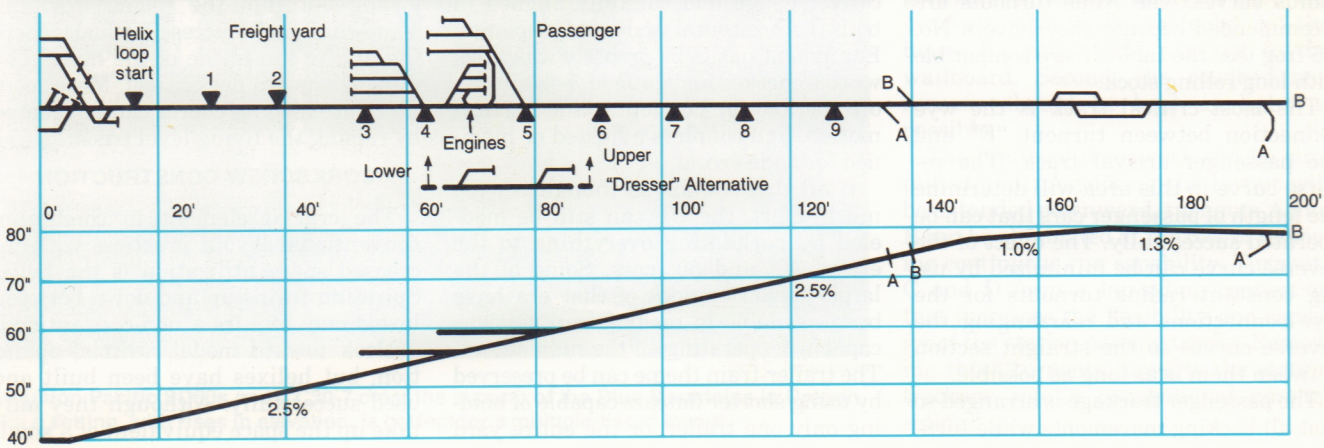
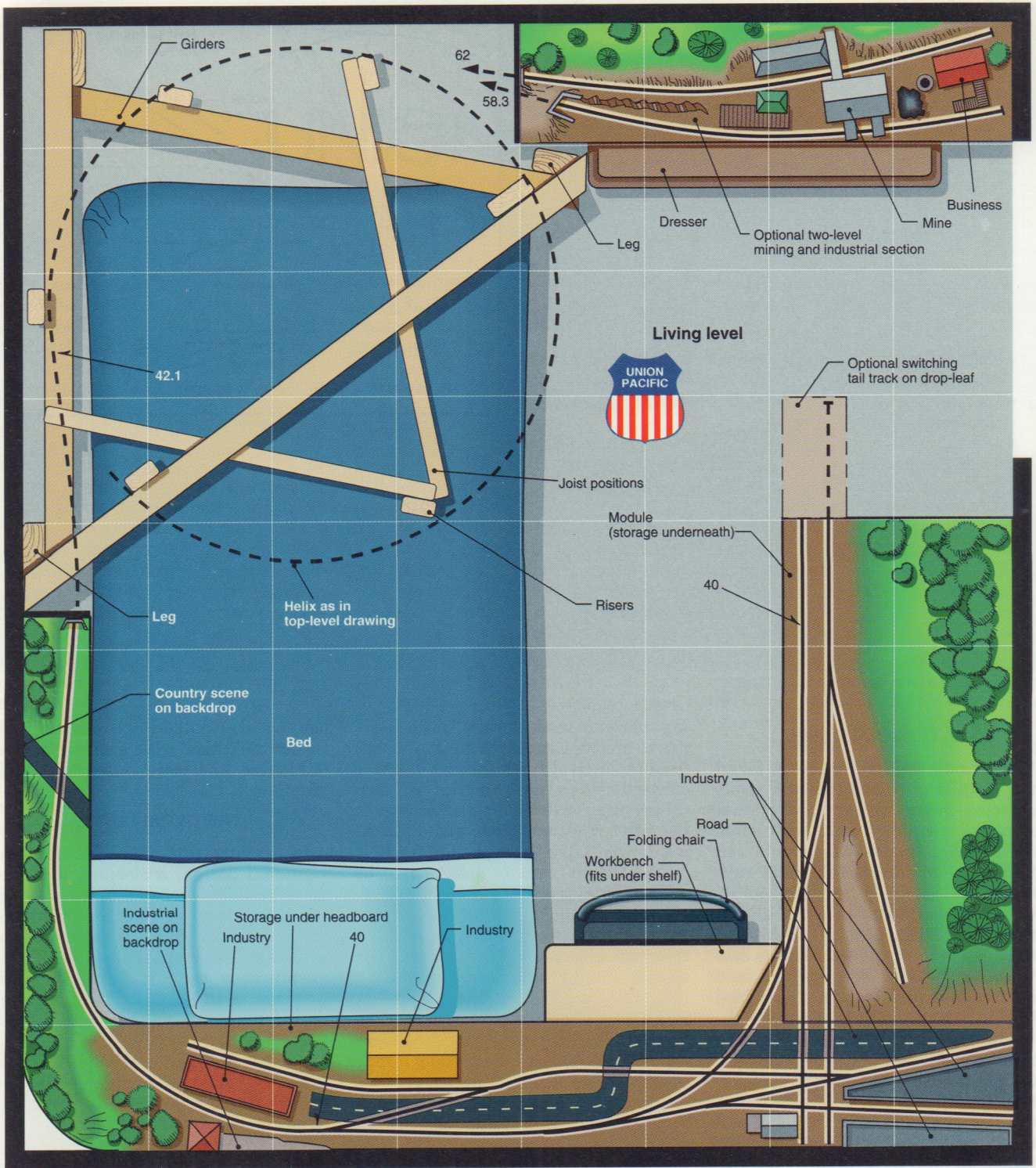
In keeping with the UP's non-conventional design, a sleeping arrangement has been included in the plan for the living level. To further stimulate thought about multi-purpose use of available space, a removable 2' x 4' module has been included to show how one of these units could be connected to the more permanently fixed home layout.

A table and dresser would fit in the room, too. The mining scene above the dresser shows a two-level industrial alternative to the engine terminal.

The tri-base arrangement for supporting the helix allows the bed to be swung out into the room, providing somewhat easier access for housekeeping and to the inside of the helix. The dimensions are not critical. More room for housekeeping chores can be created by raising the living level track.

CORKSCREW CONSTRUCTION

The crucial element in combining conventional layout practices with increased space utilization is the helix. Spiraling trains up and down between levels may require a non-conventional outlook toward model railroad operation, but helixes have been built and used successfully. Although they only take up the space equivalent of a small



Layout at a glance

Name: UNION PACIFIC

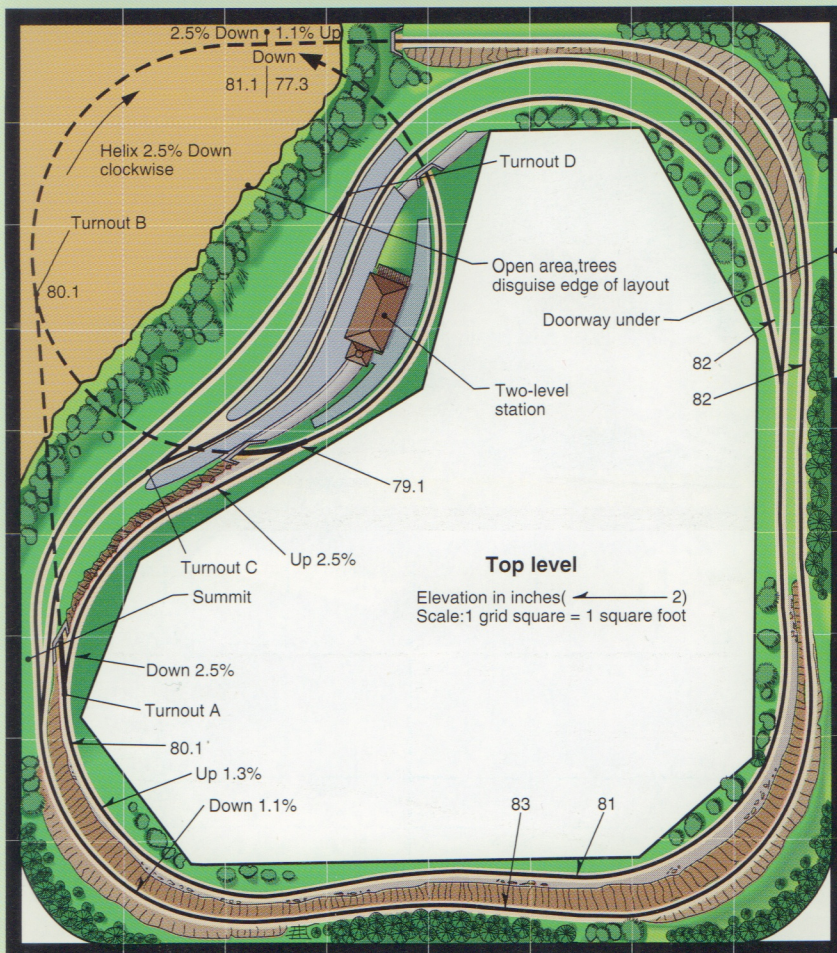
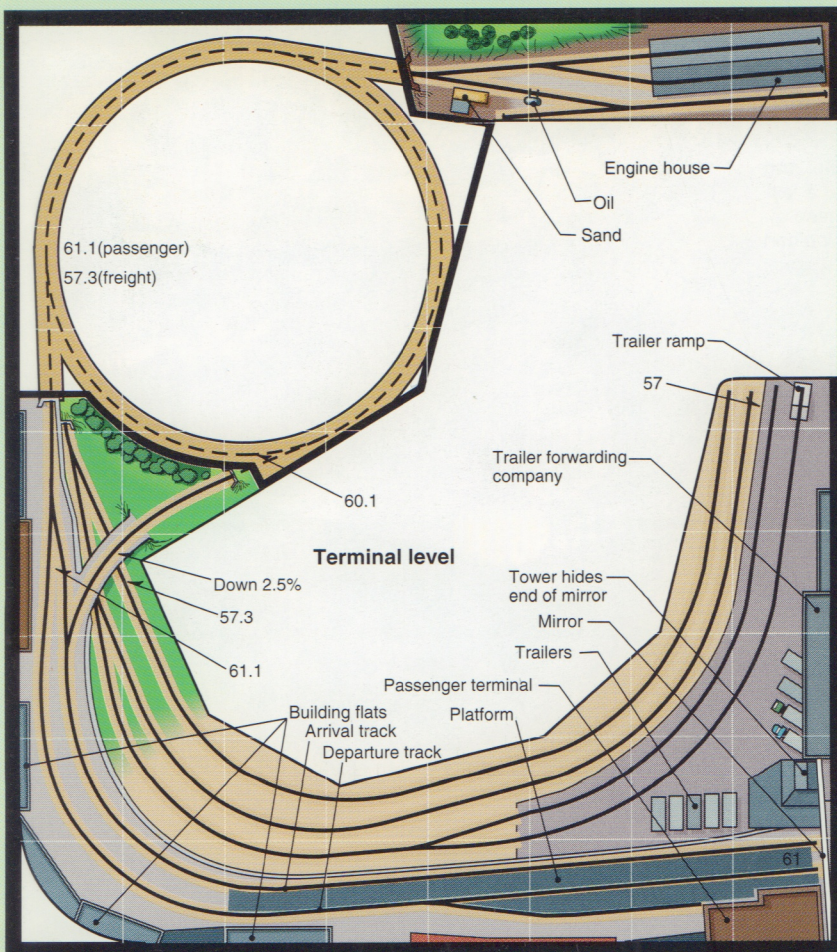
Scale: HO

Space: 8' x 9' x 8'

Location: Small room

Operation: Main line with terminals

Emphasis: Maximizing space utilization by overcoming social conventions



closet, don't underestimate the amount of railroad you get with a helix. The 10+ loops used for the UP provide 125' of running track! This is a much larger model railroad than it appears at first glance.

Chapter 7 of Linn Westcott's book *HOW TO BUILD MODEL RAILROAD BENCHMARK* (Kalmbach, 1979) includes an excellent discussion on supporting a helical spiral. Use of his notched riser and laminated thin road-bed technique would allow the UP helix to be constructed with only a 2.5 percent grade to gain adequate clearance between each level.

The UP helix is too large to fit through a normal doorway in one piece. If it has to be moved in or out, *don't* cut it into two 180-degree sections. Only three cuts are needed in the helix road-bed: at the joint with the top level, at the bottom joint with the living level, and at the middle of the helix. Cut through the notched risers on the level adjacent to the middle cut, then turn the two resulting helix sections on their sides and carry them through the door like huge wheels of cheese. Reassembly requires only a few splice plates.

A UNIVERSAL PLAN?

The endless design possibilities of connecting a helix to multiple shelves make the Union Pacific layout idea almost a Universal Plan for model railroads. The space utilization ideas of the UP, however non-conventional, are more important than specific track arrangement.

The UP can be fitted into an even smaller space by reducing the minimum radius. The inside of the helix should remain at least 20" in diameter, however, and the center access aisle should be at least 3' wide to stay reasonably comfortable. At that size, operation of the UP by more than one person had better involve only close friends.

The UP design encourages you to experiment. It challenges you to be innovative. And to model railroaders who still bemoan their lack of layout space, pay heed to this modification of Horace Greeley's renowned advice: "Go UP, young man!"