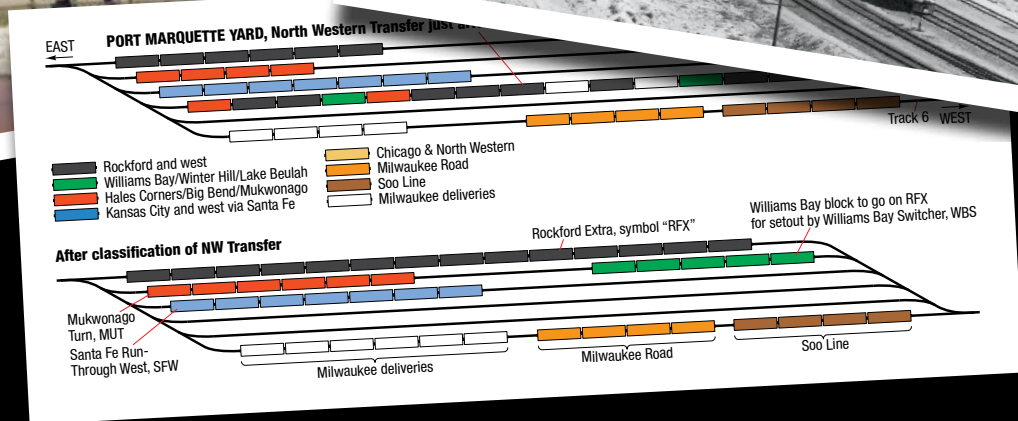
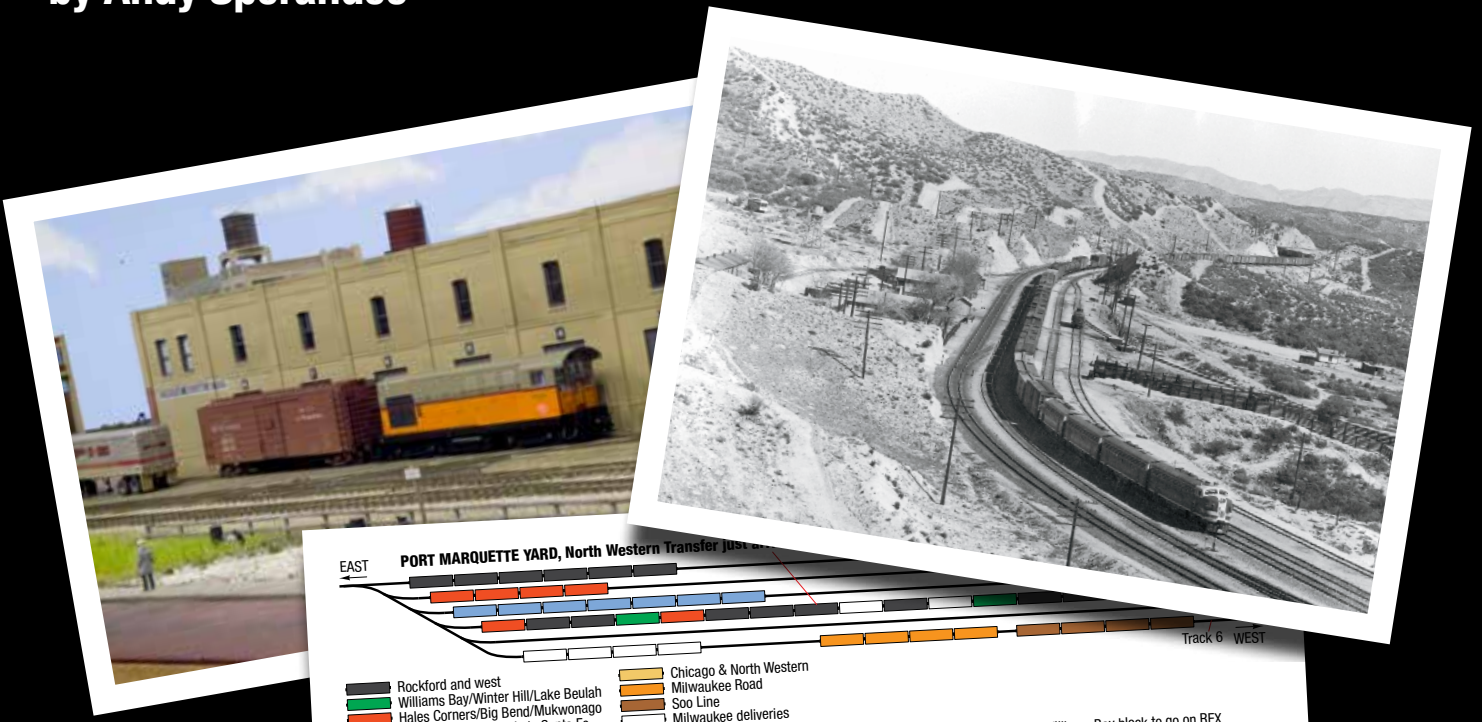


Workshop tips

Layout design for operation

by Andy Sperandio



- How a busy model railroad freight yard works
- Learn how to reproduce realistic engine terminal and caboose activities
- Types of staging yards and tips on how to use them effectively
- Prototype passenger train servicing activities that you can model

Layout design for operation

What makes one track plan better for an operating layout than another? Here are some things I look for in published track plans, plans I design myself, and plans my friends show me. Then on the following pages I'll describe operational features both prototype and model that can be planned into our layouts.

Staging. It's a given that any model railroad can represent only part of a major railroad, let alone the continental railroad network. So any operating layout needs offstage tracks to represent the distant places our trains come from and go to when they aren't passing across our too-short main lines.

In general I'm open to any of the three main types of staging – stub-ended, reversing loop, or through. Each has its applications, and my only concern is that the staging is suited to the kind of railroading to be practiced.

If the plan is for a mainline railroad, I prefer that the staging define the ends of the main route between A and B. Shortline, branchline, and terminal railroads may need only one staging yard to represent “everywhere else.”

The very smallest layouts may make do with on-layout staging – that's been sufficient for our operating sessions on *Model Railroader's* Milwaukee Road Beer Line. Recently I designed an N scale industrial railroad based on a Santa Fe prototype where a car float connecting to a float bridge at one corner of the 4 x 8 layout is the staging beyond the layout.

Access. Walk-in access is a must. Lift-outs or gates to allow walking in are okay, especially if someone else has to build them! I'll accept a limited amount of stooping, but if “duckunder” means crawling, I would prefer not to.

Even better than walk-in is walk-around, meaning the ability to follow a train along every part of its run. Modern command control systems make this practical, and onboard sound effects give us even more reason to want to be up close to the action.

Passing tracks. Most model railroads have single track main lines and so need passing tracks where trains in opposing directions can meet. An operating layout needs enough passing tracks to allow



On a single-track main line, passing sidings determine operating flexibility and train length. We're looking down the main track at Black, Texas, on Jay Miller's HO scale Panhandle & Santa Fe. The passing track is on the left. Jay Miller photo

some flexibility in meeting trains, and the length of these sidings sets the maximum length of most trains. (Yard and staging tracks also need to hold trains of that length.) Ideally I like to see at least 1½ train lengths of main line between passing sidings, to avoid crowding and allow some cross-country running.

While it may seem heresy to some, double track would be a good choice for the traffic density of many model railroads. It also happens to be prototypical for a lot of busy mainline railroads, including the part of the Santa Fe that I model. Usually double-track railroads need passing sidings too, unless Centralized Traffic Control allows running either way on either track (really two main tracks instead of double track).

Yards. I explained most of my criteria for yards in my article “13 tips for freight yard operation and design” in the June 2010 MR. I'll just add a couple of ideas here. I've learned that engine terminals can slow yard operations unless there's adequate track capacity to handle incoming and outgoing locomotives simultaneously. A turntable with only a single lead track, for example, will be a choke point at a busy yard.

For any era when a caboose was still a part of every freight train, a caboose track (or two) is pretty much a must.

One way to think of it is that the yard needs the capacity to store as many cabooses as there are road locomotives in the engine terminal. If it's a crew-change point where cabooses are swapped on through trains, it might need to store even more of them.

I've also learned to appreciate the importance of yard auxiliaries such as RIP (repair-in-place) tracks, scale tracks, icing tracks, and stock resting tracks (adjacent to pens for resting, feeding, and watering livestock in transit). These add interest and realistic action, so the more of them in a track plan the better.

And even as a confirmed “yard guy,” I'll admit that you don't *have* to have a yard. Our managing editor David Popp used to have a yard-less Soo Line layout that was a lot of fun to run. To make it work, you have to be able to set up all the trains you'll need in staging or in a fiddle yard. It can be done, even though I wouldn't necessarily want to.

Looking for more? *Model Railroad Planning* magazine as a rule approaches layout design from an operational perspective. I share the feeling of the late John Armstrong that all model railroads should be designed as if they were going to be operated, at least to some degree. To me this just makes any layout look more like a railroad.

In and out of staging

West Mesa operator's territory

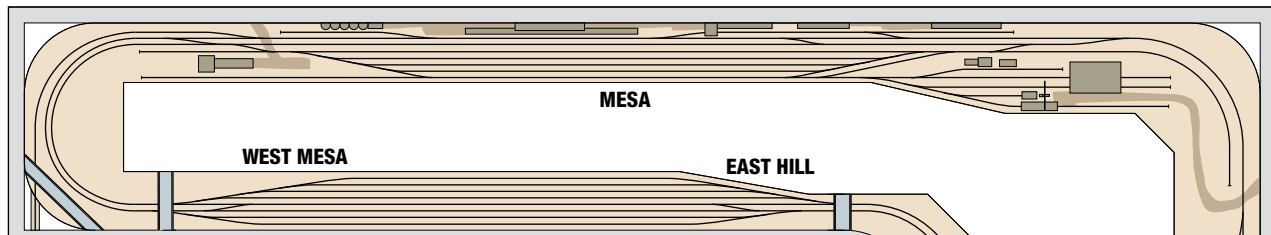


Illustration by Rick Johnson

Many layouts have a major yard connecting to a staging yard at one end. If the on-scene yard is also a crew-change point, a place where engineers start and end their runs over the layout's main line, a question comes up in regard to crew assignments: Who will run the trains between the on-scene yards and off-scene staging?

When you're concerned about providing realistic railroad jobs on your layout, that question isn't trivial. Ideally these movements will be handled by someone other than the road engineers whose job is running trains across your layout. Actually changing operators makes the crew change more significant.

On some layouts the answer to this question is "the yard guy." When I've been in that position, I usually haven't found moving trains in and out of staging to be an objectionable burden. However, this approach fails in terms of a realistic job description for the yardmaster or yard engineer.

Here are some other answers. I wouldn't say any one is best, except to the extent that it fits the circumstances of your layout.

Off-duty road engineers. On our old Milwaukee, Racine & Troy HO club layout in downtown Milwaukee, we needed to move several transfer runs between the west end of our through staging yard, called "Allis," and the on-stage, working Port Marquette Yard. This didn't amount to much of a run even though our "work rules" let inbound transfers from other railroads turn and take a cut of cars back to staging from the MR&T, instead of returning "light," meaning without cars.

People quickly learned not to bid on these lousy jobs when they were posted

on our call board, so we stopped trying to get engineers to sign up for them. Instead, operators picked the mainline runs they wanted, but all of those didn't leave immediately when the session started. That meant we usually had at least one or two engineers with time to kill until their next road job, and they gladly worked the transfers to have something to do.

Fiddle operator. Where there's some form of active staging, such as a fiddle yard restaging trains during the session, the fiddle yard operator may run trains between the offstage tracks and the on-stage yard. On Bill Darnaby's HO Maumee Route, that's usually Bill himself. He runs freights and "pullers" (yard transfers) between the fiddle yards and his on-scene freight yards. And he runs passenger trains to and from the stations at each end of the main line, where the crew change would ordinarily be made on these first-class jobs.

This lets road crews have a realistic trip over the Maumee's First Subdivision, the modeled main line representing one crew district, and get off their trains after doing their day's work. The fiddle operator doesn't have a real-life equivalent anyway, so it's not compromised by moving trains to and from staging.

Yard hostler. David Barrow's former HO Cat Mountain & Santa Fe Ry. had an open through staging yard across the aisle from the western terminal of his main line, Mesa, Texas, as shown above. The staging yard, called East Hill at the east end of the run and West Mesa at the end closest to Mesa Yard, represented both ends of the modeled railroad.

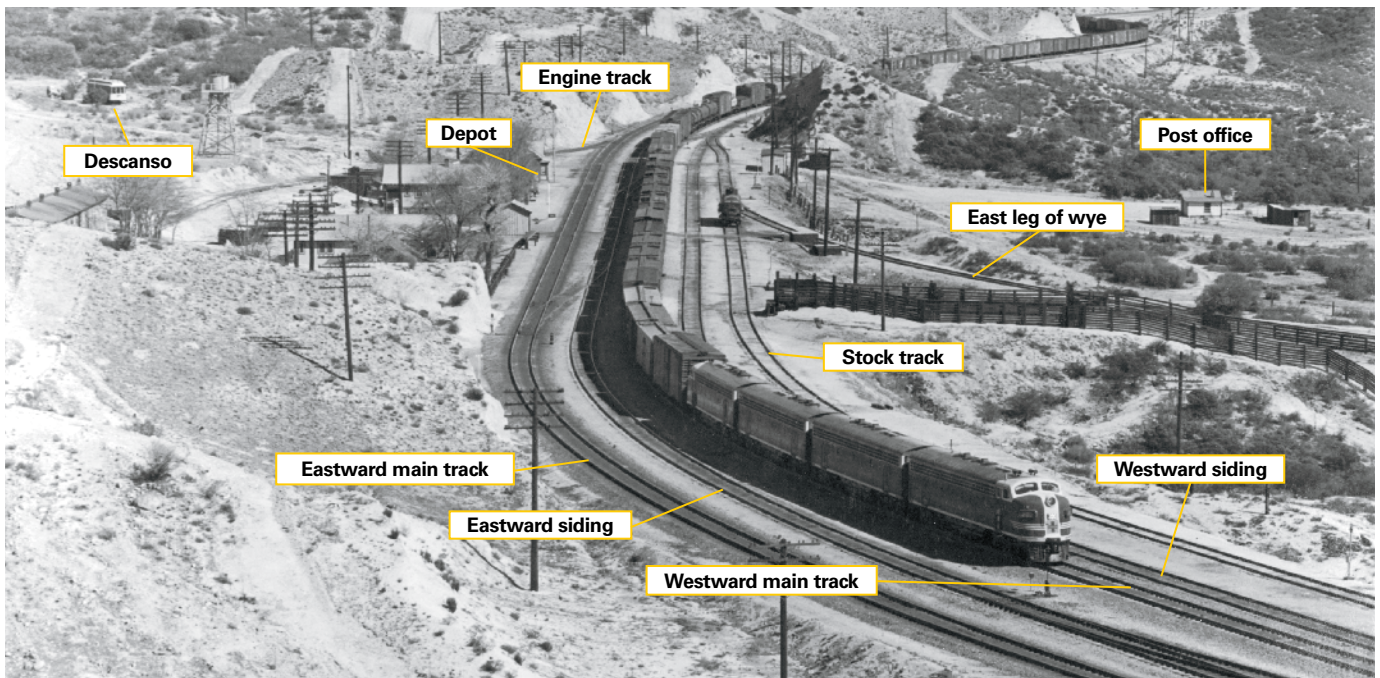
In addition to a Mesa yardmaster, David instituted the job of West Mesa

operator. When needed to move trains between Mesa and West Mesa, this person functioned as a kind of yard hostler, shifting trains between the classification yard and the mainline fueling and inspection sidings, which is how David thought of his open staging yard.

When not shifting eastward or westward trains, the West Mesa operator worked as a second yard engineer at Mesa, helping with classification or industrial switching. It was an interesting job with at least some prototypical basis, and it let road crews work over a realistic district between Mesa and East Hill.

Automation? For some, the ultimate answer might be to automate movements in and out of staging with a combination of command control and a computer interface. This has its own challenges, especially since realism may require the software-driven "crews" to hostle engines between the yard and the roundhouse. Even if that's beyond your interests, there are several good ways for people to do the job.

Name every track



Every track has a name on prototype railroads. Some names may be official and some may be informal monikers. Either way the names allow railroaders to communicate clearly about locations of trains, engines, and cars, and about movements between the various tracks. That's something we'd also like to do in model railroad operation. The names given to tracks can sometimes clarify their purpose, and often they add colorful touches of historical context.

Those of us modeling prototype roads can transfer these benefits to our layouts by learning and using the prototype names. For freelance modelers, naming tracks on their layout like the prototype does will add another layer of realistic detail as well as serving useful operational purposes.

Santa Fe examples. To help get you started, here are a couple of my favorite examples from the Atchison, Topeka & Santa Fe's line over Cajon Pass in southern California.

Officially that line was the First District of the Los Angeles Division, part of the Coast Lines grand division including all of the AT&SF west of Albuquerque, N.M. Every part of the railroad was divided into districts (equivalent to subdivisions on other railroads), divisions, and grand divisions, all named.

At Summit in the photo above, the names of the main lines and sidings explain their function. It's obviously a big help to know how all these parallel tracks were used. The First District was then (and until 1972) a double-track railroad with trains moving with the current of traffic governed by automatic block signals. Eastward trains didn't run on the westward tracks except as directed by written train orders.

Helpers on the eastward main or siding at Summit could cross the westward tracks to reach the wye because this area was within yard limits (see the column "Yard Limits" in the February 2007 *Model Railroader*, page 128).

Historical context. My other example is from the engine terminal at San Bernardino, the west end of the First District. When FT freight diesels began running into this terminal after World War II, there was no diesel house there and no way to get four- or even three-unit consists onto the turntable.

There was, however, a long track with an inspection pit just south of the roundhouse. It had been used to store Mallet articulated steam locomotives that also didn't fit on the turntable. It was known as the "Mally track," from the way railroaders pronounced the French name with a silent "t."

A westbound Santa Fe freight makes a brake test at Summit, at the top of Cajon Pass, before descending the 3 percent grade ahead. There were lots of tracks at this remote station, and every one had a name. Robert Hale photo

By 1945 the Santa Fe hadn't used articulated steamers on the Los Angeles Division in years, but on railroads, names tend to stick. The Mally track, still called by that name, made a handy place to park the FT locomotives.

Function and imagination. Does every track on your railroad have a name? It's hard to think of another way that we can add so much functionality and atmosphere for the cost of just a little time and imagination.



The pit track south of the San Bernardino roundhouse was still the "Mally track" even when it served multi-unit diesels, as in this 1947 view.

Wm. W. Turkington photo

Yard work

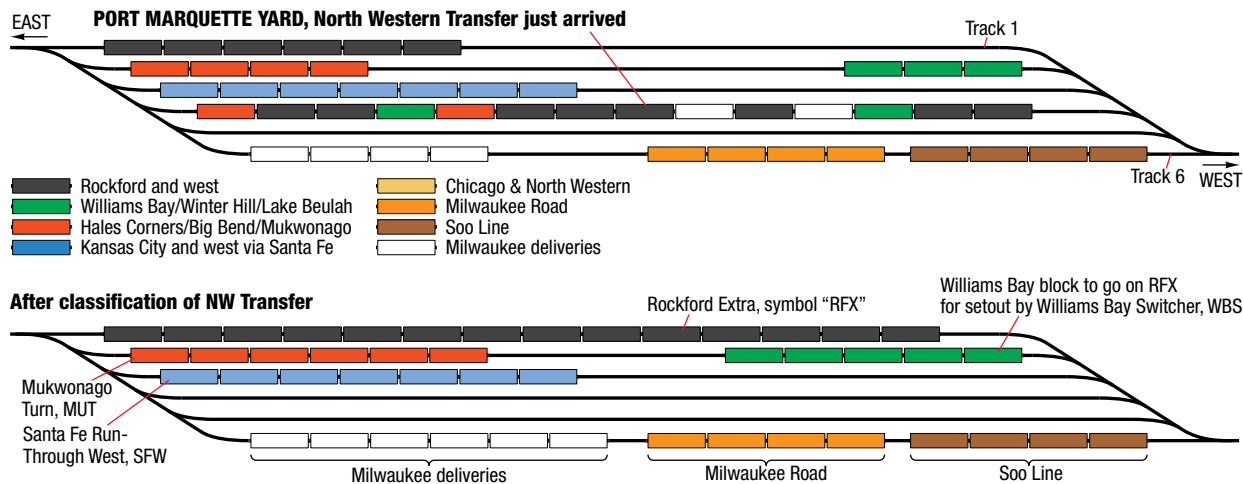


Illustration by Rick Johnson

I'm almost always willing to take on a freight yard job when I'm invited to an operating session. It really doesn't matter if I've even seen the layout before or know anything about its operating patterns – I'm happy to do it. Am I just foolhardy and overconfident?

Quite possibly. However, I've also learned through experience and observation how yards are supposed to work, and I know they all pretty much work the same way.

The basic function of any freight yard is what the railroads call "classification." That's sorting cars with similar destinations or routings together to build trains, or blocks for trains carrying cars with multiple destinations. Each grouping is a "classification," and you "classify" cars by sorting them.

For efficiency, the classification needs to be done as cars arrive in the yard, so trains are ready before they're scheduled to depart.

Port Marquette Yard. I can illustrate classification switching with an actual example instead of something abstract. The diagrams above show Port Marquette Yard, the Milwaukee freight terminal on our old HO scale Milwaukee, Racine & Troy club layout. The colored blocks represent cars, and the key shows the classifications represented by each color. Notice that we had eight classifications but only six tracks in the yard. Some doubling up was necessary, especially since the yard crew kept at least one track clear for arriving trains. Hav-

ing more classifications than tracks is typical of model railroad yards.

In the upper diagram, track 4 is occupied by cars with a variety of destinations just brought in by a transfer from the Chicago & North Western. The next assignment for the two Port Marquette switchers, one working from either end, is to classify the cars from the North Western and add them to the blocks already standing in the yard.

(There are no cars in Port Marquette for the C&NW because the transfer job took them back to its base in Butler, Wis., represented by a staging track to the east.)

Classification builds trains. The lower diagram shows the yard after the cars from the North Western have been classified. As you can see, they've been assembled directly into blocks being built for outbound trains, as identified in the lower diagram.

The RFX and SFW are both through trains headed west. The WBS and MUT blocks on track two are both for way freights, but they'll be handled differently. The WBS block will go out on the head end of the RFX, and that train will set out those cars at Williams Bay for a road switcher based there. The MUT operates as a turn to its namesake station and back, and it'll be clear to pull to the west out of track two once the RFX departs with the WBS block.

The cars on track 6 are in three blocks. The Soo cars are at the west end for pickup by a westbound Soo train

operating over the MR&T on trackage rights. After a few more Milwaukee Road cars show up in arriving trains, the yard crew will pull the middle block off six and start building a transfer for that connection on track 4 or 5. When there's a lull in the yard switching, the east end switcher will spot the Milwaukee deliveries at local industries, returning to the yard with pickups to be classified.

Where to next? And so it went. The yard was always in a state of flux as trains came and left, but outbound trains were usually ready in plenty of time for departure because we classified the incoming cars upon arrival.

I haven't said anything about our car-routing system. We had one, but its particulars don't matter. As long as the paperwork in your operating system indicates where cars arriving at a yard are going next, you'll have the essential information needed for efficient classification switching.

Engine hostling



Hostlers line up 4-8-2s and 2-10-2s on the Illinois Central ready tracks at Paducah, Ky. Robert Hale photo

Engine hostling, moving and servicing motive power in terminals, is a job deserving more attention on model railroads. It's a chance to enjoy our favorite railroad equipment, the locomotives, up close and without the distractions of mainline operating rules. A hostler can also save time for other operators. Yardmasters and road engineers have other things to do; the hostler's job is taking care of the engines.

Just getting inbound power out of the way, turned if necessary, and lined up for its next job can be time-consuming. For increased realism you can allow time to simulate servicing and inspections.

Different railroads and varied union work rules make for various ways of organizing hostling duties. One common arrangement makes hostlers responsible for all movements within the engine terminal. An arriving road crew leaves their engine on an inbound track, perhaps with the firebox of a coal-burning steamer over an ash pit.

The hostler takes over from there to move the engine through the process of

cleaning, inspection, servicing, and repair. The engine might be stored in a roundhouse stall or outdoor storage track if not immediately required. When the locomotive is assigned to a departing train, the hostler moves it to an outbound engine lead, where the road crew called for that train would take charge.

(For a model railroad example of a typical steam servicing sequence, see "The Maumee turns a Mike" by Bill Darnaby in the July 1996 *Model Railroader*; for diesels see "Diesel locomotive servicing" by Jim Hediger in the June 1982 MR. The 1996 issue can be ordered on ModelRailroader.com.)

In some cases hostlers also move engines beyond the engine terminal, perhaps to handle passenger engines between the roundhouse and a station some distance away. Or they might take engines too long for the turntable to a wye track for turning. The railroad may distinguish between inside hostlers, who handle locomotives only between the lead tracks and the roundhouse or shop, and outside hostlers, who can work anywhere within specified terminal limits.

Model terminals that handle many engine changes or helper engines are good candidates for full-time hostling jobs. The hostler might also wear the roundhouse foreman's hat to make engine assignments, staying in touch with the yardmaster and dispatcher to anticipate power requirements.

If you don't think your engine terminal is that busy, you might still benefit from part-time hostlers. Off-duty crew members awaiting assignments can pitch in as hostlers to keep the engine leads fluid and the locomotives moving through a simulated servicing routine.

If a model engine terminal is reasonably complete, the hostler's job has more appeal than many seem to think. You might find your operators lobbying for full-time hostling assignments.

Caboose operations



The way car (caboose) tracks at the Atchison, Topeka & Santa Fe's Barstow, Calif., yard were busy in 1948. Train crews ran out of this terminal in three directions – north, east, and west – and every freight train that arrived left with a different way car. Donald N. Nesbit photo

Cabooes have been missing from most freight trains since the 1980s, but for many of us they're still a necessity. And all of us who model some period before the caboose's demise can take advantage of the additional movement and interest they add to our operations.

Caboose functions are worth reviewing since they've been gone so long. A caboose was a shelter for the conductor and flagman/brakeman, an observation post so they could keep watch on their consist, and an office for the conductor's paperwork. It had a pressure gauge to monitor the train's air brakes, and a brake valve for emergencies.

Many cabooses had combined air whistles and brake valves on the end platforms for signaling and braking during backup movements. Around 1950 cabooses began to carry two-way radios for conversations with the engine crew and wayside stations and towers.

The caboose could serve as living quarters at the train crew's away-from-home terminal. Usually it had a table with seats, a stove and sink, an icebox, bunks, and a toilet. Living aboard

gradually became less common, but a few crews did so into the 1950s.

Other installments of "The Operators" explained how the caboose was the base for flag protection at the rear of the train (September 2008 *Model Railroader*), and how it carried the markers showing that the train was complete (August 2007 MR).

Switching cabooses at crew terminals was necessary for years. Until fairly late in the game – the mid-1960s on many roads – cabooses were assigned to specific crews. This was generally a part of labor agreements on work rules that railroads were obliged to follow.

Crews worked on districts (or subdivisions) of 100 miles or more, and long-distance trains required several crews to reach their destination. Every time the crew changed, the old crew's assigned caboose was switched off the train and the new crew's caboose put on. Even if all cars in the train were going through, and the locomotive too, there was still some work for a yard engine.

If the yard on your layout is a crew-change point, assign some of your

cabooes to the district to the east and others to the one to the west. Any train passing through gets its caboose changed. If you use a card-order system, the district assignments can be entered on each caboose's car card. Or letter division assignments on the cabooses themselves, as some of the big roads did.

For a higher level of detail, note the time on your fast clock when an arriving caboose is spotted on the caboose track, and use that as an off-duty time for the incoming crew. Then don't use that caboose again until its crew is rested, at least eight fast hours later.

You might find yourself running out of assigned cabooses during an operating session, or at least running short of cars representing rested crews. That's a great excuse to buy or build more cabooses – as if you needed one.

More caboose tricks. If you run more trains in one direction than the other, even occasionally, you might run short of cabooses at one end of the subdivision. Prototype roads tried to anticipate this and balance cabooses just as they did locomotives. In anticipation of a westbound weekend rush, for example, a few eastbound trains at the end of the week could have two or more cabooses, as is shown in a photo in *The Operators* in June 2009.

Only the rear car of a multi-caboose train necessarily carried a working crew, however. The other crews, paid to "dead-head" to the other end of the district, might ride a passenger train.

Regular runs such as a five-day-a-week way freight often attracted high-seniority crews because of the regular hours. Their cabooses in effect became "assigned" to those trains, and were thus subtracted from the pool available for through trains. Oh good, now you need still more cabooses!

These are just a few of the ways that prototypical procedures can let us have more fun with cabooses. Give them a try and it won't be just nostalgia making you glad you still use cabooses on your road.

Servicing passenger trains

A friend asked about a typical servicing sequence for passenger trains. Here's what I saw at New Orleans Union Passenger Terminal in the late 1950s and 1960s. It could easily be applied to operations on a model layout.

Arriving trains. When a train arrived, it backed into its station track after turning on the wye out beyond the coach yard. Once the passengers got off, the road engine was uncoupled and it went out to the enginehouse adjacent to the coach yard.

A switcher coupled on, and a carman uncoupled the head-end cars that were to be set out on the mail and express tracks on the downtown (northeast) side of the station. Checked baggage was usually unloaded onto carts on the platform, and the car carrying it might stay with the train, although there was a baggage track on the downtown side of the station, near the baggage room.

With the switching of the head-end cars out of the way, the switcher returned to pull the consist out to the coach yard. Car inspectors had been going over the cars since the train arrived, noting required repairs.

Coach yard. In the coach yard, the consist would be set out on a cleaning track for the cleaners to work through. Cars needing repair were set out on the RIP (repair-in-place) track. If a car would be out of service for long, a substitute might take its place. This was also when consist adjustments were made for the next trip's loading.

Clean linens from the railroad's and Pullman Co.'s laundry and supply rooms were carted out to the trains on the cleaning tracks. Commissary supplies for the dining and lounge cars were handled similarly, though I also often saw diners and lounges loaded from carts wheeled out on the station platforms just before departures.

When the train was ready, the last coach yard move was to pull the consist through the car washer so it would arrive at the platform fresh and clean.

Ready for departure. A switch engine backed the passenger cars for an outbound train into the assigned station track an hour or more before it was due



In 1954, the arriving Louisville & Nashville *Humming Bird* from Cincinnati backs toward New Orleans Union Passenger Terminal. The coach yard is at the right, and the engine terminal is on the left. James G. La Vake photo

to leave. Meanwhile express, baggage, and mail cars had been loaded on their assigned tracks. After the passenger consist was spotted, a switcher would gather up the head-end component and couple it on.

Then the entire train would be blue-flagged, protected by a blue metal sign reading *MEN AT WORK*. By rule, a train so marked couldn't be coupled to or moved, allowing carmen to connect it to station air and steam lines. They also made the air and steam connections through to the head-end cars.

About half an hour before departure the road power backed from the enginehouse to the station track. If the blue flag was off, the road engine coupled on. Then the blue flag went back up while the steam and air were made through to the road engine, the station connections were uncoupled, and the terminal air test was done. Passengers were boarding at this time, and last-minute mail and express were being loaded.

Shortly before departure the blue flag came off, and the conductor brought the engineer his copies of the clearance and train orders. The engineer turned on the

headlight and signal light (if any), alerting the Clara Street Tower operator to line the train out if he hadn't already done so.

At departure time the conductor called "All aboard!" the engineer blew the air horn, and away they went.

Variety and consistency. Many head-end cars reached the coach yard only when they needed repairs or to be stored when not required on the next trip. They rarely visited the car washer. A passenger consist might remain together for days or weeks at a time, but the head-end cars – except Railway Post Office cars (RPOs) – could vary from day to day. There were fewer RPOs, so they stayed on their assigned runs longer.

I designed a track plan for modeling NOUPT operations that appeared in the October 2002 *Model Railroader*; it's also included in my book, *The Model Railroader's Guide to Passenger Equipment & Operations* (Kalmbach Books).

Freight station operations



Less-than-carload lot (LCL) package and merchandise traffic lines a covered freight station dock at the Chicago & North Western's Proviso Yard in December 1942. Note the light-colored refrigerator car on the far track. Office of War Information photo, Library of Congress collection

Many of our model railroads have freight stations, but we don't always make the most of their operational possibilities. Especially for medium to large cities, freight stations can be among the busiest industries on our layouts.

Freight stations provide rail service to businesses that don't have their own rail sidings. You can think of a freight station on your layout as an industry multiplier. In the space you might devote to one small or medium size factory, your railroad can serve many unmodeled customers at a freight station.

Less-than-carload lots. Most of the traffic moving through freight stations was "LCL," varied cargos in less-than-carload lots. The freight station received LCL from a variety of shippers, consolidated it into carloads moving to like destinations, and sent it on its way, primarily in boxcars. It also received carloads of LCL from other stations. Customers could pick up and deliver with their own

trucks, the railroad might have a trucking arm of its own, or it might contract with a private trucker.

Right into the 1950s, the railroads had enough of this traffic to schedule dedicated "merchandise" freights carrying all or mostly LCL. However, this was retail transportation, and railroads are best at wholesale. As early as the 1930s, some railroads leased space in freight stations to forwarding companies that operated pickup and delivery trucks and consolidated their own loads for rail shipment. Ultimately freight stations were sold to freight forwarders, although for our purposes they still worked much as when the railroads owned them.

While LCL disappeared from freight stations by the end of the 1960s, a good share of it is still on the railroads in the form of TOFC (trailer-on-flatcar) traffic.

Opportunities. Here are six ways to take advantage of the operating potential of freight stations.

1. Schedule setouts and pickups.

You can establish cutoff times requiring arriving cars to be spotted in time to make the next morning's scheduled truck deliveries. Also set deadlines to have outbound cars in the yard in time for either a merchandise train's departure or for pickup by a merchandiser passing through.

2. Use parallel tracks for loading and unloading from one dock.

It was common to spot cars so their door openings lined up, allowing bridge plates between cars to connect the outer cars to the dock.

3. Reload "foreign" empties. Cars from other railroads can arrive at your freight station with LCL from across the country. When those cars have been "unloaded," reload them – a paperwork procedure – with outbound LCL (toward their home roads, if possible).

4. Use refrigerator cars for LCL.

Empty "RS"-type reefers (ice-bunker cars without meat rails or other special equipment) often carried clean, dry freight on their way back to perishable-producing areas. Or if your road serves a produce-growing region, your freight station may receive LCL in reefers coming home from distant markets.

5. Load LCL "peddler cars" for way freights.

Pull the peddler boxcar from the freight station and couple it at the head end of the way freight. Besides its other work, the local will stop for five or ten minutes at each station along its run to unload and load LCL. At the end of the way freight's trip, spot the peddler car at that terminal's freight station.

6. Make it a separate switch job.

At large, busy locations, an engine and crew might work for part or all of a shift to spot the freight station tracks and transfer cars to and from the classification yard.

For more on freight station operation, see "From the freight house to everywhere," by Mark Vaughan, in *How To Build Realistic Layouts: Industries you can model*, a *Model Railroader* special issue. Another good reference is "Package and LCL Traffic," Chapter 6 in *The Model Railroader's Guide to Industries Along the Tracks 2* by Jeff Wilson, from Kalmbach Books.

Helper operations



This four-unit set of matched F7s is headed away from us, pushing a Baltimore & Ohio coal train up West Virginia's Cranberry Grade from behind the sturdy steel wagon-top caboose. The flag on the side of the nearest cab unit is a marker indicating the rear of the train. H.W. Pontin photo

Helper operations on model railroads can transform an operating problem – a grade steep enough to limit train length – into an operating highlight. It's perfectly realistic to get long and heavy trains over a steep section of line by adding extra locomotives, whether steam, diesel, or electric. Before today's radio-controlled distributed power units (DPUs), those added locomotives most often had their own crews who worked as a team with the road engine crews to get trains over the railroad's Big Hill.

Digital Command Control makes it easy to independently control two or more locomotives on one train. That makes helper service an opportunity that can add excitement to your railroad's operations.

Double-heading, with the helper in front of the road engine, is the simplest way to add power to a train. This was often done on passenger trains, but was used on freights too. However, too much power applied from the head end might exceed the strength of the cars' draft gear.

Draft gear limitations aren't a problem on model railroads, but our sharp curves can introduce another difficulty, "stringlining." That's when the power up front and the load behind are each great enough to pull cars off the inside of a curve, as if drawing a straight line between points along the arc.

Pushers at the rear of the train reduce the strain on prototype draft gear, since

many drawbars are in compression instead of tension. Having part of the train pushed rather than pulled also makes stringlining less likely on a model railroad. If neither engine can move the train by itself, the pusher can't derail the train by buckling it in the middle. If either engine hesitates, the train stalls.

With cabooses, the question is whether the pusher can be behind the cabin or must be ahead of it. Often the deciding factor was whether the prototype's caboose had a steel underframe to transmit the pusher's power. There were also laws in a few states requiring pushers of a given weight or tractive effort to be ahead of occupied cabooses.

If the pusher is ahead of the caboose, some kind of switching maneuver is needed to cut the pusher out of the train and get the caboose back on. Then the train needs to make a standing set-and-release brake test. This can add interest even to through freight runs.

There's also drama in dropping a pusher on the fly from behind the caboose. The big roads did it with a long valve handle on the caboose platform to close the angle cock in the brake pipe, as well as a chain or extension lever to lift the coupler pin. The pusher's brakes set automatically when the air hoses separated and the train went on its way.

On model railroads we can simulate this maneuver by blocking open the knuckle of the pusher's front coupler. The pusher can stay with the train just

by pushing hard enough to help. When the train starts over the summit, the pusher engineer can back off his throttle and let the train pull ahead.

Mid-train pushers add more complication, both in getting the helpers into the train and out of it again. This was usually done where there were crossovers between parallel tracks.

Operating rules treat helpers as part of the train they're helping. The helper crews receive copies of all the clearances, train orders, or track warrants delivered to the train while they're helping it.

Once cut off from a train, a helper engine needs independent authority to return to its base. Typically it runs as an extra train.

On a road with two or more main tracks and current-of-traffic signalling, such movements were often authorized with a clearance card assigned a number and okayed by the dispatcher. On single track the light (without cars) engine would need a Form G running order.

Under Centralized Traffic Control, a clearance might be issued from an open office, or the crew could get the dispatcher's verbal authority, by telephone or radio, to proceed to the next signal and run on signal indication from there. Under track warrant authority the light helper needs its own warrant.

However it's done, getting the helpers back to their base adds at least one train movement down the grade for every train that needs help going up.

Industrial switching layouts



Lance Mindheim's HO East Rail layout represents a CSX industrial park in Miami. The unloading rack in the foreground is for propane tank cars, and it's a great example of how compact an "industry" can be. Lance Mindheim photo

If you're looking for a layout theme, consider the example of several leading model railroad operators who have built industrial switching railroads. What these workaday lines lack in mainline glamour and drama they make up for with concentrated switching movements. If industrial switching is what you most enjoy, you can make it the focus of your model railroad.

Those who have built and are operating industrial layouts find that they have many advantages. I'll explain some of them here, and highlight some of the opportunities such layouts offer for operating realism and interest.

Simplicity. Many industrial layout owners cite their less-complex operations as an advantage compared to more elaborate mainline systems. Timetable schedules, signals, telephone or radio communication, and complicated controls are largely or completely unnecessary. The operating environment can be more relaxed, with time to think and pay attention to the details of basic switching movements. This may be an easier path to the kind of operating fun you're looking for.

Simplicity can also equate to easier and less-costly construction. Narrow shelf construction and industrial layouts

are a natural match, meaning you have to model only a relatively narrow strip on either side of the railroad, much of which can be taken up by industrial structures and installations. Benchwork can be basic, and a minimum of roadbed structure would probably be most realistic for this kind of railroad.

Manually operated turnouts can be the norm, combining lower expense and prototype authenticity. If you prefer powered turnouts, you can use the simplest controls located in line with the switch points on the layout fascia, where they'll be convenient for walkaround use. That will both minimize wiring and help maintain the working atmosphere of a switchman on the ground.

Structure modeling may be the greatest challenge in building an industrial railroad. However, the operational function of most structures is to give purpose to the placement of cars, and that can be fulfilled by illustration-board or foam-core mock-ups until you have time to complete fully detailed models.

Multiple prototypes. The variety on hobby shop shelves presents a dilemma to many of us: how to model just *one* railroad when there are so many attractive possibilities. Industrial railroads can

offer believable ways to run trains from several prototypes on one layout.

One approach is to model transfer operations. In cities where several railroads have terminals, these inter-yard runs move connecting cars from one to the other. Locomotives and cabooses from any line can thus enter your railroad to deliver interchange cars to a yard. Often work rules dictated transfers could handle cars only from their own lines, so the transfer power and caboose would return home "light," without cars.

A good example of this is Chuck Hitchcock's Argentine Industrial District Ry., featured in the February 2007 *Model Railroader*. Chuck's layout represents a Santa Fe yard in Kansas City and five nearby industrial switching zones. But in addition to the home road switch jobs, transfers from each of the many other lines in Kansas City arrive to bring in connecting cars.

Another angle is to model an industrial area with overlapping or parallel lines. Each railroad would have its own industrial zones to serve, and there could also be some joint service areas to provide competition between carriers. Transfers and interchange connections could be included as well.

Paul Dolkos' Baltimore Harbor District layout, featured in the 2010 edition of our annual *Model Railroad Planning* magazine, demonstrates this approach. The Baltimore & Ohio, Canton RR, and Western Maryland each have their own industrial zones to switch on Paul's layout, and transfers arrive from the Pennsylvania RR too.

A developing trend? Industrial switching railroads have been planned by some leading layout designers since the earliest days of our hobby, but I think more of them have actually been built and operated in the last 20 years than in all the time before. The advantages I've pointed out and more are appealing to growing numbers of model railroad operators.

Innovations continue, and many new ideas are included in the article "Grow your operations, not your layout" by Lance Mindheim in the *Model Railroader* special issue *How To Build More Layout in Less Space*, available from dealers or from ModelRailroader.com.

“Loading zones”

One way to add to the operating interest and realism of a layout is to follow prototype practices for track arrangements and car spots at industries. That gives more meaning to how we place cars when switching those industries, and looks more realistic too.

The photo here is a good example. Tony Koester built the tracks at the Low Gap tipple on his former HO railroad, the Allegheny Midland, to follow a common mining country pattern from the days of “loose car” railroading, back before unit trains or loading on the move.

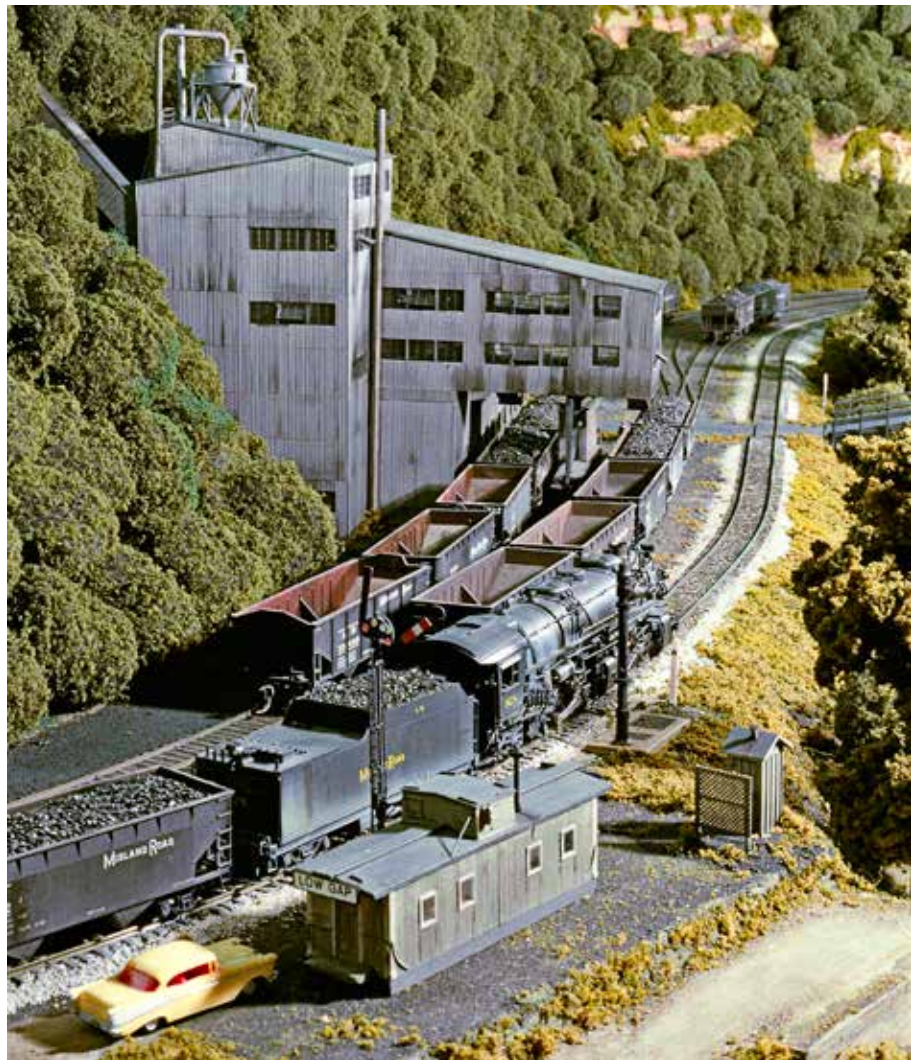
Loading sequence. Empty hoppers are placed on the two tracks passing under the tipple, but either entirely past it (toward the camera) or with the first car on each track under a loading chute. Typically the tracks are built with a slope from the empty car end in the foreground to the loaded car yard in the distance, with the cars held by hand brakes.

To spot a car for loading, a tipple worker releases enough brakes to let the cut roll under the tipple, then applies one brake to stop the first empty under the chute. When the car is filled, the hand brake can be released to roll the next empty into position, and so on. When a short cut of cars has been loaded – short enough to be safely controlled by hand brakes – the loads can be uncoupled and allowed to roll into the loaded car yard.

When the Midland Road’s Coal Fork Shifter arrives to work the tipple, the crew finds the empty tracks vacant and the load tracks full. They pick up the loads to haul to the coal marshalling yard, and spot another set of empties past the tipple.

At smaller tipples and truck dumps there might be just one shorter track holding only a few cars, but the principle is the same. And note that only as many cars as fit on the track upgrade from the tipple can be loaded before the track must be re-spotted, and that there has to be room below for that many loads.

Model subterfuge. Alas, gravity switching controlled by hand brakes is pretty hard to reproduce in HO scale. In reality, the Shifter picked up the loads and spotted the empties on mostly level tracks. The empty hoppers then stood still until the end of the operating session.



The Low Gap tipple on Tony Koester’s old Allegheny Midland layout is a good example of realistically arranged loading tracks. Tony Koester photo

Between sessions, Tony put loads in the cars and rolled them by hand to the load yard, ready for the next visit of the Coal Fork Shifter.

Nevertheless, the tracks were laid out to support a realistic loading sequence, and even those who didn’t know how a coal tipple worked could learn from the model railroad. And Tony could stage a photo like the one here showing the tipple in the midst of loading its daily allotment of hoppers.

Not only mines. Similar patterns applied for other kinds of bulk commodities, including cement and grain. Large grain elevators used long double-ended tracks where 40-foot boxcars were fed into one end and came out the other,

either loaded or unloaded, or both. Rather than gravity, it was more common to have car pullers or privately owned switch engines move the cars through the loading/unloading sheds.

Hand-powered subterfuge works for model elevators, even during a session. See “Switching Santa Fe’s Elevator ‘A,’” by Chuck Hitchcock, in *Model Railroad Planning 2006*. But also see “Working car puller for your soybean plant,” by Bill Darnaby, in our 2007 special issue, *How To Build Realistic Layouts: Industries You Can Model* (for the back issues go to KalmbachBookstore.com).

For any industry, if we model not just the buildings but the prototype’s car handling patterns, we can find greater realism and switching satisfaction.

THE OPERATORS

Sure spots for switching fun

Milwaukee 20451 to door 8



Andy Sperandio photo

“Sure spot” is a term some railroads use for placing cars at specific track locations, not just anywhere near the customer’s building. Shippers and receivers usually need cars placed precisely, as at numbered doors, for loading or unloading. For us this can add to the fun by requiring additional switching to line up and spot cars as specified on waybill cards or switch lists. Here on *Model Railroader’s* HO scale Beer Line layout, a Milwaukee Road boxcar is being delivered to door 8 at the freight house.

On the right track at Schlitz



Andy Sperandio photo

When industries have multiple tracks, each track usually serves a particular purpose, and the customer wants certain cars placed on certain tracks. At the Beer Line’s Schlitz warehouse, the switch list orders cars to be placed on track 1, 2, or 3 (from left to right). The switch crew usually sorts cars for like tracks together so that each track’s cars can be spotted with one shove. Making the fewest possible movements inside the building is generally safest for both railroaders and warehouse workers.

Loading rack for three cars



MR staff photo

At the ethanol plant on MR’s Wisconsin & Southern layout, each tank car is uncoupled to be spotted at a filler point along the loading rack. Only three cars can be spotted at a time, and any extra empty cars will be left “off spot.” That means leaving them on the plant lead off to the right, or on a storage track, to be placed the next “day” (operating session) after the loaded cars are pulled. The left-most spot also serves for unloading the gasoline used to denature the ethanol. When, as in this photo, a gasoline car is spotted for unloading, only two ethanol cars can be loaded at a time.

Modeling livestock traffic

Stockcars have a place in many of our freight car fleets, and stock pens or stockyards are common models on our layouts. But are we making use of the operational opportunities in livestock traffic? Modeling the details of livestock operations could add movements and interest on many model railroads.

Preparation. Before loading, stockcars had to be cleaned, inspected, repaired as needed, and “bedded.” This last meant putting down a layer of sand, and perhaps also straw or hay, on the floors of the cars.

To model these activities we can switch empty stock cars to a designated cleaning or bedding track, or to a repair track in a nearby yard, for a preparation period before moving them to stock pens or stockyards for loading.

Don’t forget that the sand and hay have to come from somewhere. Deliver occasional carloads of these to supply your livestock operation.

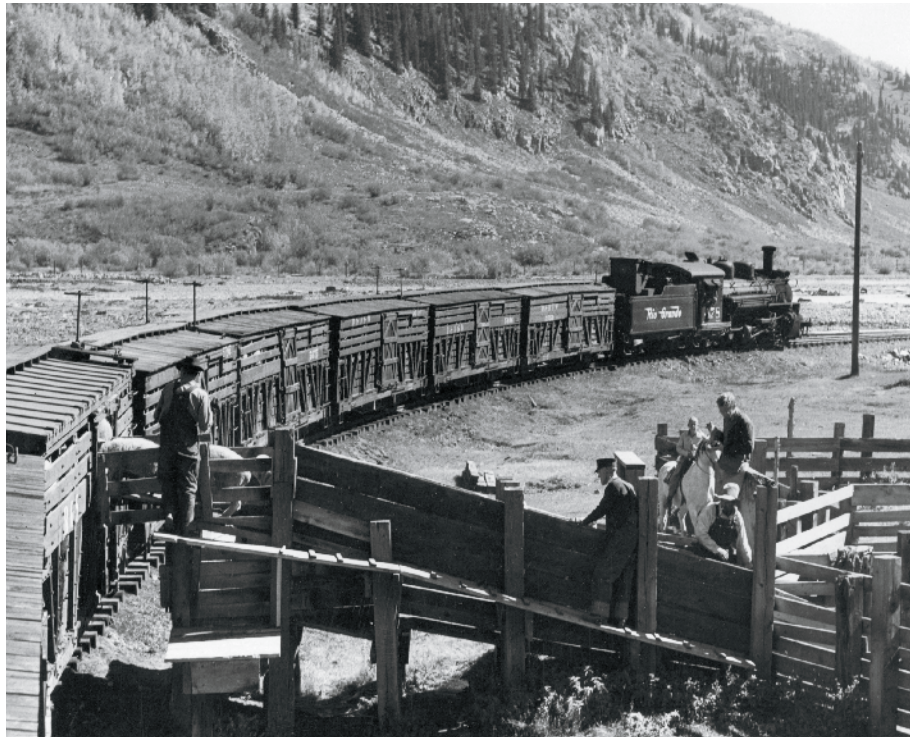
Loading. Obviously we’ll spot stockcars with their doors lined up with the loading chutes. Chutes were ordinarily spaced about 40 feet apart, the length of a typical stock car, so more than one car could be spotted in one move.

If you have more cars to load than chutes, you’ll need an engine standing by to re-spot empties. In the photo above, the locomotive is pulling the stockcars up to the single loading chute one at a time to receive sheep. (Sometimes cars could be re-spotted by gravity, or by men with pinch bars if only a few cars had to be moved.)

The ranchers or “drovers” shipping the stock drove the animals into the cars, but railroaders often helped, including the train crew, station agent, and even the local section gang (track workers) for large shipments.

Shipping charges were based on both weight and distance. If there wasn’t a stock scale where the cars were loaded, they would be weighed at the nearest track scale, another operation you can model on your layout.

Transit. Loaded cars were quickly sent on their way. Most railroads placed blocks of loaded stockcars at the head end of trains to reduce the effects of slack action.



Ranchers and railroaders help load sheep at Silverton, Colo., on the Denver & Rio Grande Western narrow gauge. William Moedinger photo

By law, livestock could be kept in the cars for only 28 hours, or 36 with shippers’ waivers. Then the stock had to be unloaded at suitable pens to be fed, watered, and rested for at least five hours.

If your layout is somewhere along a lengthy livestock route, stock-resting pens could be a major industry and a way to keep through freights from getting across your main line too fast.

(The 36-hour waiver let the Union Pacific run fast “DLS” (for *Day Livestock*) trains from Salt Lake City to Los Angeles without rest stops.)

Drovers cars. Shippers could send caretakers (drovers again) along with their stock. When there were only a few, they could ride in the caboose, but several Western roads used special drovers cars for larger groups of riders, which you can add to your stock trains. These included rebuilt or purpose-built open-platform cars on the Santa Fe, long cabooses with extra windows and seats on the Missouri Pacific, and older arched-roof coaches on the UP.

Destinations. Most livestock was shipped to large “union” stockyards in

places like Omaha, Kansas City, and Chicago. These had slaughterhouses and packing plants adjacent, but stock could also be reshipped from union stockyards to other points. Traffic at these yards was generally as steady as our appetite for meat, but stock movements could be seasonal in various ranching regions.

Another kind of seasonality was the fall movement of stock from summer ranges in high country to winter ranges in the lowlands. Some of the last large stock movements were of this kind; the Denver & Rio Grande Western ran its last fall stock extra in October 1980.

Learn more: Jeff Wilson’s article, “Rolling livestock” in our special issue *How to Build Realistic Layouts: Industries You Can Model*, pages 48-53, goes into greater detail. I also recommend “Santa Fe’s Livestock Service, History and Operations,” by Matt Zebrowski, in the Third Quarter 2001 issue of the Santa Fe Ry. Historical & Modeling Society’s *Warbonnet* magazine, on sale at atsfrr.net.

Andy Sperandeo is a contributing editor for Model Railroader. He writes the monthly column, “The Operators.”