

Master Builder — Cars

article and model photographs by *Frank J. Hermanek, MMR*



Introduction

To qualify for the Master Builder — Cars certificate, you must build eight operable scale models of railroad cars. “Operable” means that they must be able to roll on the track, negotiate a curve, be pulled by something, and so forth. It doesn’t mean that every door, valve, or other moving feature of the car must work as the prototype does. (However, any operating features that you can include in your car are likely to increase your score.)

There must be at least four different types of cars represented in the total of eight. One of these must be a passenger car.

The intent of this requirement is to show that you can model a variety of types of cars, not just several variations of the same type. For example: a 40-foot steel-side boxcar and a 36-foot wood-side reefer would be different types of cars, but a 40-foot steel-side boxcar and a 50-foot steel-side boxcar probably would not (unless you can show that there was a substantial difference in what it took to build them). Similarly, a wood deck flatcar and a steel deck flatcar would not be considered “different” types of cars, but a regular flatcar and a depressed center flatcar would, because they are substantially different types of cars.

“Passenger cars” include anything that would normally be found in a regular scheduled passenger train, including baggage cars, express reefers, business cars, or other passenger carrying cars such as drover’s cabooses.

Remember, it is only four different types that are required: You could build a set of five identical passenger coaches, a boxcar, a tank car, and a gondola, and satisfy the requirement.

Each of the eight models must be super-detailed with either commercial parts or scratchbuilt parts (for extra points).

When looking for ways to super-detail your cars, brake wheels, grab irons, and ladders are good places to start — particularly by replacing the “molded on” ones that the car came with. That’s where many judges start looking. Another area that many judges look for is the underframe brake gear.

In addition to being super-detailed, at least four of the eight models must be scratchbuilt. The term “scratchbuilt” implies that the modeler has done all the necessary layout and fabrication that produce the final dimensions, appearance, and operating qualities of the model.

This is a good statement of the intent and spirit of the “scratchbuilt” requirement. Notice that it does *not* say that the use of a few commercial detail parts will disqualify the model as being “scratchbuilt.” Generally, the same standard applies that is used in contest judging: “completely scratchbuilt” means that 90 percent or more of the model was scratchbuilt.

The following parts are specifically excluded from the scratchbuilt requirement:

- Wheels
- Couplers
- Light bulbs and electronics
- Trucks
- Brake fittings
- Marker lights & drumheads
- Paint, decals, and the like
- Basic shapes* of wood, plastic, metal, etc.

(*Basic shapes are things that the builders of the prototype would have used as raw materials. For example, an “I” beam would be a basic shape; a commercial door or window casting would not.)

Something that you should remember if scratchbuilding is intimidating: There is very little difference between scratchbuilding and building most craftsman kits. The big difference is that in a kit, the manufacturer has assembled the materials needed for you. Only the construction needs to be done from scratch. If you take someone else’s plans and instructions (even those from a kit), go to the hobby shop, buy the materials yourself, and assemble them, that qualifies as scratchbuilding. On the other hand, if you do develop your own plans, make sure that you tell the judges that, because it will earn you extra points.

You must earn a score of at least 87-½ points on four of the eight models in either an NMRA sponsored contest or in AP merit award judging.

Note that only four of the eight must earn 87-½ points. The others don’t even have to be judged! They do all have to be

described on the Statement of Qualification (SOQ forms are also available from your Regional AP Manager), which includes the following:

An attachment giving a detailed description of each of the eight models, including:

- Identification of all scratchbuilt features
- All commercial components used
- Materials used in building the model
- If the model is a kit, whose kit is it?
- Verification of the Merit Awards (photocopies of the certificates)
- Photos of the model are helpful, though not required.

Remember that your eight cars do not have to be from the same era, or part of the country. They don’t even have to be the same scale. You also don’t have to earn your four Merit Award certificates at the same time — you can earn one this year, another two years from now, and another the year after that.

BUILDING A WOOD REEFER — USING WOOD

CAR No. 1

Some may ask: “Why wood?” Well, I’ve been an MMR for about two years, but I’ve been a model railroader for almost 60. Neither plastic kits nor styrene were available back then, so I modeled in metal, cardboard, or wood. Also, the best kits (craftsman) were all offered in wood. Besides, John Allen modeled in wood “...because real railroads use it...” That was/is good enough for me, so whenever I scratchbuild I use wood. I also have shelves full of Ambroid, Northeastern Scale Models, and Silver Streak kits waiting to be built. Are you willing to try your hand at scratchbuilding a wood, model wood reefer? If so, you can use it to meet the scratchbuilding requirement.

My wife and I periodically vacation “Down East” (Maine) where I came across a refrigerated delivery truck. This was too good to pass up, so I photographed it and put the picture aside until I got the urge to model 37-foot reefers. (I was going to model a refrigerator truck into a refrigerated car.) The cars, built in the early 1920s, were typically used by meat companies. Swift had a



Above: The finished Maine Shellfish Company HO scale refrigerator car. This car was scratchbuilt, painted, and lettered with decals produced by good friend Jim Wilhite.

permanently together. The remaining two blocks are inserted into the two sides midway between the end blocks. Make a pencil mark on the blocks 2½ inches from the end blocks. This will be the midpoint of the car and the location of the door openings.

This is good time to add additional weight to the model. NMRA recommendations for a five-inch car is 3½ ounces. With the building components used, you'll need to add about 1¼ ounces to bring the car up to the recommended weight. Add a half-ounce on the inside of each end block and a ¼ ounce between the two side blocks. If the weights are added onto the floor instead, stay away from those areas where the trucks would be located: The truck mounting screw, when inserted, could loosen the weight.

Take about 15 pieces of 2x6 strips and stain 10 or 12 with MinWax Ebony and the remainder with Special Walnut. After drying cut them into lengths equal to the width of the floor (the Chopper does this best). Starting at one end of the floor, spread a thin layer of wood glue about one inch out and begin laying the stained pieces parallel to each other. Continue spreading the glue and attaching the pieces (randomly alternating colors) until you have covered the entire bottom of the floor. This is one of the "small details" noted earlier.

When the floor planking has dried, continue with the underbody. Lay a piece of wax paper on a flat surface (I used a pane of glass) and place the shell on its side. Butt a painted 2x2 on the edge of the glass/floor (length wise) and, using CA, fasten it to the flooring at the car's ends and several intermediate locations. Use the point of a straight pin to apply minimum quantities of the CA so it doesn't run out onto the planking. Repeat this process, attaching the other side sill. Floor stringers are added two scale feet (0.276 inches) away from the side sill and toward the center of the car.

Determine the centerline of the car and run a pencil mark along it. Next, measure 0.625 inches away from the outer edges of the two end blocks along the centerline, and mark their position by drawing a line at 90° to the centerline. Drill a No. 72 hole (0.025-inches) at the intersection point. Take two NSL body bolsters and cut off their "wings," leaving only the center portion. This should measure approximately 0.25 by 0.172 inches high. (You could use ¼-inch wood or plastic strip to make the bolsters.) At the direct center of the bolsters' square face, drill a 0.025-inch hole. Put a pin

offer all kinds of modeling possibilities, especially the inclusion of small details. You'll discover this as we go along.

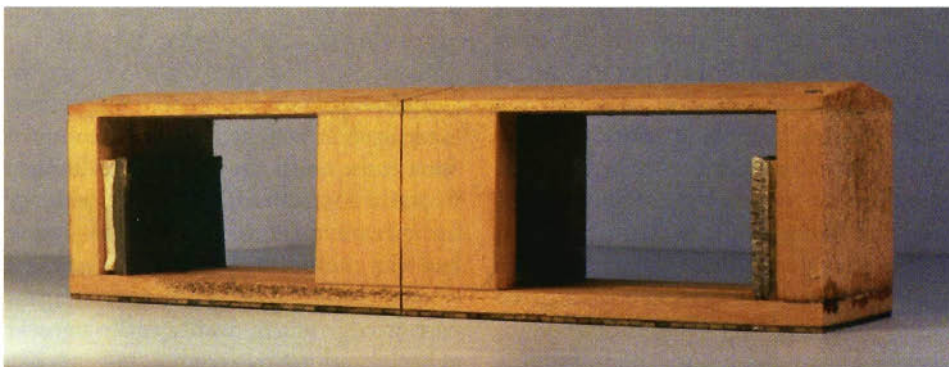
Note the "Bill of Materials" on page 16. We will be using a lot of Northeastern Scale Lumber (NSL) to construct the reefer. If you are not familiar working with wood, I advise you to rub all surfaces gently with 4/0 steel wool. This removes any "fuzz" resulting from the manufacturing process. Also, the sheathing should be sealed with Scalecoat "sanding sealer" and then rubbed again with dry steel wool. This will prevent the wood's grain from bleeding through the car's finish paint. Also, paint the underbody beams and supports flat black. You'll see why when we model the underbody.

We'll begin by building the inner body or shell onto which we'll attach the car's sheathing and small details. Using a razor saw and miter box, cut a five-inch piece of an inner roof and a freight car floor. Make square cuts and both pieces of identical length. Cut four one-inch pieces from the length of end block stock; these too should be square cut. Glue one block to each end of the floor. Take care to assure squareness between the block and the floor. Next, glue the roof onto the tops of the blocks. When the glue has completely dried and the assembly is rigid, use ½ -inch nails to lock the pieces

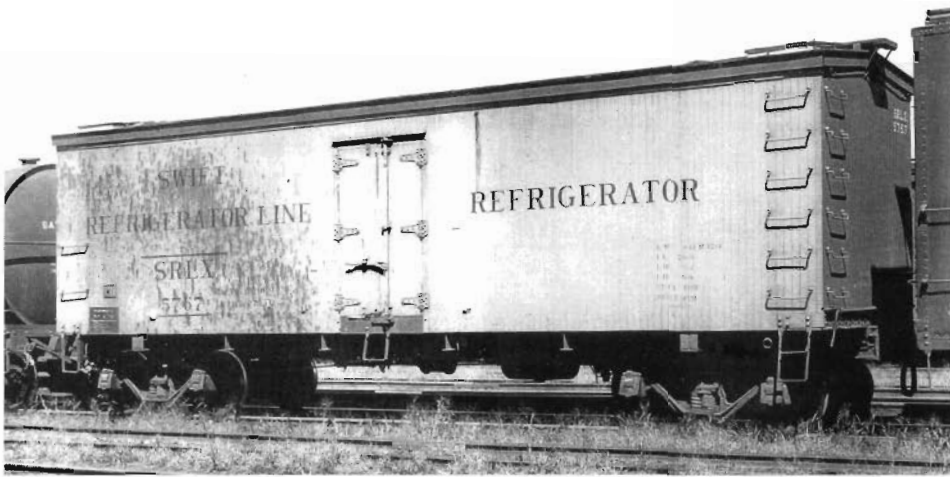


Above: This is the car's B-end, showing placement of the retainers, roof walk support with two braces, coupler lift bar, platform, brake staff bracket, and decals.

fleet of 37-footers, and classified them into its 5200 series. The cars were built with a wooden superstructure and were double sheathed with tongue-in-groove wood on their roofs, sides, and ends. The cars had a steel underframe with "I" beam cross ties without end caps. The doors were four-foot wide and 5-foot, 9-inches high. These cars



Above: Here is the inner body/frame of MSC reefer model. The larger blocks support the door area and keep the car square while adding strength. Weights were affixed to the end block of the car.



Here is a prototype photo of Swifts 36- to 38-ft refrigerator cars. — Photo courtesy Sunshine Models

into the hole and the one in the car floor. This is the position to mount the bolsters; glue both in place. When the glue has dried, drill a No. 47 hole into the bolster, but not into the floor. This will prevent cracking the bolster when mounting the trucks. (You should use incremental drills before attempting to cut the No. 47 hole. Also, add small wood blocks on the internal floor where the truck screws may enter.) Measure the distance between the two bolsters and cut the center beam accordingly; glue, so it is in line with the bolsters. Cut two strips of 2x4 and glue, onto the floor, at the outer bases of the center beam. This should create the impression that the center beam is constructed from two channels.

The end sills are made by cutting two pieces of 1/8-inch channel 1 3/8-inches long. Glue these to the end blocks in line with the side sills. There should be some “extra” material sticking out on each side of the block. This will be tended to when we build up the car sides.

Rather than using the “standard” Kadec coupler and draft gearbox, we’re going to use their “scale” No. 78 set. These are located along the car’s centerline and on top of a 0.020-inch piece of styrene cut to the same dimensions as the draft gearbox. Cut off the gearbox rear tab and temporarily mount the gearbox on the styrene pad. Next, going through the gearbox’s center hole, drill a No. 55 a hole, 3/4-inches deep into the styrene, floor, and end block. Use a 00-80 machine screw to secure the coupler and gearbox in place. If you countersink the gearbox hole, you can use a flat head. The space between the gearbox and bolster is fitted with center beam stock approximately 0.090-inches long.

Cut two pieces of scribed sheathing as wide as the end block and 1 1/4-inches long. Cuts should be in the scribed lines. Spread

a thin layer of wood glue on the end block and butt the sheathing edge tightly against and perpendicular to the end sill. Clamp securely in place and, when the glue has dried, cut the roofline.

The Roof

Determine the roof’s longitudinal center and draw a line along it. Next, clamp a straightedge on the line with a strip of wax paper under it. This is to prevent glue from sticking to the straightedge. Because NSL sheathing is only 3 1/2-inches wide, two pieces will be required to cover one-half of the roof. Cut two pieces 0.7-inches wide and butt them against the straightedge, gluing them to the roof. They should overhang the car ends about 0.050 inches and the sides about 0.070 inches; the overhang will be trimmed before attaching the side sheathing and fascia. Take care in butting the ends of the pieces together, joining them at a scribed groove, so the joint is not noticeable. Clamp the sheathing to the roof during gluing.

Once the four roof sheathing pieces are firmly glued in place, the excess side overhang can be removed. This is best done by sanding or filing. (I sanded the overhang using 600-grit silicon carbide paper mounted on a glass plate to give it a flat surface.) Because the combined thickness of the sheathing and fascia is approximately 0.063 inches, we will want to reduce the total overhang to roughly 0.080 inches, or 0.017 inches beyond the fascia. This will equate to a prototypical 1 1/2 inches. The overhang numbers are not firm, but most Swift reefers photos show a slight overhang of the roofing over the fascia boards.

The Doors

Glue a piece of 2x8 where the kick plate is — just below the door. Make the strip lon-

ger than the four-foot door as excess stock will be removed once the door is fastened in place. The strip should be glued to the side rail and inner body floor.

As noted previously, the doors are four-foot by five foot, nine inches (0.552 inches x 0.793 inches). Cut two pieces of sheathing to this size, and then attach the door blank to the car body centering it on the sides’ centerline.

The Sides

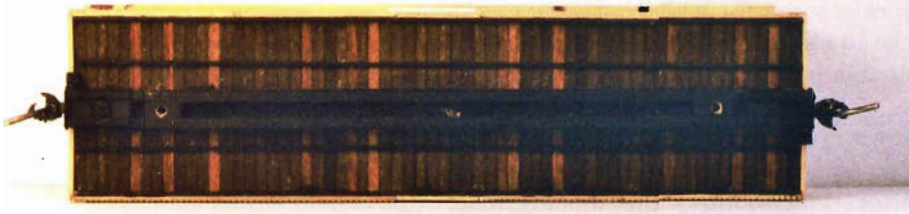
Concentrate on one end of the car. Measure the distance from the edge of the side sill to the roof’s underside. Subtract 20 mils and cut two pieces of sheathing to this size. Butt the sheathing against the door and cut it two or three scribed grooves longer. With the sheathing butted against the door and above the end sill, mark the sill’s location, and cut a 1/8-inch-high notch to fit over the end sill. Butter the side’s supporting structure with wood glue, adjacent to the door, and butt a piece of sheathing against the door, gluing it in place; repeat for the opposite side and clamp the two in place. Insert a polling pocket into the end sill and wrap it around onto the side forming a corner brace that will hide the end sill notch.

With the sides in place, make a cut even with the top of the door into the first board on either side of the door. Remove the top portion of the cut boards and place a 2x4, the width of the door plus the two cut pieces on top of the door. Glue the 2x4 on its narrow edge to form the door header; cut and or file it so it’s flush with the door and adjacent sheathing. Cut a piece of 12-mil styrene, 0.060-inches wide and the same length as the 2x4; glue it flat on top of the header to form the drip molding. Fill in the area above the door with a small piece of sheathing matching the pattern of the scribed grooves.

Installation of door hardware, grab irons, small details, and underbody with brake gear, will be covered later.

The Roof Detail

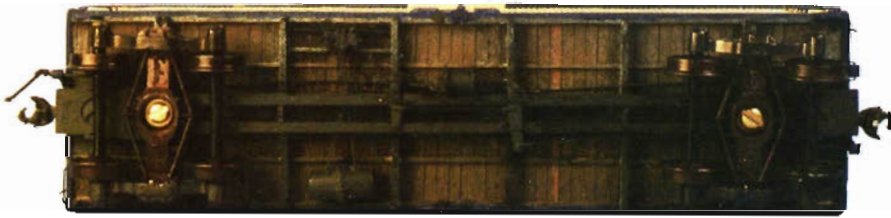
Roofwalk/running board supports are made from 2x4s spaced two scale feet apart. Start at the midpoint of the centerline and mark the location of 17 supports plus one for either end. There is a three-foot space between the end support and the next one — mark a point midway between. Using the narrow edge of a Swiss file, make a groove at each marking to accept a 2x4 support. Don’t file too deep, but just enough to stand a 2x4 up in it. Cut 21 1/2-inch-long 2x4s and



Above: The basic underframe detailing was beginning to take shape. The center sill and parallel stringers had been installed as had the draft gear and couplers. The airbrake system and underframe supports will finish the process. The car floor was made from individual planks.



Above: The sides of the car were nearly finished at this point. Notice the kick board, header, drip molding, fill-in sheathing, grab iron placement, and the myriad other details included in the car. The roofwalk was yet to come.



Above: The underside of the car shows the detail applied to create a realistic appearing model. The Kadec trucks were added and are held in place by self-tapping wood screws.

glue (CA) them into the slots. With a pin-head, add a spot of CA to either side of each support. When dry, cut the excess support material back to 18 scale inches. (I used a strip of pre-cut, NSL roofwalk as a cutting guide.) The 18-inches represents three 2x6s with a one-inch space between them. Use 600-grit silicon carbide sanding paper on a flat surface to sand the tops of the supports until all are of equal height, about 2½- to 3-inches tall.

The roof grabs are applied only to the car's right corners. The corner leg is soldered under the 90° bends. I prefer this approach because the available eyepins appear out of scale; however, use them if you're comfortable with their appearance. Drill a No. 77 hole in the second board from the end and an equal distance from the side; put in a grab bolt then drill a No. 78 hole diagonally in from it. Temporarily install the corner leg and determine the locations for the other two. Drill No. 78 holes and install the grabs. Add a grab bolt at the base of each leg.

The ice hatches are from Tichy without the wood platforms. Cut the hinges from the platform and glue them to those on the hatch. Glue a latch bar to the hatch, then glue a pivot/hinge to the bar. Set the edges of the hatches five boards back from the car's end and 10 to 12 inches from the side. Glue in place. Hatch cushion boards are positioned about two feet behind the hatch covers. This is an approximate point where the latch bar retainer would be hitting and damaging the roof.

Detailing and Painting

The Maine Shellfish Company reefer is painted Polly Scale Aged White and Prussian Blue. Apply the white to both sides. Mask off the underbody. When dry, mask off the white from the roof overhang to 0.300 inches above the bottom of the siding. Add the lift bars and brake gear. While still not on the model, paint the roofwalk, fascia boards, and door hardware, mounted face-up on masking tape. Also, paint the

grab bolts because they are very difficult to paint when installed. Paint the roof, ends, and sides.

Install the fascia strips and attach the roofwalk boards in random lengths with none more than (scale) 24-inches long; leave a (scale) 1-inch space between boards. Allow the roofwalk to overhang the ends (scale) 10 to 12 inches. Use a 2x6 brace to tie together the boards' end. Roofwalk braces are bent from 1x1.5-inch flat brass wire. Brush paint the ends of the fascia strips and the roofwalk braces.

Side and End Detail

There are two sets of (scale) 23-inch straight grab irons on the left side of the car. The lowest set is (scale) 1¾-feet up from the sheathing's bottom edge and the second set one foot higher; grabs are inward (scale) six inches from the corner. Drill No. 77 holes at these locations then move over seven grooves and drill another two holes in line with the first two. These should be the attachment points for the (scale) 23-inch straight grab bolts, drill No. 78 holes just below them to attach the grabs.

A (scale) 18-inch grab is (scale) 10 inches above the end sill and (scale) six inches from the corner. Drill No. 77 holes to accept the grab bolts; install them and an 18-inch straight grab iron into a No. 78 hole.

Corner grab iron locations are readily drilled using a template or fixture. The plan for the tool is provided. The template is made from ½-inch K&S brass angle stock.

Using the fixture, drill the holes for the grab bolts using a No. 77 drill bit and glue them in place. Then, drill No. 78 holes just below the nuts to attach the drop grabs. All grabs should be brush painted Prussian Blue.

The door hinges are installed (scale) one foot below the header, one foot above the kick board, and at a midpoint between. Cut a door hatch bar just above the handle and install so the bottom lock is just on the kick board. Cut excess stock from the top portion of the latch bar so it fits between the handle and header.

Cut two eyebolts so they are now hooks. Install them seven boards outward on either side of the door and (scale) 18 inches up. Add buffer pads on the sixth board opposite the lock handle and on the fifth board to the right of the center hinge. The left pad is the width of a board and eight-inches high; the right pad is 5x5 inches; use 5 mil styrene. Car vents, located to the right center of the lower 23-inch grabs, are 12x12 inches

(0.012-inch styrene). Between the side sill and sheathing, drill No. 76 holes and add the A-Line stirrups to the corners of the car and under the center of the door. They should extend (scale) 20 inches below the sheathing.

Underbody Detail

Before installation, all underbody details should be painted black except the brass wire used to represent the brake system piping, which should be darkened using Blacken-it.

Begin the underbody detail by attaching Kadee AHB-1 mounting brackets to the right side and against each coupler box. The train line, 1¼-inch piping (15 mil wire), is next added by drilling a No. 76 hole, at a bias, through the center beam at its midpoint. The line is best installed by making it in three pieces. Two pieces, one on each side of the center beam, go from just inside the angle cock mounting brackets to a hole in the center beam. A third piece, between the two holes, completes the assembly. Continue to construct the AB brake system per Cal Scale instructions. Piping from the triple valve is ¼-inch (10 mil), except that going to the retainer valve, which is ⅜-inch (6 mil). Drill two No. 79 holes through the center beam and feed the piping from the triple valve to the reservoir through them. Brake rods are ⅜-inch (10mil) with clevises

connecting them to the levers. Use turnbuckles with one cut off to make the clevis. Use 18-inch grabs as lever supports at locations shown in the underbody photos.

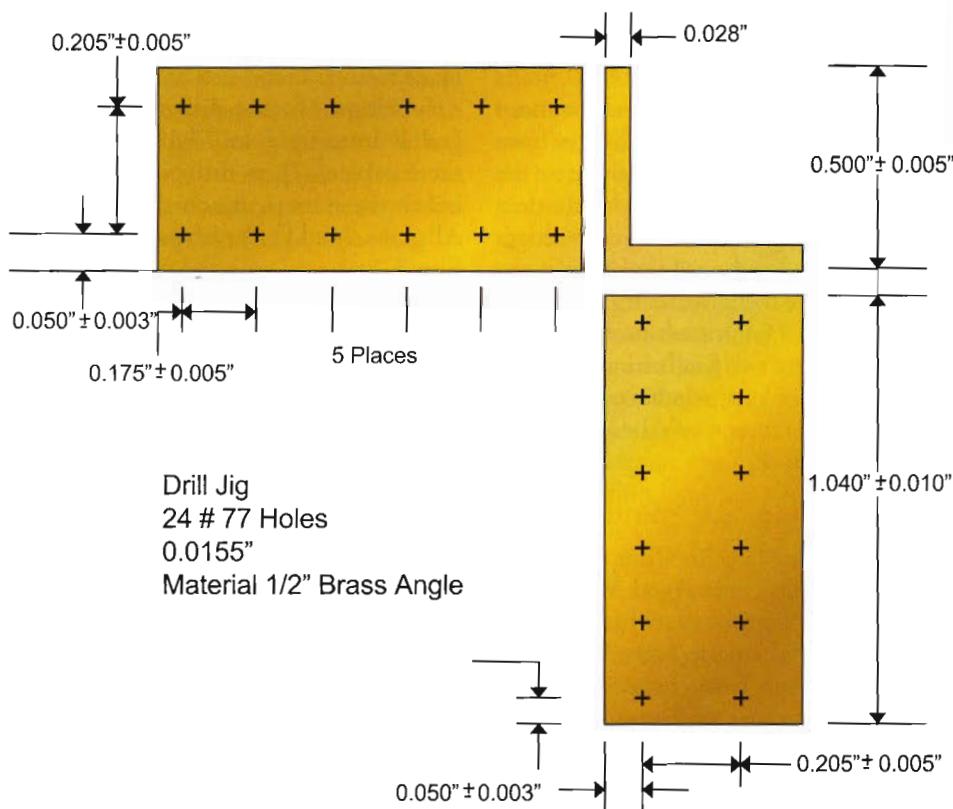
Create "I" beam body bolsters by laying down two pieces of "I" beam from either side of, and perpendicular to, the truck pivot (¼-inch bolster). They should extend from the bolster to the car's sides. Repeat for the other side of the bolster and the other end of the car. Install four "I" beam cross ties equally spaced between the body bolsters. Their length is equal to the distance of the center beam's flat surface and the car side. Paint their ends.

Decaling

Gloss paint the car's sides and ends. When the paint is dry, decal the car as shown. With the decals in place, apply several coats of decal softener to get the decal to settle into the sheathing grooves. When dry and set, overspray with Dullcote to erase the glossy appearance and protect the decals.

Aren't the decals great? They really make the car stand out. My good friend Jim Wilhite made them. Kudos to Jim, who did a great job. Jim can be contacted at Jwilhite@netdirect.net.

Add trucks and the car is ready to roll.



Grab-Iron Drilling Template

BILL OF MATERIALS

NORTHEASTERN SCALE MODELS

Inner Roof
Freight Floor
End Block Bolsters
Grooved Center Beam
½" Channel
3/32" I beam
2"x2" Scale Lumber
2"x4" Scale Lumber
2"x6" Scale Lumber
2"x8" Scale Lumber

CAL SCALE

AB Brake System

DETAIL ASSOCIATES

0.006" Round Brass Wire
0.010" Round Brass Wire
0.015" Round Brass Wire

TICHY

Ice Hatches
Grab Bolts

KADEE

Bettendorf Trucks
Type 78 Scale Coupler & Draft Gear Box
Angle Cock and Type
HB-1 Mounting Bracket

GRANDT LINE

Standard Gauge Reefer Hardware
Brass Turnbuckles

EVERGREEN SCALE MODELS

0.005" Styrene
0.012" Styrene
0.020" Styrene

WESTERFIELD

18" Grab Irons
24" Grab Irons

POLLY SCALE

Antique White
Prussian Blue

TESTORS

Dullcote
Glosscote

A-WEST

Blacken-it

A-LINE

Stirrups

JIM WILHITE (Jwilhite@netdirect.net)
Maine Shellfish Company Decals

UPGRADING ACCURAIL'S WHEELING & LAKE ERIE HOPPER

CAR No. 2

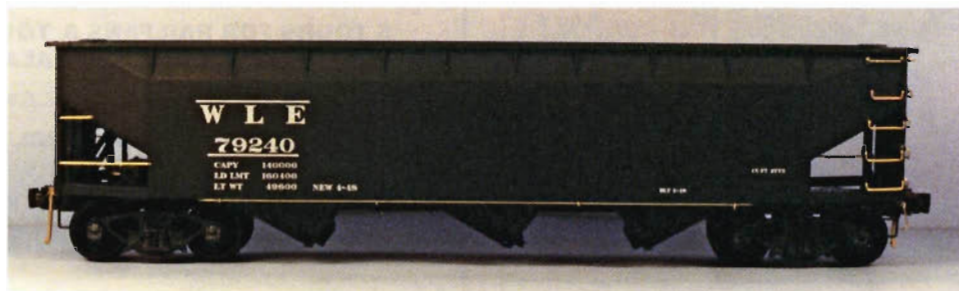
I recently purchased a Wheeling & Lake Erie hopper car from our NMRA Division store. It's a nice model, but it can be improved upon with just a little effort. Let me start by stating that I am not a rivet counter, but I do like full brake rigging, wire grabs, and other "little" details.

The photo to the right is a side view of the car. Note the new grabs and the brake line. Begin by removing all the cast-on details leaving the grab nuts. Drill No. 80 holes below the grab nuts and replace the side drop grabs with Tichy or Westerfield brand grabs. The end grabs are slightly smaller (0.180-inch), and are made by bending 0.012-inch wire to shape using needle nose pliers. File a notch in the plier's jaws and all the grabs will be the same size. Large horizontal grabs are 0.012-inch wire, also located in No. 80 holes. I added new drop grabs and large horizontal grabs and the two straight grabs on the end sill, and the cut lever bent from 0.010-inch wire. It's attached to edge of the draft gear also in a No. 80 hole; drill the hole as close to the edge to avoid interference with the couplers' working. I like working with brass and its

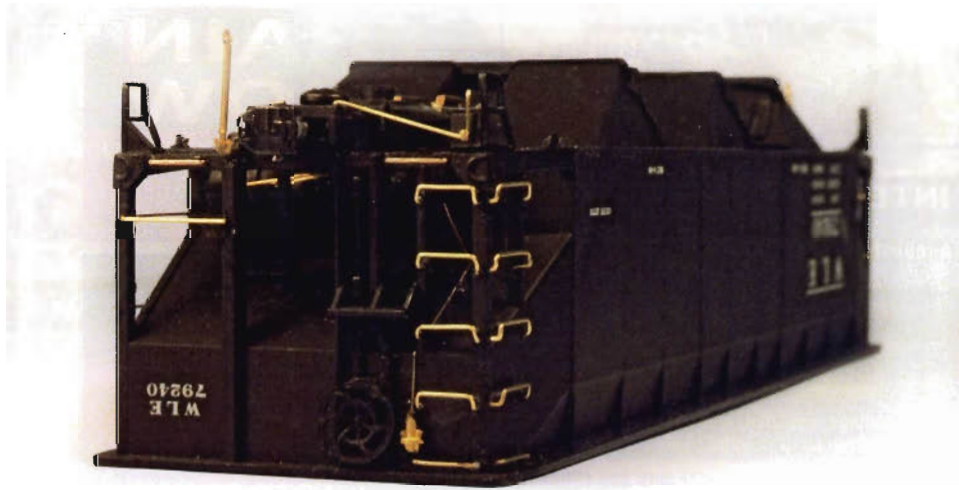
additional weight, so I added a brass Cal Scale AB brake set. Follow the Cal Scale directions for installing it on hopper but use 0.010-inch wire for the tubing between the AB valve, reservoir, and cylinder. Run 0.006-inch wire between the AB valve and retainer.

The car's underside is shown in the very bottom photo. The train line is 0.019-inch wire in four pieces. Run one piece the length

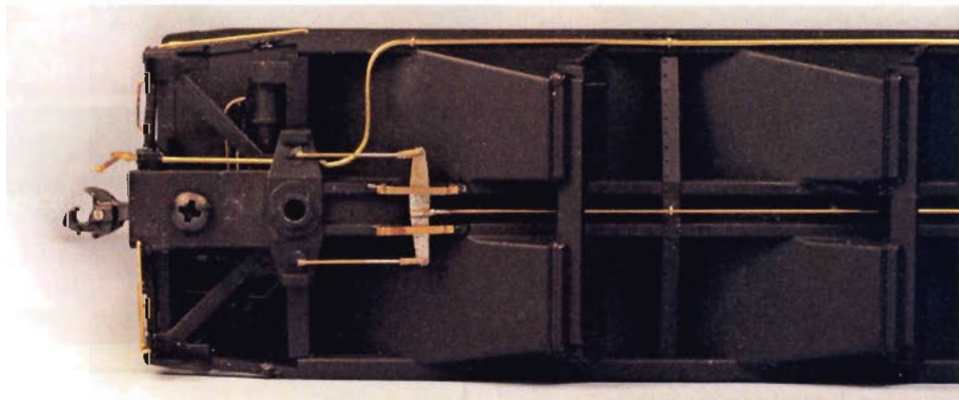
of the to just behind the bolster securing it in place with 0.010-inch "U" hooks. The "A" end line is in two pieces. Make the brake levers from 0.010-inch brass sheet metal and the clevises from Grandt Line turnbuckles. Detail Associates flat wire is used for the lever brackets. The air hoses are Precision Scale as is the block they're mounted in. This car will definitely help you toward getting your Master Builder Certificate. 🛠️



Above: Adding a few high-quality details to a stock freight car can create a fantastic model in a very short time. This W&LE open hopper is ready for the airbrush booth and a quick touch-up to the paint. Notice the cut levers, brake pipe, and new grab irons. All these details work together to create a more realistic model. Next stop, NMRA judging.



Above: The addition of the new grab irons, cut levers, and brake gear all enhance the model's appearance. Holes were drilled in the styrene body to facilitate the installation of these details. Notice the tiny retainer valve piping and its application. One of the beautiful things about detailing is that it is scalable, allowing the modeler to do as much or as little as they wish.



Above: The underframe detailing is particularly visible on hopper cars because of their angular underframe. The parts are simple and can be soldered together in subassemblies at the workbench. It would be possible to upgrade dozens of cars assembly-line style by building multiples of the subassemblies at once.

BILL OF MATERIALS

CAL SCALE

AB Brakes

GRANDT LINE

Turnbuckles

PRECISION SCALE

Air Hoses & AHB-2 Mount block

DETAIL ASSOCIATES

0.006" Round brass wire

0.010" Round brass wire

0.012" Round brass wire

0.019" Round brass wire

3/4"x2 1/2" Flat brass wire