Model Railroader MAGAZINE

- EXPERT ADVICE ON MAKING REALISTIC RIGHT-OF-WAY
- INFORMATION ON AND PHOTOS OF LINESIDE DETAILS
- A SUPPLEMENT TO *MODEL RAILROADER* MAGAZINE

How to model realistic track and trackside scenes

- Roadway, ballast, rails and ties
- Terrain and features alongside your track
- Signals, signs, and grade crossings
- Trackside communication, safety, and maintenance equipment

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Roadway, ballast,

The right-of-way offers many modeling opportunities, such as this signal bridge made from old boxcar center sills on J.D. Smith's HO Southern Ry. In this special booklet, author Paul Dolkos describes how to add lineside details to your layout.

rails, and ties

By Paul Dolkos • Photos by the author

Should you use cinder or stone ballast? Do you need a telltale in front of that low-lying bridge? And what do the numbers on that signpost mean? From the type and depth of track ballast to signals and signs to line poles and telltales, the infrastructure of a railroad offers many modeling opportunities. In this special booklet I'll describe how to model the right-of-way by following prototype practice.

Lineside details shouldn't be placed haphazardly just for the sake of adding something "railroady" to a scene. A real railroad carefully considers the location and purpose of each item along its right-of-way. Take this approach when adding signals, line poles, or even ballast on your model railroad, and these seemingly mundane details will make your layout's scenery and operations that more realistic.

Planning the right-of-way

Railroads acquired at least a 100-foot-wide right-of-way whenever possible. Along with space for the roadway, this gave the railroad room to install lineside equipment.

Most railroads developed clearance and location standards for items along their rights-of-way.

Many of these are available from railroad historical societies and can help you plan your model railroad right-of-way.

For example, A list of standard side clearances for the Boston & Maine (the railroad I model) in 1960 is given on the right.

Although these details are often the last items installed on a layout, you should determine their locations when developing a track plan.

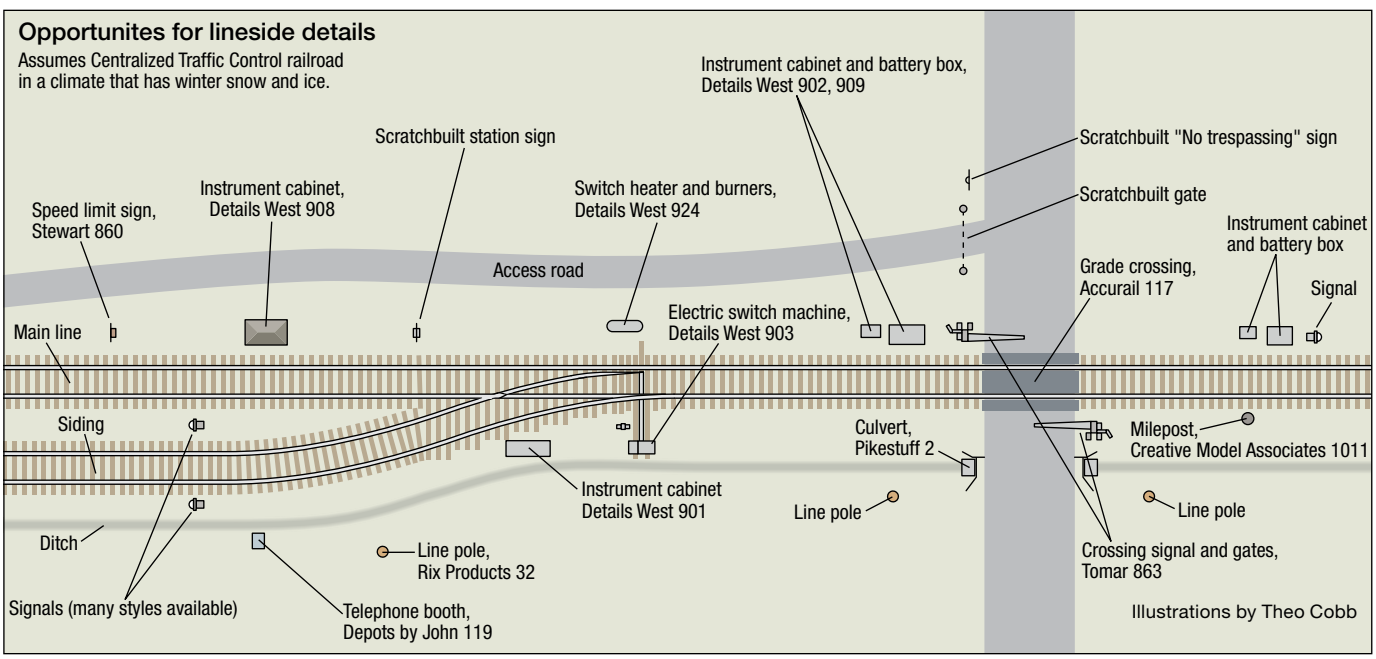
The drawing below shows common locations for items and scenic details found along a typical railroad right-of-way, from a lowly ditch to signals and instrument cabinets.

This story will also deal with the roadway, including advice on ballasting and detailing your track, as well as modeling the ditches, culverts, and retaining walls that keep the roadway stable. **MR**

Paul Dolkos is a frequent contributor to Model Railroader.

Standard side clearances

From center line of tangent track	
Abutments	8'-0"
Low switch stand	6'-9"
High switch stand	9'-3"
Battery box	10'-4"
Relay bungalow	10'-6"
Mileposts	17'-6"
Retaining walls	10'-0"
Section houses	17'-0"
Signal masts	10'-6"
Signal bridges min.	8'-7"
Signs for train crews	11'-6"
Crossing gate post min.	9'-0"
Building eave min.	8'-0"
Station awning post min.	10'-6"
Telephone poles	25'-0"
Telephone box	12'-0"
Ties and lumber min.	10'
Wires over tracks min.	27' high
Mail cranes	6'-6"
Telltale poles	8'-6"



The roadway

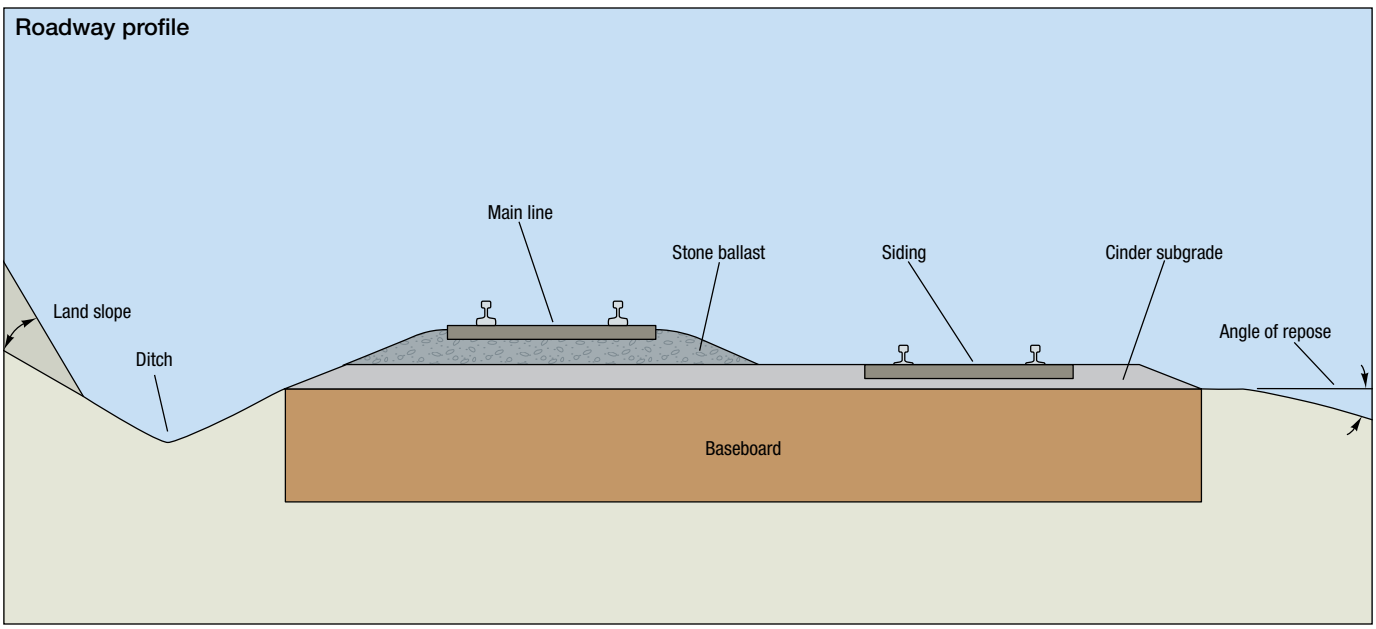
Railroads refer to the space occupied by track, the track base, and ballast as the roadway. The track base is compacted earth and is usually between 18 and 24 feet wide. A rule of thumb for a length of straight model railroad track is to allow a width of 20 scale feet for a single main and an additional 15 scale feet for any additional main lines. Branch lines and industrial tracks can have tighter clearances but are typically not less than 16 feet wide.

The roadway often includes a two- to three-foot shoulder along the edges of the ballast. Crewmen used this shoulder to more easily walk beside their trains.

Early prototype railroads buried railroad ties in earth but soon found that dirt ballast didn't hold the track in line and trapped water, which caused the wood ties to quickly rot. More porous materials, such as crushed gravel, trap rock, cinders, and blast furnace slag, were placed in a mound on top of the track base to serve as ballast that kept the track stable and allowed for sufficient drainage.

Most railroads developed standards for the type and amount of ballast applied to specific lines across their system. The depth of the ballast usually ranged between 12 and 30 inches. Railroads installed deeper ballast on heavily trafficked main lines and used a minimum depth on sidings and industry or secondary lines. You can duplicate this look by using thicker roadbed on your main line and thinner material on sidings.

On an HO scale model railroad, ⅛" to ¼" thick strips of cork, Homasote, or other roadbed material represents the



Railroads often use different types and amounts of ballast on main lines and sidings. On a model railroad, installing the main line on slightly thicker roadbed and using different colored ballast adds realism.

ballast mound. The edges of the material should be beveled from 20 to 30 degrees, not 45 degrees, which is commonly used on model railroads but too steep to be realistic. A filet of plaster or scraps of Styrofoam can be used along the edge of the roadbed to achieve a prototypical angle.

When choosing model railroad ballast you should examine the size of the individual pieces and not simply rely on the scale marked on the package. Individual ballast pieces are between one and three inches across.

The type of ballast you choose will also help establish the era and prototype of your layout. In the steam era and into the diesel era, cinders and blast furnace slag formed the ballast of most secondary lines, sidings, and yard tracks. Heavily trafficked main lines often had a subgrade layer of cinders or slag covered with a layer of crushed gravel or stone. As the diesel era progressed and ballast was renewed, less and less of the cinder subgrade would be visible. Some railroads also used ballast of a distinctive color other than gray, such as the "pink lady" granite ballast used on much of the Chicago & North Western.

When applying ballast you may run out of a certain color and not be able to find an exact match. This happened on the real railroads as well when a quarry closed or the railroad changed suppliers. Sometimes mainline tracks that are side by side or even two adjoining lengths of a single-track main could have different colored ballast. If you think that the difference between the colors looks too drastic on your layout, you can tone down the difference by weathering the ballast with an airbrush or powered pastels.

Roadways weren't equally maintained. Most railroads kept ties spaced a minimum of 10" apart from edge to edge. Heavy-duty main lines typically had 24 ties for each 39-foot rail length, resulting in a space of 11½" between the tie edges. A siding, industry spur, or yard track may have only 19 ties for each 39-foot rail length with the ties spaced as wide as 16" apart. In those locations, you'd also be more likely to see grease and oil drippings from locomotives as well as a few weeds sprouting up between the ties.

An abandoned spur track adds a sense of history to a model railroad. This can be easily modeled by installing several heavily weathered ties on a thin layer of ballast.

A roadway can be abandoned altogether, which can add a sense of history to your model railroad. You can add a remnant of an old line by installing heavily weathered ties (without rails) and a thin layer of ballast. You can also remove a few ties and vary their height. For a contemporary setting, the old roadway could be a groomed or paved trail.

Tips for applying ballast

Ballasting a model railroad can be time consuming, but the realistic results are worth it. Before you start to ballast, you should consider installing the adjacent scenery first. That way a stray glob of plaster or a clump of ground foam won't ruin your ballasting job.

If you've installed track with plastic ties, paint the track with a dark brown color such as Polly Scale Railroad Tie Brown. The paint will tone down the shiny plastic ties. I also make sure to wipe all the paint off the rail tops immediately after painting.

You'll need to take extra care when painting turnouts. Always make sure to mask the switch points so that they don't get painted and lose contact.

Use a spoon or small cup to apply the ballast between the rails and to the shoulders. On the shoulders I brush white glue onto the edges of the roadbed and apply a light layer of ballast. This adds some tooth to the slope, which helps when I pour on the final layer of ballast. Working in one- or two-foot sections at a time, I brush the ballast in place, making sure to keep it off the tops of the ties.

After the ballast is in position, I spray it with 70 to 90 percent isopropyl alcohol. This wetting agent ensures that the 1:4 white glue/water solution that I apply next will soak into the entire ballast layer.

Weeds, sand, and spilled aggregate loads add a lot of realism to yard and industry tracks on a model railroad. The oil spills are thinned acrylic paint. Cody Grivno photo

Before the glue sets fully, make sure to knock any ballast off the sides of the rails. You don't want a stray piece of stone or cinder to be defying gravity on your finished track.

After finishing a ballast job, I brush-paint the rail sides with Polly Scale Grimy Black. You could also airbrush oil spills and add ground foam or other ground cover between the rails to simulate weeds and spills from loads.

Choosing the right rail height for a specific location and adding a few extra details at a turnout can add a lot of realism to the roadway.

Model railroad track is sold in varying heights, referred to as track codes, which represent different sizes of rail used by prototype railroads. Common codes for HO scale track include codes 100, 83, and 70, which represent 156-pound rail, 132-pound rail, and 100-pound rail respectively.

Code 100 track is too large to realistically depict most prototypes. Code 83 will work for a heavy-duty main line, while code 70 is appropriate for a siding or spur. To accurately model many steam-era prototypes, you would need to have a code 70 main line with code 55 sidings and spurs.

Although they're available in all these rail heights, most ready-to-install turnouts, although reliable and convenient, have compromised prototype fidelity for reliability. The gap between the open point and the stock rail is extra-wide to prevent short circuits, and the points are often hinged on a center pivot. On the prototype, points are moved by narrow switch rods, not a bar as wide as a tie.

Many firms, such as Central Valley, Details West, and Alkem Scale Models, sell parts for scratchbuilding more realistic looking turnouts. Many of these details, including joint bars and rail braces, can be added to ready-to-install turnouts to improve their appearance.

Other details that can enhance a turnout are switch stands and switch targets. Prototype railroads use switch stands on manually operated and remotely controlled switches that have a manual override lever. Railroads usually standardized their lines with one or two types of switch stands.

High switch-stand targets were common on railroads into the 1960s. Switch stand targets have painted faces that indicate to train crews which way a switch is thrown. A white or green face means that the switch is in its normal position. A red or yellow face means that the switch is in the opposite position. Some targets also had lanterns for night operations.

Electric or electro-pneumatic switches on lines controlled by Centralized Traffic Control (CTC) offer other detail opportunities. These include battery boxes or relay sheds (now commonly called bungalows) for the switch motors and propane tanks and heaters that keep switches from freezing during winter months.

If you model railroads before the modern era, you could also include a mechanical interlocking tower like those found at a yard or junction. At these locations, pipes run along the tracks to connect each switch point to a corresponding lever in the tower. The tower and linkages are interesting details for a trackside scene. You could also build an operating model using fascia-mounted levers in that location. [For information on building a non-operating model, see "Model a mechanical interlocking," by Bill Darnaby, in the January 2004 *Model Railroader*. – *Ed*.]

Including a tall, lighted switch stand, this turnout features many added details that make it look more prototypical. The rail braces are from British rail chair castings and the non-functioning switch rods are styrene. The actual switch rod is disguised as one of the long switch ties.

Mechanical interlocking plants add a lot of detail to a scene. This operating model uses a bank of fascia-mounted levers connected to turnouts on the layout.

Today's railroads use low-mounted switch stands, such as this one on the Maryland & Delaware in Hurlock, Md. The large handle adds leverage, making it easier to operate.

Drainage and retaining walls

Modelers often include spectacular bridges and trestles in their track plans but ignore the simple structures that keep most of the main line stable, protecting it against erosion and other forces of nature. When planning your model railroad, examine the scenery along the right-of-way for logical places to add a ditch or install a culvert or retaining wall. Each is a simple project that will add a lot of realism to your layout.

A drainage ditch along a roadway is necessary anywhere the land slopes toward the roadway, but not where the land slopes away from the roadway. If possible, the slopes would also be sodded or covered with vines to prevent erosion. This vegetation can be useful to a modeler since it can hide a slope that for space considerations needs to be steeper than the prototype.

The ditch, like any other scenic detail along the roadway, shouldn't have sharp edges or be completely bare. Contours become rounded and ditches are often full of weeds. (Maintenance-conscious railroads spray or burn them.)

Culverts are also important to draining water away from the roadway. These structures can range from a piece of drain pipe protruding from the roadway to an elaborate construction of wood, concrete, or stone. Many companies offer culvert kits in a variety of scales, sizes, and styles or you can scratchbuild your own. You can model a drain pipe by simply installing a piece of styrene or brass tubing into the side of the roadbed. To be prototypical, you should have an eight scale feet or greater drop from the top of the rail to the drainage bed.

Retaining walls are also constructed from a wide variety of materials, they are most common in urban areas where they can serve as loading platforms or revetments for signals. The ideal retaining wall height on an HO model railroad is no more than two inches, although on taller slopes you can follow prototype practice and incorporate a series of terraces. Most retaining walls aren't vertical but have a slight slope, which you should also incorporate into your model.

Next we'll look at different types of signals, signs, and grade crossings that you can add to your right-of-way.

Ditches are an important scenic feature along the roadway. On Paul's layout, this ditch would divert water away from the track through a culvert under an access road.

A simple drain pipe can be modeled by installing a piece of tubing into the side of the roadbed.

On the Paul's layout, this railroad-tie retaining wall stabilizes a siding. Note the wall's slope.

Signals, signs, and grade crossings

By Paul Dolkos • Photos by the author

A ball signal indicates that the junction is clear for this northbound freight on Paul Dolkos' layout. The yard limit sign and flanger sign beyond it also guide crews. In this article, Paul describes how railroads use lineside signals and signs.

Depending upon your layout's setting, modeling a realistic right-of-way can range from an elaborate signal system to a simple "W" on a post that instructs an engineer to sound the engine's whistle or horn when approaching a grade crossing. In this story, I'll explain some of the signals and signs that warn and guide railroaders. I'll also describe different types of grade crossings and the signals and signs that the railroads use to keep motorists (and engine crews) out of harm's way.

I'll give some modeling ideas, but it's impossible for me to list every variation in just one short story.

Hopefully you'll be inspired to take a closer look at the trackside details of your favorite prototype. **MR**

More on our Web site

Get inspired as you build your own trackside scene by clicking on the video tab and then navigating to "layouts" at www.modelrailroader.com.

Signals

From semaphores to color-position light signals to cantilevered signal bridges spanning multiple tracks, signals are one of the most prominent lineside details on a railroad. The types of signals that you use, or the lack of lineside signals, can help identify your layout's prototype and era.

Some lines, especially those with sparse traffic, have no signals and are referred to as dark territory. Before radio communication became widely used, trains on this type of line were controlled by a timetable and written train orders delivered en route. At certain locations, usually stations or interlocking towers, there were manually controlled signals called order boards. These were typically semaphores that let an engineer know whether or not he had to receive orders.

On modern railroads, traffic through dark territory is controlled by radio communication between the dispatcher and engine crews. Referred to as direct traffic control or DTC, this type of railroad usually has signs marking the beginning and end of each DTC block.

Depending on the era and the railroad, busier routes could be controlled by several types of signaling systems, including manual block systems (MBS) and automatic block system (ABS) that warn trains of occupied track up ahead. The most complex systems use Centralized Traffic Control (CTC) where routes are set up from a remote dispatching center.

Even in unsignaled territory, operating signals could be found at interlockings or junctions. These signals would indicate if a turnout was open or closed or if a train was approaching from another line.

Real railroads spend a lot of time and money maintaining their signal systems, and a fully operational signal system can be a complex, high-maintenance part of a model railroad as well. Many companies, such as Atlas, sell modular components for an ABS system. Companies such as Digitrax and NCE Corp. make signal decoders so you can control the signal system with Digital Command Control and a computer, using either an off-the-shelf program like Winlok [See "Operating signals with user-friendly software" in the October 2007 *Model Railroader*. – *Ed*.] or your own computer code.

Signals are usually standardized across a specific railroad. Installing signals appropriate to your prototype and era adds realism to your layout.

Some distinctive designs include the Southern Ry.'s signal bridges, which used the center sills of retired boxcars. Prototype-specific signal models are available from many manufacturers, including Alkem Scale Models, N.J. International, Tomar, and TrainCat Model Sales.

In unsignaled (dark) territory, many stations had train order boards to signal an approaching train. In this photo the position of the semaphore blade indicates that there are no orders waiting for next train's crew.

The color-position signal (left) was a signature of the Baltimore & Ohio Ry. The signal will soon be replaced by a modern type like this one (right) on the Norfolk Southern.

I recommend Brian Solomon's book *Railroad Signaling* published by MBI Publishing Co. A basic understanding of signal systems will help you know where to place signals and other equipment for a more prototypical model railroad.

Signs

A sign marks a junction on Paul's HO scale Boston & Maine layout. Prototype railroads named many locations along a line even if there was no town or station.

Most railroads identify bridges and culverts with milepost markers to pinpoint a train's location. This bridge is 41.02 miles to the next terminal.

This milepost on Paul's layout indicates that Berlin, N.H., is 45 miles ahead. He made the model out of Hydrocal and painted it to look like granite.

Real railroads post a wide variety of signs along their rights-of-way. On a model railroad, signs take up little space, provide scenic interest, and as on the prototype, can help operations run more smoothly.

Signs guide engine crews by posting speed limits, marking yard limits, and providing place names, which don't always correspond with a station or town. Especially helpful in bad weather, some signs provide the distance to the next marked destination on the line, such as "Station one mile."

Railroads use mileposts to mark locations along the line. Most railroads identify bridges and culverts with their milepost location. Mileposts are also noted in train orders to indicate work areas and speed limits.

On an approach to a junction or grade crossing, railroads installed whistle posts to alert an engineer to sound his whistle or horn. In colder climates, a flanger sign may also be placed near the whistle post. These signs let maintenance-of-way crews know when to raise the blades of their flanger or snowplow to avoid damaging the equipment.

Many other types of more specific signs could be found along the line, from signs marking signaled and unsignaled territory to no trespassing and, in the steam era, no coal picking warnings. In addition, railroads often had distinctive standards for the shape, size, and lettering of various signs used along their rights-of-way. You can find examples used on a particular railroad from prototype photos, rule books, or official maintenance-of-way booklets available from many railroad historical societies. Taking the time to match the signs on your layout to a specific prototype and era adds to the realism of your railroad.

Many manufacturers, such as Blair Line, Tichy Train Group, and Pikestuff, sell plastic or etched-metal models of signs. You can also get generic sign decals from Microscale and scratchbuild your own posts.

If you can't find a specific sign model or decal, you can print your own using a computer. Unless you use a high-resolution (2,400 dpi or greater) printer, smaller lettering will be illegible, but that's usually not critical. The suggestion of lettering is often enough to capture the look of a sign.

I attach my signs to pieces of styrene cut to fit. Brass angle or rail (code 55 is ideal for HO scale) makes a durable signpost. I don't use wood because it's easily broken.

Railroads place no trespassing signs all along their rights-of-way, especially at bridges or tunnels. Paul prints many of his signs on a computer and prefers to use styrene instead of wood for his signposts for added durability.

Grade crossings

Grade crossings range from dirt fill between the rails at a private road to crossing gates, flashing signals, and rubber or concrete pads where the line crosses a busy highway. Even the simplest grade crossing can add a convenient scenic break on a long stretch of track.

You can make a realistic grade crossing by following prototype practice. Embankments or cuts for the road approach are usually at least 20 feet wide. Also it's preferable for roads to cross the tracks at right angles.

Some model railroad grade-crossing approaches are often much too steep. Railroad industry recommendations were to help prevent a stalled vehicle from rolling onto the tracks. At 41 feet away from the track, the road surface shouldn't be more than 3 inches higher or 9 inches lower than the top of the rail. At 11 feet, the road should be 3 inches lower than the top of the rail and slope upward until it was 1 foot from the track where it leveled out.

The fill material between the rails at a crossing varies by location. Dirt, asphalt, and timbers are still used. Blair Line and GC Laser sell HO scale wood grade crossings.

In the last half of the 20th century, some railroads started using concrete panels or rubber composite mats to give motorists a smoother and quieter ride across the tracks. Accurail and BLMA offer HO scale grade-crossing mats.

Signs and signals around a grade crossing provide other modeling opportunities. Crossbuck warning signs with "railroad" intersected by the word "crossing" at 90 degrees are the most common sign seen at a grade crossing, whether mounted on a signpost or a flashing signal. Some railroads used other types of signs in the past, including crossbucks at shallower angles, diamonds, and shields. These signs often had more wording, such as "Look out for the locomotive."

Along busier routes in cities and towns, railroads install flashing lights and/or crossing gates. Flashing light signals have been in standard use by many railroads for several decades, but other variations can be found on both past and present railroads. Though most have been replaced, wig-wag signals (which have a swinging signal head) once were prevalent on many railroads.

On some of today's busy multi-lane roads, multiple sets of flashing warning lights are mounted on a cantilevered signal bridge spanning the road.

Companies, such as N.J. International and Tomar make models of different types of grade-crossing signals and gates. Circuitron and Berkshire Junction, among others, sell modules for operating signal flashers and gates.

Grade crossings provide some operational interest on a model railroad. If you run sound-equipped locomotives, you'll need to sound the whistle or horn as a train approaches a crossing. Some cities have ordinances, often posted on signs, limiting the amount of time that a train can block automobile traffic. This can be an added challenge for your engine crews when working around a grade crossing.

Although 90-degree crossbucks are now standard, these cast-iron crossbucks are at 50 degrees. This photo was taken in 1967 along the Pennsylvania RR in Denton, Mich.

Modern grade crossings, such as this one in Manassas, Va., feature crossbucks and crossing gates. Many railroads now place flashing signals in cantilevered bridges.

A grade crossing can incorporate a lot of lineside details. This crossing on Paul's layout features flashing light signals and two different types of fill: timber and asphalt.

Wig-wag signals, such as this one on a former Atchison, Topeka & Santa Fe line in Cherryvale, Kan., have a swinging head that simulates the motion of a brakeman's lantern.

Trackside communication, safety, and maintenance equipment

By Paul Dolkos • Photos by the author

The right-of-way on Bill Aldrich's HO New Haven layout includes line poles and telltales. In this story, Paul Dolkos shows how to model these and other prototypical trackside details.

Looking beyond the ballast and signals of a railroad's right-of-way there are many other items that would make interesting details on a model railroad. These include communication equipment, safety appliances, maintenance-of-way (MOW) equipment, and automatic detection devices.

Railroads are convenient paths for communication links, from overhead wires to fiber optic cables. Other items along the line prevent accidents, including bumpers, derails, and telltales, which were used back when most freight cars had rooftop running boards. Railroad maintenance-of-way departments had their own dedicated infrastructure, including handcar setouts. Modeling lineside detectors adds interest to a modern-era layout.

Throughout this booklet I've outlined some common details that make up a typical right-of-way. There are many more variations. Information can also be found in *Trackwork and Lineside Detail for Your Model Railroad* (Kalmbach Publishing Co., currently out of print). **MR**

Communication along the line

Even without overhead wires, line poles add realism to a model railroad, such as these on Lance Mindheim's N scale Monon layout. Line poles varied in height depending upon the terrain.

Lines of communication are a common trackside detail. Line poles carried company telegraph and telephone wires, as well as power lines that served stations, signals, and other electrical equipment along the right-of-way.

Railroad rights-of-way provide convenient paths for commercial communication networks as well. Many companies, including Western Union in the past and telecom corporations today, lease circuits or even build and maintain this part of the railroad's infrastructure in exchange for the use of the right-of-way.

Until the modern era, line poles were a common trackside detail. Today many line poles, although no longer in service, remain intact along stretches of main line.

Generally, the busier the route, the more crossarms on the line poles. On a branch line, the poles might have a single crossarm supporting a couple of telegraph wires between stations, while those along a main line could have up to seven crossarms carrying communication and power lines.

A typical line pole is 22 feet from the ground to the top of the pole. However, this height varied in uneven terrain to avoid abrupt changes to the height of the wire. The wire varied no more than four or five feet from pole to pole. Taller poles were used in dips and shorter poles, sometimes as short as 10', were used on rises.

On prototype railroads, spacing between poles ranged from 130 to 200 feet, depending upon the number of wires and whether they had to bear the weight of snow or ice. On a model railroad I've found that spacing the poles between 80 and 100 scale feet apart (approximately 12" in HO scale) looks best.

Model line poles are available in all scales from companies such as Rix, and even without overhead wire they enhance a model railroad's appearance. A good option for overhead wire is EZ Line from Berkshire Junction. EZ Line is made out of stretchy Lycra thread, so it's more forgiving should an errant hand brush against it.

Today overhead wires have given way to buried fiber optic cables. The cables are marked at regular intervals by short white posts, usually with a brightly colored tip. You can scratchbuild these details from styrene.

Before railroads used radio communication, they installed phone boxes along the line. Phone boxes were mounted on the side of a line pole or station wall, or placed on a dedicated post or inside a phone booth. Phone booth and phone box castings are available from Details West.

Phone boxes were more numerous along rights-of-way before the widespread use of radios. Model castings of phone boxes are available in most scales.

Today, fiber-optic cables are common along the right-of-way. Lineside markers like this one along the Norfolk Southern in Linden, Va., denote the buried cable's route.

As radio communication became more widespread beginning in the 1960s, many phone boxes and phone booths were removed. If you model this more modern era, a tall radio tower along the line or at a station would help date the era of your layout.

Safety first

A few manufacturers sold their own distinctive bumping posts. This HO scale casting from Custom Finishing depicts a Durable Model D bumping post.

Used in pairs and often found on industrial spurs, wheel stops keep cars from rolling off the end of the line. These Tomar Industries HO castings model a Hayes design.

Derails are often used at sidings to keep a runaway car from fouling the main line. Bill Aldrich modified this HO hinged-block derail to actually operate via a switch stand.

Telltales were prevalent back when freight cars still had running boards. The ropes reminded a brakeman on a car roof of a low clearance ahead.

Some items on the right of way are dedicated to preventing accidents and injuries. These include bumping posts, car stops, derails, and telltales.

As with other equipment, railroads often had their own preferences regarding the types of safety equipment used. But they followed many of the same general guidelines.

At the end of stub tracks there's often a barrier in place to stop a car from rolling off the ends of the rails. These barriers range from a pile of earth at the end of an industrial spur to a knuckle coupler embedded into a concrete abutment at a passenger terminal.

Metal bumping posts are common at the end of a spur. These usually consist of metal supports with a cast head that's off center by 2" to directly engage a car's coupler face. Several prototype manufacturers make their own distinctive bumping posts, including Buda, Hayes, and Durable. Tomar sells HO and N models of Hayes bumping posts, and other styles are available from various other manufacturers.

Wheel stops are smaller and often found on industry sidings. They are used in pairs and clamped to the rails to engage a car's wheel treads. Although their manufacturers tout these light-duty devices as portable, most car stops are kept in place once installed. Cast metal models of wheel stops are available from Tomar and Selley Finishing Touches.

Both bumping posts and wheel stops are meant for emergency use only, not to stop a car that had been "dropped" or sent rolling by a switchman. Many railroads had rules against this practice, and you can follow suit during your operating sessions to encourage conscientious car spotting. On a model railroad, just like on the prototype, repeatedly slamming a car into a bumping post or pair of wheel stops will eventually break the part.

Derails are safety devices that divert a runaway car's wheels off the rails and onto the ground. They can be connected to manual or remote switch stands, or to an interlocking via pipe linkage. Railroads often use derails on mainline sidings, on approaches to movable bridges, or any location where an errant piece of rolling stock could cause a major accident. Having to rerail a boxcar is preferable and less expensive than having to fish it out of a river.

The most common type of derail is a hinged-block derail, which consists of a metal casting that in the closed position rests on top of the rail. Alexander Scale Models sells model castings of hinged-block derails. Another type is a switch-point derail that, when opened, creates a gap that diverts the wheels of a car onto the ground. A sign marked "DERAIL" is used to alert crews of a derail's location.

If you model an era before the 1960s when brakeman would sometimes ride the tops of cars during switching moves, you can also place telltales on approaches to bridges and tunnels or any other low-hanging overhead obstacle. They were required where overhead clearance was less than 22 feet. Depending upon the speed limit in the area, telltales were placed between 50 and 300 feet away from the low clearance point. Faster speeds meant that the telltales would be placed farther ahead of the obstacle to give a crewman additional time to react.

A typical telltale had a row of 13 to 17 ropes placed 6" apart that hung 12½" below clearance level to brush the shoulders of a crewman, warning him to get down. Creative Model Associates and Sequoia Scale sell telltale models.

You can also scratchbuild your own telltale model out of styrene. Make sure you don't use thick plastic for the ropes. I use .010" wire.

Maintenance-of-way equipment

A railroad's maintenance-of-way (MOW) department provides other modeling opportunities. Equipment and supplies are kept at regular intervals near stations and towers to reduce the distance that a section gang has to travel to get the job done.

Before the advent of hi-rail vehicles, MOW crews used handcars and motorized speeders to patrol the right-of-way. Handcar setouts were placed along the line so crews could get these relatively light vehicles quickly out of the way of an approaching train. The setouts consisted of a pair of rails or wood beams placed perpendicular to the track. Planking or a ballast mound between the running rails made it easier for the vehicle to be rotated 90 degrees and run onto the setout.

Today's hi-rail vehicles can escape to a siding or an access road if they need to get out of the way of an oncoming train. Models of hi-rail vehicles are available in many scales from several manufacturers. Adding one or two on a siding can add a maintenance-of-way presence to a modern-era layout.

Sheds of various shapes and sizes were often located next to a handcar setout. They stored speeders, tools, and other equipment. The small buildings can be made of almost any material, including retired highway trailers or rolling stock with the trucks removed.

One of the main jobs of MOW crews is to make sure that the track is in good repair. On lines where sectional rail is used, crews would leave 39-foot rail sections along the right-of-way, so that a break could be repaired quickly. To avoid storing rails directly on the ground, rail sections were often placed in cast concrete rail racks, which can be easily scratchbuilt for a model railroad.

Tie piles are another easy-to-model MOW detail. Resin tie piles are available from several manufactures or you can scratchbuild your own using wood or styrene. When modeling this detail, keep in mind that the cross section of a typical tie is 7" x 9". Also note that the storage areas are usually free of tall vegetation and the bottom layer of ties is kept six inches off the ground by blocks.

Handcar setouts use wooden beams or rails installed perpendicular to the track. A pile of ballast or a wooden platform makes it easier for the handcar or motorized speeder to be rotated onto the setout and out of the way.

Many railroads store rail sections in racks so that a break in the line can be repaired quickly. Paul scratchbuilt his concrete rail racks from styrene. Each set of racks holds a scale 39-foot length of rail.

Train detectors

Although dragging equipment detectors have been used on some railroads since the 1940s, most train defects were observed and reported by crewman in the caboose, station agents, and other railroad personnel until the 1960s. As railroads eliminated cabooses, closed stations, and reduced manpower, more types of lineside detectors came into use.

Along with dragging equipment, modern lineside detectors warn of excess height loads, overheated wheel bearings, and broken wheel flanges. When the train passes a detector, the crew will receive a radio message saying "no defects," unless there is something wrong, in which case the crew will have to stop the train and locate the problem.

Other detectors are used to make automatic train lists. In the 1970s, railroads tried Automatic Car Identification (ACI) that used an infrared reader to scan barcodes on the sides of cars. This system proved unreliable and was discontinued in 1977. Beginning in the 1990s, railroads began using Automatic Equipment Identification (AEI) that uses more reliable radio-frequency identification (RFID) technology.

A modern-era mainline layout should have at least one detector installation as a signature element of the period being modeled. Some companies, such as Details West, make models of various types of detectors. Lineside detectors also are easy to scratchbuild using styrene and following prototype photos. [See "Model a defect detector" in the July 2004 issue of *Model Railroader*. – *Ed*.]

Lineside detectors serve many functions. In plastic boxes along each side of the track, these car-tracking detectors are on the Norfolk Southern line near Manassas, Va.