Contents

Realism through color and texture

Welcome to the exciting world of structure building, a perennial favorite aspect of the hobby for many model railroaders. I'm sure the number of detailed structure-building articles written in the hobby press over the decades numbers in the thousands, so there's no shortage of how-to information out there. All kits come with instructions, so every model you purchase will explain to an extent how to glue part A to part B. In other words, the basic ABCs of structure building have been covered many times over. However, it's the subtleties of color, careful assembly, and planning the assembly and painting (and weathering) steps that will turn these models into realistic depictions of prototype structures.

In the pages ahead, my overarching message will be just that: understanding which aspects of structure building create the most visual impact. Armed with that information, you can then focus your effort into mastering those important skills. Although we'll spend considerable time on the step-by-step processes, the ongoing and repeated message will be understanding which construction phases are the most important and which will require the bulk of your emphasis.

Although many construction steps are simple, some are more important to get right than others; I call these "difference makers." As an example, in Chapter 1 we'll talk about neatness of assembly. As part of that, it's crucial to learn how to neatly and cleanly fill any gaps and seams between parts.

Priorities

Success is all in how you define it, and that definition will vary from one modeler to the next. We see prototype structures daily and, as a result, we know in our minds how they're supposed to look. When your eyes first sweep across a model railroad scene, your mind subconsciously compares the structure models to the real thing, and you will have an instant feeling whether the models are well done and "feel right," or that they somehow miss the mark. However, you might not consciously know why this is so.

In order to achieve realistic results, we thus need to understand what elements contribute to that end — and in what proportion and priority — so we can direct our efforts appropriately.

Here is my list of important elements that the eye registers, in order of priority:

1. Color treatment
2. Weathering
3. Neatness of assembly
4. Parts thickness
5. Details
6. Prototypical accuracy

Surprised? Are you wondering why prototype accuracy is at the bottom of the list? To clarify: I'm not saying that it's not a worthy goal and not important. My point is that, in and of itself, prototypical accuracy doesn't always contribute as much visually as you might expect. I consider myself a "prototype modeler." With apologies to the many others that feel the same way, the reality is that if an element of your model is off by a scale inch or two, the eye won't notice. If a prototype's windows had eight panes and your model has six, same thing — almost nobody will catch it. However, if a chimney leans away from vertical by just a degree, it stands out like a sore thumb. If the color or weathering is off, same thing. You can build a model that checks all of the dimensional boxes, and may even win awards, and yet still falls short in the impression it gives. However, an ordinary structure kit that is cleanly assembled and masterfully painted and weathered will be worthy of a magazine cover.

Furthermore, the realities of our always-too-limited spaces are that, even if we have all the prototype plans, photos, and data in the world, in the end we may need to modify the model's size to fit available space. Because color management (and weathering) and plain old "basic neatness" are so crucial, a large percentage of the pages ahead will be devoted to those topics.

Because you need to walk before you can run, we'll start with basic assembly techniques and the tools and adhesives related to that. With that foundation established, we'll move to the meat of the book, color-related topics. Finally, we'll move onto ancillary topics such as details, understanding and managing parts size and thickness, kitbashing, and a touch of scratchbuilding.

Structures can be built from kits, modified kits ("kitbashed"), or built from raw components ("scratchbuilt"), all using a variety of techniques. This building was scratchbuilt using multiple photos of a prototype structure, with photos stacked and sections cut out to provide depth, all laminated over a styrene core.

Deliberate practice

Like everybody else I have my hobby mentors. For reasons I don't remember, I lost track of one of them for several years, only to have him resurface recently. What struck me was that, although he was a modeling veteran of many decades and had been published many times, as he approached age 80 his work had improved considerably since I'd last seen it. The point is that no matter where you are on the experience spectrum, there is always room for improvement. And, if you think about it, that's pretty uplifting. We are all on different points of our hobby journeys, so enjoy the ride. With each project, give yourself a pat on the back and acknowledge that it was your best effort given where you were when you built it. At the same time, be aware that a project you build five years from now will likely be better. That's how it works and what makes it fun.

In general, the more you do something, the better you will get at that skill. However, just mindlessly gluing kits together without any form of internal review won't result in improvement. From time to time, take a look at your work with a detached, impartial view and look for subtle areas where you could improve on the next project. This is called "deliberate practice." Approach structure building with an eye toward subtle (but forgiving) long-term improvement. And know that even experienced structure builders need constant practice in order to keep their skills sharp.

Playing to the majority

Structure kits came in a variety of materials including plastic, laser-cut wood, strip and sheet wood, cardstock, metal, resin, and plaster. The overwhelming majority of modelers, however, work primarily in plastic, so injection-molded plastic kits will get the majority of attention in the pages ahead, with a nod to laser-cut wood kits, as well.

Now turn the page and let's start with a look at some required tools and techniques.

CHAPTER ONE

Tools and structure assembly basics

You have to learn to walk before you can run, so let's start off with some basics that are the foundation of structure building, whether it be assembling kits, kitbashing, or scratchbuilding. "Basics" doesn't mean beginner-level skills. Many of these concepts are crucial skills that even the most experienced modelers need to focus on to keep their skills sharp.

Here's the intersection of 22nd Street and 13th Avenue on my HO scale CSX Downtown Spur layout. Realistic structures help place a scene and railroad into a specific era and region or location, in this case an area of Miami, Fla., that hosted a former Seaboard Air Line industrial spur.

If you're an experienced modeler, you might be tempted to look at this chapter as information for beginners and quickly jump ahead. Please don't, as that's not the case. You'll pick up tips on tools and techniques that will make you a better modeler. We'll take a look at basic tools and adhesives — and how to best use them — and then look at prepping parts and assembly steps and techniques.

TOOLS

Many years ago, while attending a prototype modeler's meet in Cocoa Beach, I noticed that a seminar on tools for structure building was on the agenda. It was being presented by a well-known, very experienced modeler. I was trying to imagine what Star Wars-level devices he used to build his amazing creations. I showed up, notebook in hand, looking forward to getting insights into boosting my own structure-building skills. Twenty minutes into the talk, my thought was, "you have *got* to be kidding me." At the end of the lecture my notebook page simply read, "razor blades, cutting edge, sandpaper."

I couldn't believe it, but his point was what I will emphasize in this chapter: Most of the tools you need to build the majority of your projects are extremely basic.

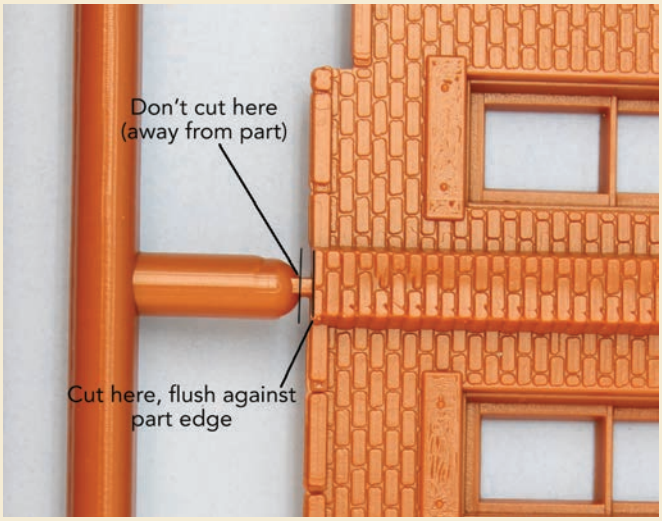
Between my layout-building business and personal layouts, I probably build 50 structures a year. Although I do use some specialty tools from time to time, by and large the ones I use the most are pretty basic. The photos starting below show the tools that see the most use on my workbench. You can get these (and many others) from many sources, including hobby shops, Micro-Mark (micromark.com), and the Kalmbach Hobby Store (kalmbachhobbystore.com).

Here are my most commonly used tools: A self-healing cutting mat, razor saw, sprue nippers, steel straightedge/scale ruler, curved fine-nose pliers, pin vise with drill bits, box cutter (utility knife), tweezers, and hobby knife with No. 11 blade. The tried-and-true No. 11 blade is one of my most frequently used tools. The fine-point design, however, means it loses its sharpness relatively quickly (the tip is also prone to breaking). Get in the habit of changing them often. When purchased in bulk packs of 100 to 500, they are relatively inexpensive.

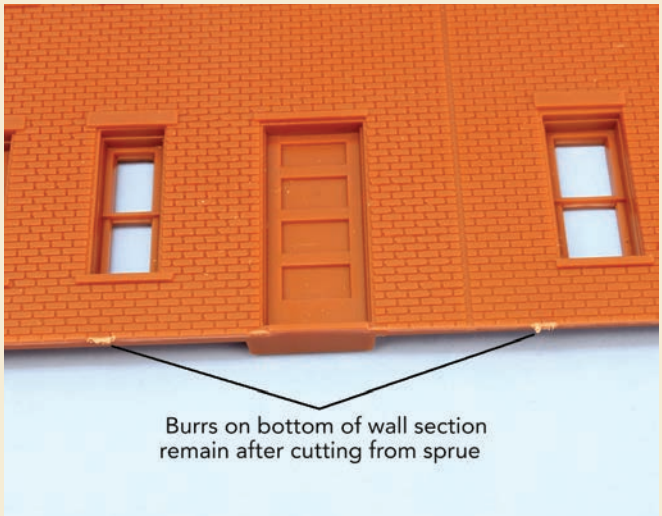
Plastic parts are made by a process called "injection molding," where hot, liquefied plastic is injected into one or several steel molds. When the plastic solidifies and the mold halves are separated to release the parts, there will be a small (or not-so-small on some older kits) seam at the joint; any extra plastic that oozes out is called "flash."

In addition, most parts — whether they're plastic, laser-cut wood, or etched metal — are joined to a larger frame called a sprue. When you cut a part from its sprue, there will be a small burr. In both cases you need to do some cleanup on the parts to remove the flash and burrs. Cleanup involves gentle cutting and or scraping with a blade followed by some light sanding or filing. With many newer or higher-quality kits, the flash is almost unnoticeable and the process goes quickly. With older or cheaper kits, however, the flash can be significant and removing it is a bigger job.

The time to find out that two parts don't fit together properly (an unfortunately common problem, especially on older kits) is before you apply the adhesive. Many parts are joined by seating a peg in a hole or slot into a notch. If a part is larger than the location it's seating into, then some modifications need to be made by trimming or reshaping one or both mating pieces. Common situations are pegs that are larger than their mounting holes, pegs that are tapered so only part of it fits in the hole, misalignment between pegs and slots, and windows or doors that are slightly too large for their openings.

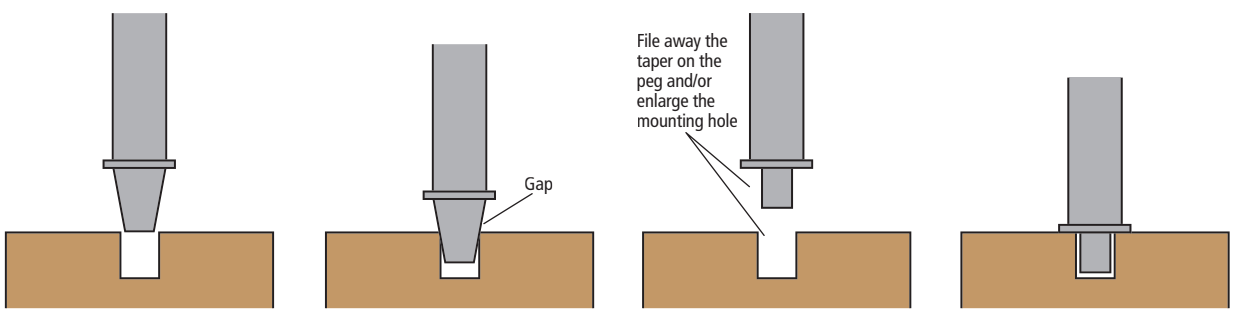


Cut the part off of its sprue (do not twist or pull the part from the sprue!). Make the cut as close to the part as possible to keep the resulting burr as small as possible.

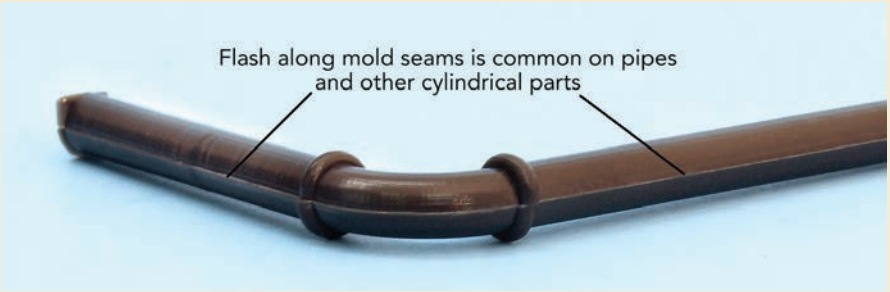


Remove any small burrs from sprues by sanding with sandpaper or needle file, or trimming with a hobby knife.

PEGS AND MOUNTING HOLES

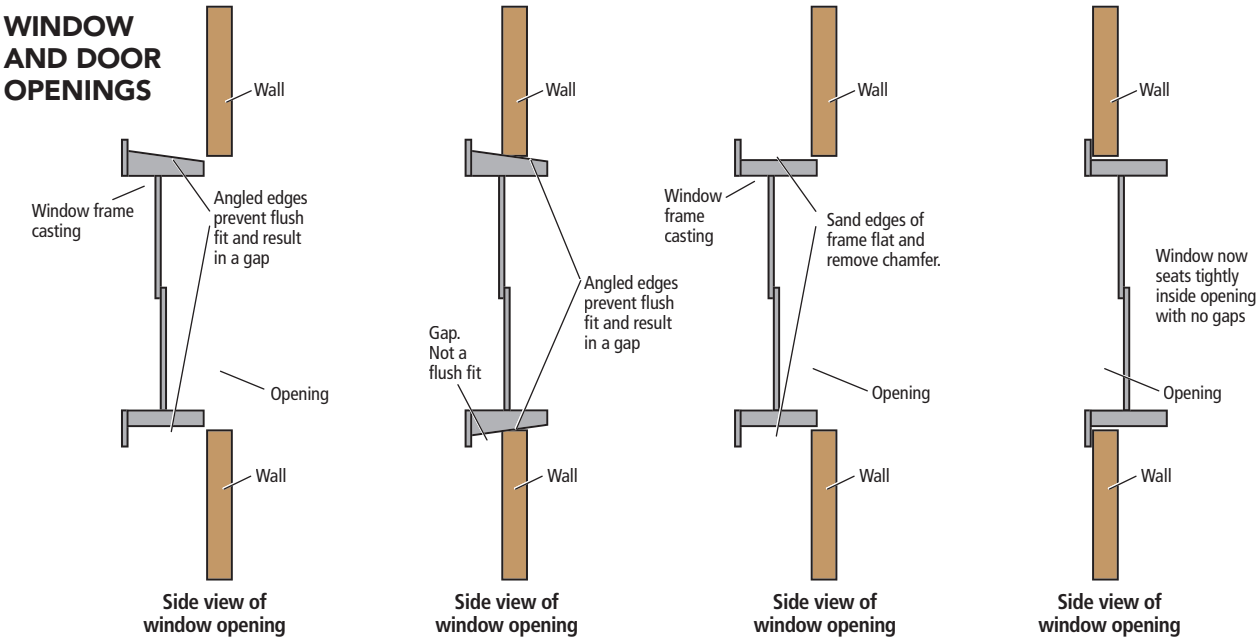


Here's the sequence for correcting a piece with a peg that's too large for its mounting hole.

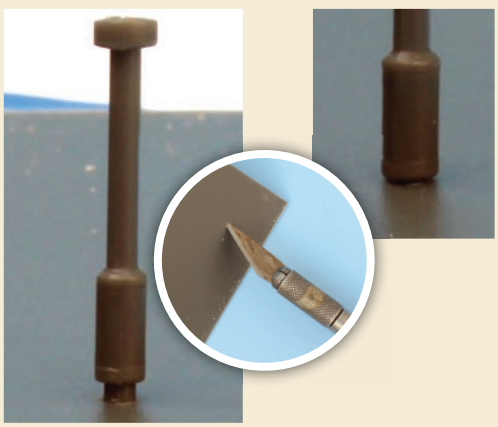


Parts will sometimes have seams, ridges, or stray plastic along the mold parting lines. This is called "flash," and is particularly common with cylindrically shaped parts such as this pipe. Sand or scrape this off with a blade. Unremoved flash will be very evident on the finished, painted model.

WINDOW AND DOOR OPENINGS



Here's how to fix a window casting that won't fit into its opening.

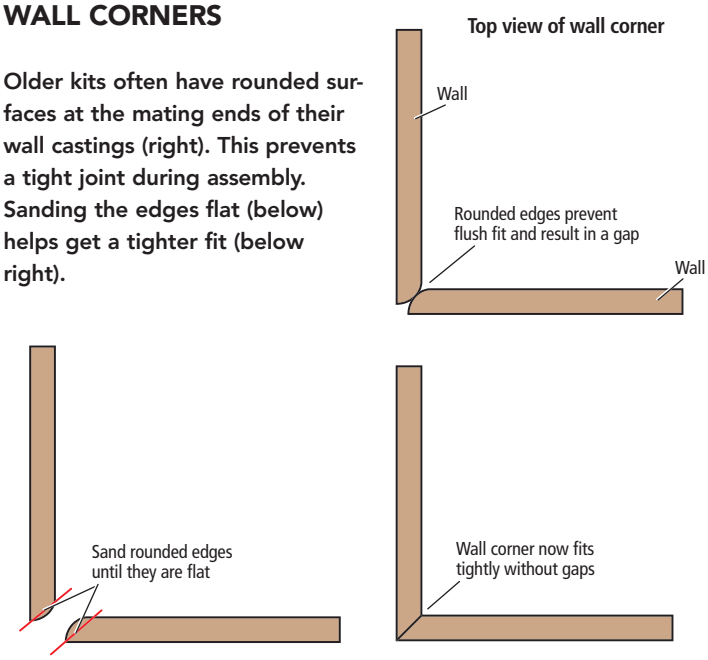


An unfortunately common and unsightly situation is where a part — in this case, the stack — won't fit in its mounting hole (left).

A quick fix is to insert a No. 11 blade into the hole and give it a few quick twists. You can also re-drill holes using a bit of the proper diameter. For larger (or square) mountings you'll need to file down the peg.

WALL CORNERS

Older kits often have rounded surfaces at the mating ends of their wall castings (right). This prevents a tight joint during assembly. Sanding the edges flat (below) helps get a tighter fit (below right).



The eye is extremely sensitive to noticing elements that are out of alignment, especially vertical parts that have a slight angle to them. Examples include smokestacks, chimneys, vents, downspouts, conduits, and the walls themselves (especially at corners). The same applies to elements that are supposed to be horizontal. The slightest misalignment tends to really stand out, especially in photos.

The first step is simply to be aware of the potential problem and take care when assembling parts where this could happen. When mounting parts, use a square to check alignment.

The best way to keep parts in alignment is by placing a square or known 90-degree tool next to the part you're trying to align. Photos are very unforgiving in this area, and this model isn't perfect. Note the slight lean in the back vent as well as the downspout on the right. Both need to be corrected. Chimneys and smokestacks such as the one shown above are notorious for having a slight lean to them if you don't pay attention.

Improving skills

How does one improve one's skills at assembling kits? Like any other motor skill, *practice*. Simply doing the same thing over and over again is a large part of it, but there has to be a sense of purpose to it. Mindlessly slapping dozens of kits together without thought or critical self-evaluation along the way won't make your skills (or models) better.

Somewhere along the line I picked up the term "deliberate practice." That means combining repetition with examination. Take a look at your work dispassionately and give yourself a pat on the back and recognize that it was your best effort at the time. Now look at the model closely for areas that could stand improvement. Is there a consistent theme of glue leakage, lack of alignment, or less-than-realistic color? Take a photo, zoom in, and take a good look. Make a mental note and, regardless of the level you are at, try to improve ever so slightly on your next effort.

Critically examine the work of other modelers. Does anything jump out that says it's a model? Focus on the work of excellent modelers and try to pinpoint what specific characteristics make their work stand out.

The good news is that the methods for effectively representing these surfaces are relatively simple, often just requiring a few basic color layers. Chapters 2 and 3 looked at color treatments and weathering; now let's take a detailed look at methods of realistically representing specific materials. The techniques shown can be used regardless of scale or model material: injection-molded styrene, resin, sheet styrene, and other textured sheet materials.

BRICK

Brick, particularly through the steam era, was the material of choice for structures that were meant to be sturdy and have long lives. If you study a brick structure up close you'll notice that the coloring is fairly complex. Each brick is a slightly different hue than its neighbor. Add in the mortar lines and weathering and the pattern gets tricky quickly. Oxide red is the most common shade but you'll also see brick in shades of brown, terra cotta, and even yellow. Although it's usually left unpainted, you'll also find brick that's been painted (especially in the modern era on structures that have been renovated).

When modeling brick we are trying to achieve some tonal variety. We want to avoid the basic two-tone look of uniform oxide red brick with bright white mortar (mortar is rarely white — it ranges from light to dark gray, and often has brick color mixed into it). Even less effective is using a single-tone oxide red. In the steam era, brick structures near the tracks (especially in larger cities) acquired a grimy cast from the soot left by steam locomotives and industrial pollution. When modeling, the more subtle color variations we can add the better.

On any given structure I use one of two different techniques. You can lay down the brick color first and then wash the mortar over that, working it into the cracks. You can also do the opposite, applying the mortar color first and then drybrushing the brick tones over it. With either method, I try to paint at least a few individual bricks slightly different tones, and in both cases I always finish with an India ink/alcohol wash. Since brick is dark, I go with a stronger mix of 2 teaspoons of ink per pint of alcohol.

You can use many shades of paint to represent brick. Among my favorites are Rust-Oleum oxide red primer, flat red primer, terra cotta (for brick with more of an orangish tint), linen/ivory (for light yellow brick), and driftwood (for lighter tan brick).

A northbound Amtrak train approaches the tower on the north shore of the Passaic River in Newark, N.J. In this case the brick on the tower was created using a dry-brush technique. A few individual bricks have been painted here and there for variety and contrast.

You can learn a lot by studying old prototype brickwork. Notice the color variation from brick to brick and section to section. Notice the mortar, the contrast, and the weathering. This degree of subtle color variety is what we're aiming for.

Begin by spray-painting the brick surface. In this case I used Rust-Oleum flat red primer. Dilute some slate gray acrylic craft paint and wash it downward over the surface, filling all the mortar cracks. Work in small sections at a time.

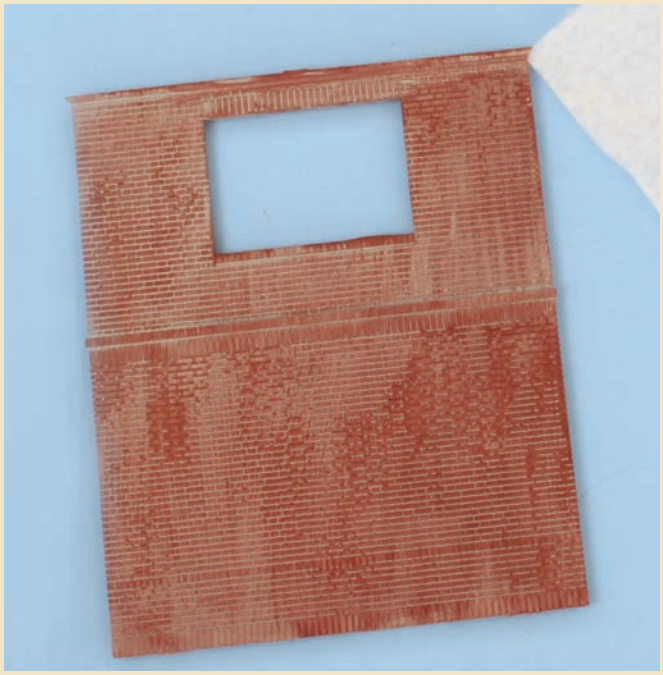
Take a soft rag and wipe downward across the brick, wiping all of the gray wash off the surface of the bricks and leaving the remainder in the mortar cracks. Do a section at a time and repeat.

Place small dots of various brick-colored craft paint on a scrap. The shades should be slightly different than the original brick color. Use a small brush and, working carefully but quickly, paint some of the individual bricks different colors. How many you do will be determined by your patience level!

When the paint is dry, apply an India ink/alcohol wash (I use the 2 teaspoons ink/pint of alcohol blend). Use downward strokes with a soft, flat brush. The wash will add contrast and help blend everything together.

The dirty, soot-stained brick on the building above at right was painted using a drybrushing technique. The base (mortar) color was done first, followed by the brick color and weathering.

For the drybrushing technique, begin by painting the wall pale gray (here Rust-Oleum aged gray) and let it dry. To "dry-brush" the brick color, dip a flat brush in the brick paint color of your choice and then tap the brush lightly on a paper towel to remove most of the paint—the paint remaining on the brush should be barely moist but not completely dry. Sweep the brush downward across the brick at an angle to the mortar lines, doing so lightly so that the paint is deposited on the brick faces and not into the mortar lines.



Here's a completed drybrushed wall. The technique takes some practice, and you can go back and touch up areas. Next, follow the same technique as the earlier method by painting individual bricks and finishing with an India-ink wash.

When somebody says a model is "highly detailed," it's considered the ultimate compliment. At least for me personally, detailing is one of the more enjoyable aspects of structure building. That said, because of their relatively small size, details don't always contribute as much as one would think. If you have a very well-done structure core that's neatly assembled and realistically painted and weathered, small details add only an incremental amount visually. Even so, they are very rewarding to play with.

Ask yourself these questions before adding a detail: Will the detail even be noticeable? Is it on a wall that won't face the layout? Is it so tiny and dark you can't really see it? And will I enjoy adding it (is this a step in building the model that would be fun for me)?

If you answer yes to any of these, a fourth question to ask is this: Is there a decent version of the part available commercially, or is what's available (or what you could fashion) a crude stand-in? If the answer is positive, jump in. If not, you may risk downgrading the look of an otherwise nice model.

My personal strategy regarding details is to focus on those that look like they belong there. Is there a logical reason for a detail to be on the model? I never add a detail I can't see. If a wall is facing a backdrop, faces away from a viewer, or will be obscured by neighboring buildings, that side gets a cursory coat of paint and that's it. My approach is the same regardless of whether the structure is built straight from a kit or is kitbashed or scratchbuilt.

Here are the details I focus on because they are part of the systems that most structures need to function:

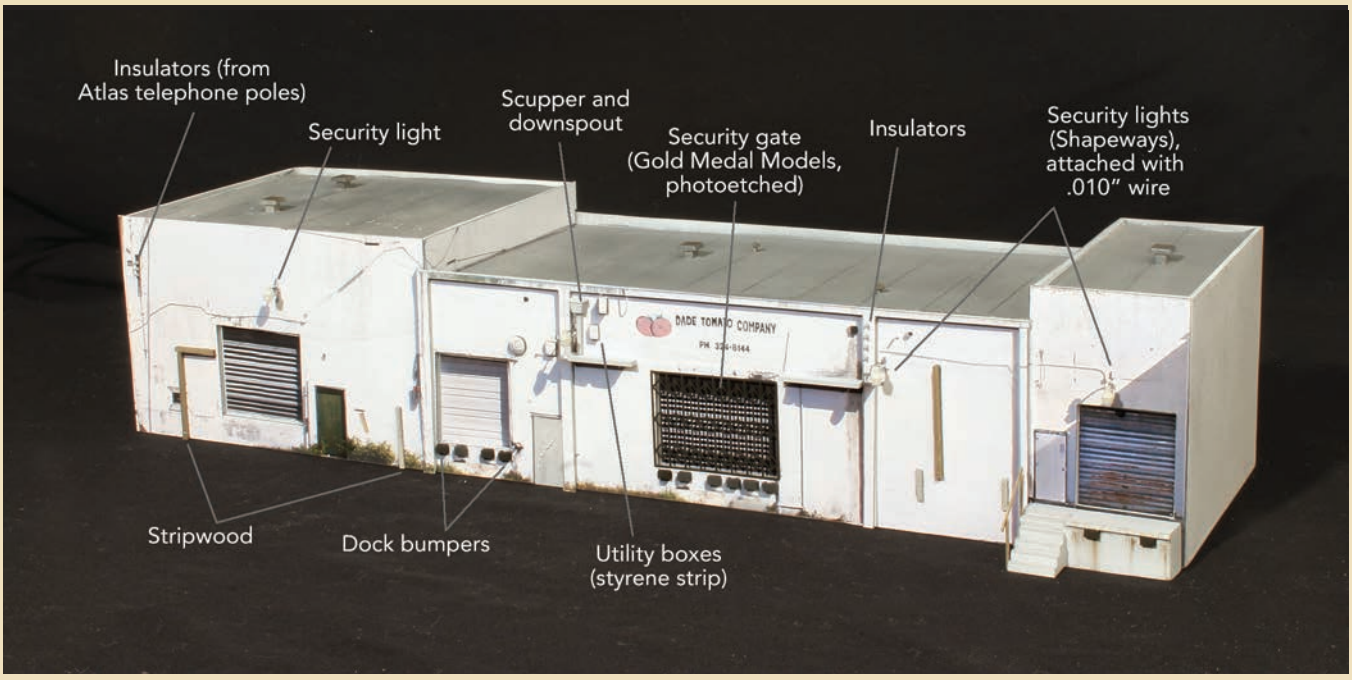
- Electrical service conduits running down the face of a structure. When you get into larger facilities (industrial buildings), the conduit arrangements become larger. (One of my favorite detail parts sets is the Walthers modern electrical fixtures set, No. 933-4075—it's simply a perfect match for components you see everywhere in real life.)
- Electric service meters and electrical connection components.
- Lighting (security or over-the-door).
- Downspouts.

Other favorites that don't apply to all situations are fire escapes, window air conditioners, dock bumpers, and signs. If you're a prototype modeler, let photos be your guide.

As a detailing strategy I usually start with lighting over entry doors, as almost every building has those. Tichy, Grandt Line, and Shapeways all have excellent offerings. I like downspouts, as they can be very handy for hiding seams in the wall. I sometimes add gutters, but they don't stand out as much as you'd think.

Conduits are among my favorite details. They make a structure look like it works for a living and are easy to model effectively. My favorite material for modeling them is steel spring wire (unpainted) for smaller versions and aluminum rod for larger diameters and situations where there's a bend to it. Curving wire is easily done by bending it around a paintbrush handle. Mounting brackets are represented with small strips of .020" x .040" styrene inserted between the conduit and wall.

Adding details can be the most fun aspect of structure building. However, details need to be managed thoughtfully and serve a purpose. This scratchbuilt structure is located in the Miami Produce Market courtyard on my HO Downtown Spur layout. Details include electrical conduits, signs, a wall-mounted air conditioner, downspouts, and blocked-over dock door opening with dock bumpers still in place.



This model is located in a very visibly prominent location on my Downtown Spur layout. The walls are photo laminates over a styrene core for the base. It's always been one of my favorite buildings on the prototype, so I detailed it a little more than most structures. The callouts list the added details. Details to match the prototype include dock bumpers, security lights from Shapeways, a sign, an etched-metal security gate from Gold Medal Models, and conduits.

This structure, based on a prototype in Portland, Maine, is about as typical as they come. This side faced directly toward the aisle, so I added several details, including signs, electrical and gas service meters, a downspout, steel conduits, and signs.