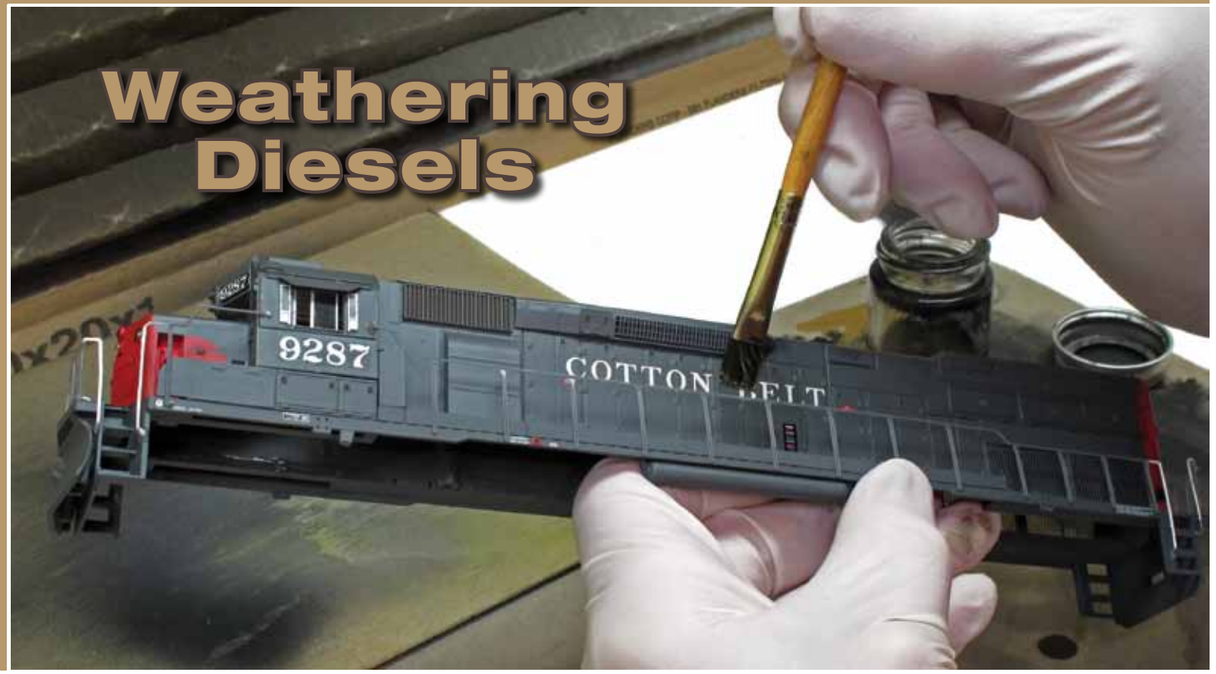


Solid Techniques Developed Over 150-plus Locomotives

CRAFTSMAN/*William E. Botkin, photographs by author*

SD45T-2 9287

Before any weathering of the body, apply one or more black wash coats using black paint combined with thinner in a 1-to-10 ratio. Be sure to keep the brush strokes vertical to simulate the effect of dirt washed down by rain.

As an avid model railroader, I really honed my locomotive weathering techniques when I volunteered to weather a large fleet at the Colorado Model Railroad Museum (CMRM), where I have been a long-time volunteer. The CMRM has a huge locomotive fleet — more than 200 in all. Of course, not all are out on the layout at once, but with 14 regularly scheduled freights, that accounts for more than 60 individual locomotive units plus at least ten yard switchers. There are many more kept as spares as needed.

Most of the CMRM locomotives assigned to the scheduled freights were weathered during the past couple of years when I volunteered to take on the job. I had no idea how large a job it was until I was well into it. Over the course of weathering 100-plus locomotives for the museum plus 50 of my own, I developed standardized processes to facilitate the work that was both efficient and realistic. These techniques can be used to weather one or ten locomotives.

Why bother to weather your locomotives at all? Weathering rolling stock, particularly the locomotives, transforms what looks like an accurate toy model to a realistic representation of a working locomotive. One of the most glaring differences between a weathered locomotive and one that is not is the look of the trucks and fuel tanks. Compare the two Erie Lackawanna SD45–2s – one weathered and one out of the box from Athearn. While the unweathered model is beautifully detailed, it looks like a toy. Even brand-new units on a railroad start to accumulate dust and dirt on their first trip over the road, especially on the trucks and fuel tank.

One of the very first things I do when working on weathering is to study prototype photos of the locomotive to see real weathering effects. If you have access to photos of the actual locomotive in question, so much the better to accurately portray real-life weathering.

One source for prototype photos is the Internet. You can often find good photos on the Internet by doing searches of a particular type of locomotive and a particular railroad. For example, you could search "Photos Erie Lackawanna SD45," and you will likely find numerous links and images. There are at least three good websites as well that are helpful, including the Fallen Flags site (**www.rr-fallenflags.org/**) that is organized by railroad and locomotive type; RailPictures.net, (**www.railpictures.net/**), where you can perform searches by railroad and locomotive type; and Railfan.net ABPR, (**http://abpr2.railfan.net/**).

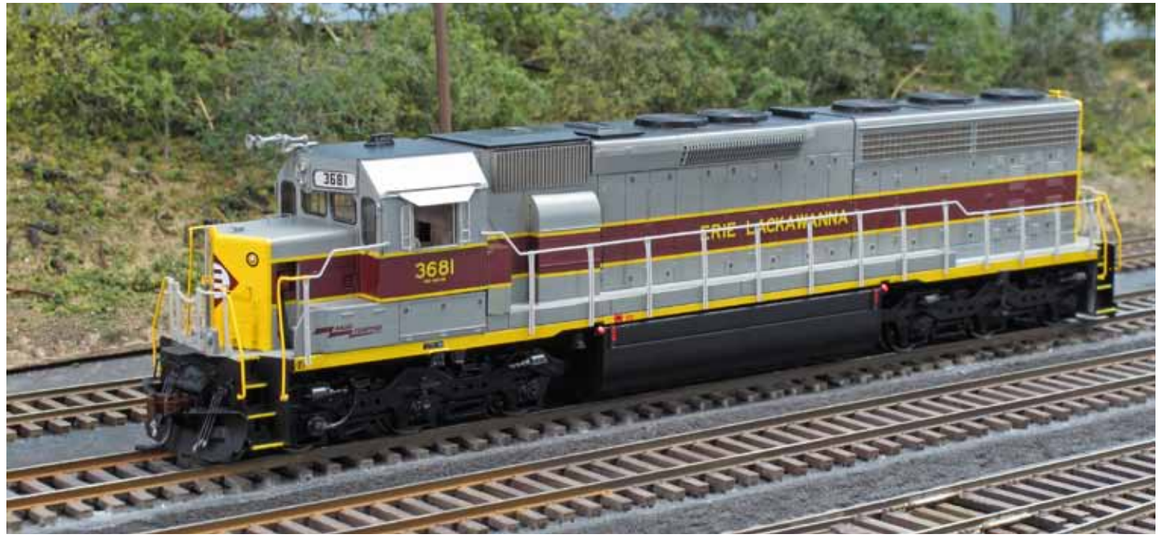
Once the research is done, then there are many choices for weathering medium and techniques, including chalks or pastels, oil paint, washes, acrylic paints, and solvent-based paints. My personal choice for locomotives is to use Floquil paint washes as a base and then use an airbrush with diluted regular Floquil paints. The results can be subtly built up and are permanent and durable. For starters, the following Floquil colors are useful for weathering, though you might have variations depending on the railroad modeled: Grime, Mud, Rust, Grimy Black, Weathered Black, Rail Brown, Earth, Engine Black, Railroad Tie Brown, and Roof Brown. For weathering, the dilution ratio is about one-to-one paint to thinner. Washes are diluted even more — about one part of paint to ten parts of thinner. With the discontinuance of Floquil paints, the same techniques can be used with your favorite solvent-based or acrylic paints.

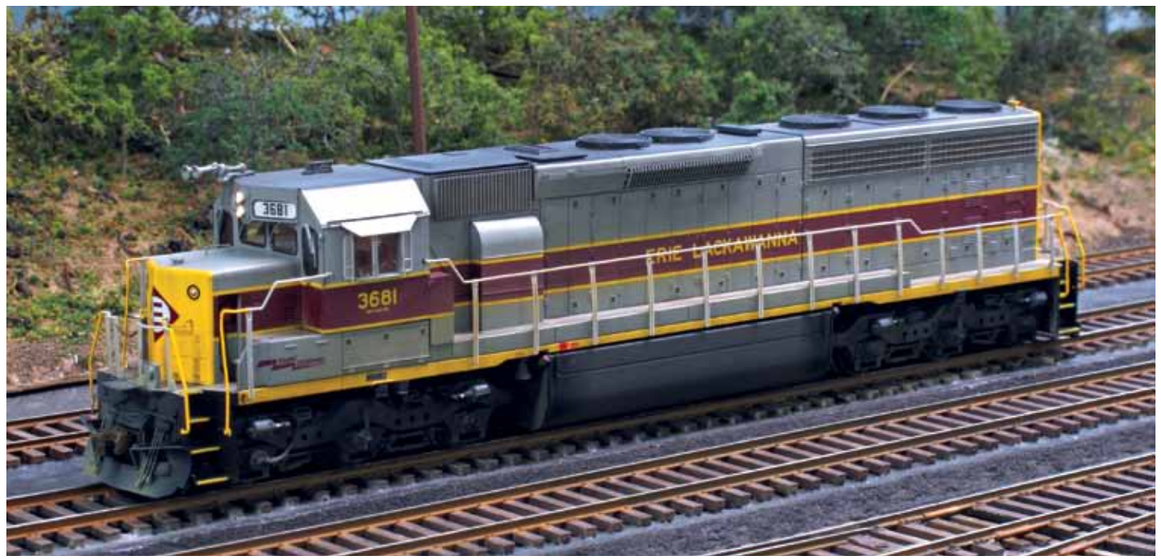
The following information is in the sequence that I recommend using when weathering locomotives.

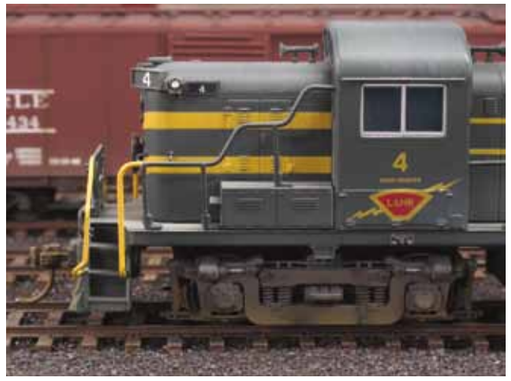
Safety First! – *Regardless of the type of paint you choose, whenever using solvent-based paints or any acrylic paints with an airbrush, always ensure you have proper ventilation, prefer-*

EL SD45-2

Right out of the box, this Athearn Genesis SD45–2 is a beautifully detailed model but it looks "toy-like" with no weathering. After some light weathering, the unit looks a lot more prototypical. Overall, the application of a black wash and weathering the pilot, trucks, and fuel tank made a big difference.







Alco Switcher

Above: No. 4 clearly has been doing battle with the elements. Lots of mud has been kicked up on the front trucks.

DL&W F3A

Below: The pilots get spattered with dirt and mud kicked up by the locomotive wheels. Carefully build this effect up with your airbrush from the bottom up in line with the railheads.

F-M 934

Below right: The pilots and walkways have a light accumulation of dirt. The coupler has also had a touch of rust added to it.

ably by using a paint booth that vents to the outside. Also, use a partial face respirator with a P100 air filter for organic solvents and wear nitrile "rubber" gloves (the purple ones) to protect your hands from organic chemicals. Using solvent-based paints without these precautions is a serious health risk. Even using acrylics with an airbrush is a health danger without proper ventilation because of the particulates.

Wheels, Trucks, Fuel Tanks, Pilots and Couplers

If you can remove the shell from the frame or chassis, it makes weathering somewhat easier. In many cases, the shell is held on with the coupler boxes and a couple of screws attaching the chassis to the frame. Also, depending on your skill level, you may wish to disassemble the trucks so you can paint the wheel faces separately. Some locomotives allow you to remove the truck sideframes without removing the wheels from the truck assembly. If you prefer not to disassemble the trucks, you can paint the edges of the wheels by running the locomotive while it is on its side on your workbench as described later. While this may seem fussy by some modelers, seeing shiny wheel faces on an otherwise weathered model is not realistic.

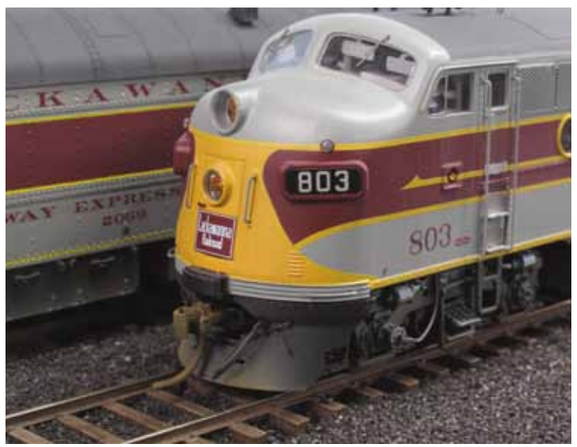
The first step is to clean the wheel faces or at the minimum the wheel edges. An easy way to do this is to take a Q-Tip wet with 91 percent alcohol and clean the wheel edges that are visible from the side to remove any oil or grease. If you have the shell off, you can clean the wheel faces by clipping leads to the left and right track inputs on the circuit board. If you are not removing the shell, just touch track inputs to the wheel treads, so they rotate slowly as you clean the faces of the wheels.

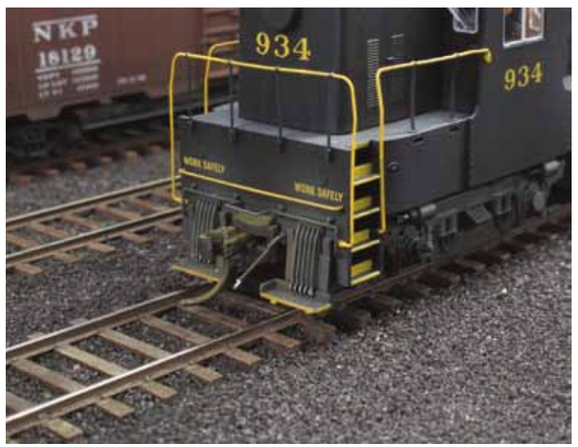
In general, unless a locomotive is brand new, the wheels are a dark color, but not black. Depending on your research of your prototype, mix up a "standard" wheel/truck color. My personal choice is a mixture using Grimy Black as a base, and then adding some Rail or Roof Brown to give it a slightly brownish shade. However, if you are modeling a western road that uses a lot of sand going up grades, you might want a color more toward a gray tone.

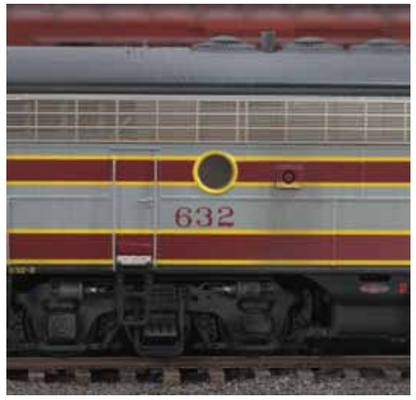
To paint the wheel face, apply power to the locomotive, so the wheels are rotating slowly, and paint the edges using a small brush. Don't worry about getting paint on the wheel treads; they will be cleaned later. Be sure not to paint the axles or the flat surface around the axle ends because this conducts current from the wheels to the trucks and locomotive.

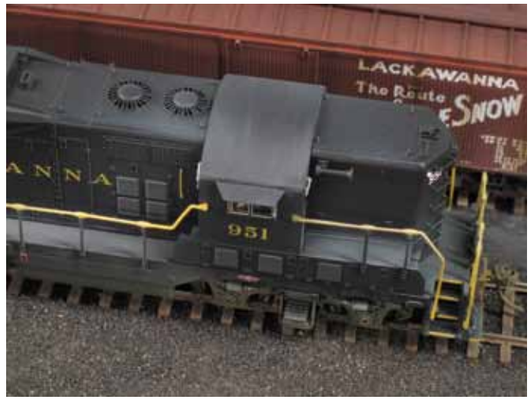
To paint the trucks and fuel tanks, use an airbrush to apply a thin coat over the existing truck color. **NOTE:** Locomotives with silver trucks, such as those typically found on Santa Fe units, need to be treated differently at this stage by using an even thinner coat so that the underlying silver shows through. Some of the recent models have lettering on the trucks, and you don't want to totally obscure that, so dilute the "base" color about 50:50 with thinner. A double-action airbrush works best for this, so you can carefully control the amount of paint being delivered.

Once you have the "base" color, you can add some more weathering. A good starting point is to use a light color, such as









EL 632

Far left: Here, you can see the effects of the wash on the side of this F7. Note the black streaking that simulates the effects of dirt being washed down the side of a unit by rain.

GP7 951

Left: Using a black wash on a black locomotive isn't effective. Instead, use a medium gray wash to show the streaking effects of dirt. Go lightly with the gray — it will dry more pronounced than it appears wet.

F-M 854

Below left: Before any weathering with an airbrush, be sure to mask the windows and headlight lenses either using masking tape or Microscale Micro-Mask.

SP 6190

Below: Typical weathering pattern on a flat carbody, such as an F-unit, is the bow wave effect. Using your airbrush, sweep over the side from below and just behind the pilot to midway along the side with thinned dirt or mud color.

Grime or Earth, aiming the airbrush from the top down to simulate general dirt that settles on the top surfaces of the trucks. Then use a darker brown shade, such as Rail Brown, from below track level, aiming the airbrush upward on the truck face to simulate the road dirt and mud that splashes up from the roadbed and track. Again, you are using highly diluted paint, so you build up the effect slowly. It is better to have to go back and add weathering because it is difficult to "undo" a too-heavy weathering job after you are finished. Later, we will come back to the trucks and fuel tanks for other effects, such as fuel spills, using a regular paintbrush. Remember, you are not "painting," you are adding a thin coating of highly diluted paint to simulate the effect of dirt and grime on the locomotive.

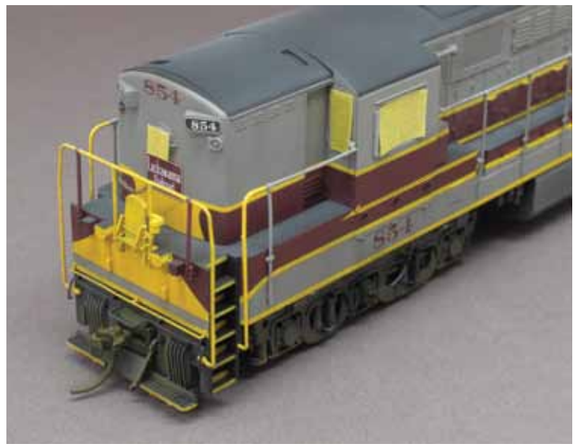
The major weathering effect on pilots is the streaking that occurs from dirt and water kicked up from the unit ahead when it is in a multiple-unit consist. Spray vertical streaks in line with the track gauge. Earth, Rail Brown, and/or Mud works well here. Don't get carried away — spray just enough to show an effect. While you have those colors in the airbrush, you can spray the end faces of the fuel tanks since they also get spattered from the wheels kicking up dust and dirt.

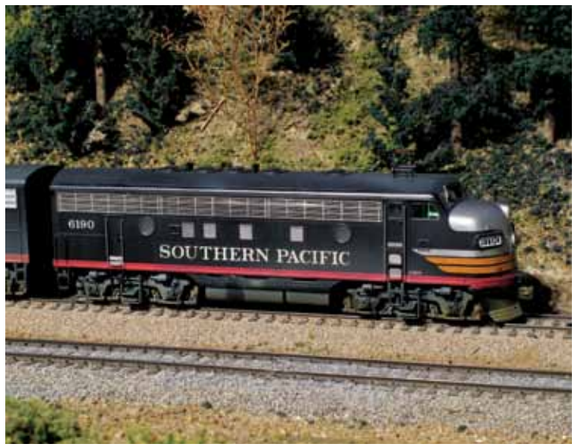
Finally, paint the couplers with a mixture of Rail Brown and Rust in about nine parts of Rail Brown to one part of Rust. Use light applications (again a one-to-one mixture of paint to thinner) on the couplers, so you don't impact the operation of the couplers.

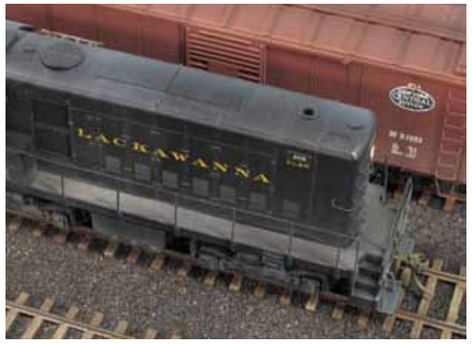
The Car body or Shell – Using Washes to Simulate Rain and Snow Effects

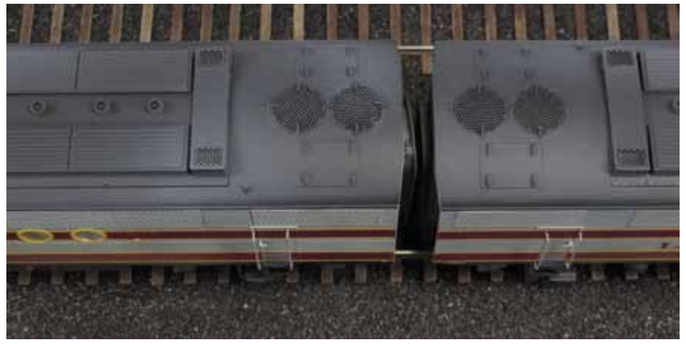
The next step is the use of highly diluted washes to simulate the effects of rain and snow on the sides of the diesel locomotive car body. Studying photos of the prototype gives you a good guide to use to simulate that effect you are trying to create on your model.

Washes are nothing more than paint highly diluted with thinner. A good starting point is using one part Floquil Engine Black to nine parts Testors Universal Airbrush thinner. With acrylic paints, such as Polly-S, use denatured alcohol to dilute the paint. Using plain water will cause the wash to bead up on the surface. Apply the wash with a soft, flat brush about ¼-inch wide. The idea is to build









Switcher

Above: Walkways collect dirt and grime over time. You can simulate this either with your airbrush or using Bragdon Weathering Colors.

EMC FTs

Upper right: Before weathering a black roof, it is best to repaint the roof with Weathered Black and then add fading using your airbrush with a light gray color such as Grime. Exhaust soot can be added around the stacks.

up the layers of wash gradually to gain the effect you want. Here are a few key points to successfully applying washes:

• Make sure all your brush strokes are vertical. You are trying to simulate the effects of gravity on rainwater and snowmelt. Water always runs down surfaces vertically, dragging accumulated dirt along with it.

• Only use washes on surfaces where water will run, such as vertical surfaces on the nose, hood sides, frame, curved roof surfaces such as the cab roof of an Alco RS-3, or the angled roof of the cab of an SD45. You won't see streaks typically on the flat surface of a roof or walkway.

• In general, it is better to pull the brush from top to bottom — that is how weathering happens in the real world. However, if you are weathering a hood unit with walkway handrails installed, it is difficult to do this. In this case, drag the brush upward from the walkway up to the edge of the roof, being careful not to leave puddles where your brushstroke ends.

• In my experience, using solvent-based washes typically doesn't soften the factory paint, so long as you don't flood the surface. Your brush should be damp, but not dripping with the wash. One nice thing about using solvent-based washes is that if you need to correct a mistake, the wash will allow you to change an effect without disturbing the underlying paint even after the wash has dried. If you are using acrylic washes, once the wash dries, you cannot change it or remove it.

• The number of applications of wash depends on how heavily weathered a unit you are trying to simulate. The first application will typically not result in much streaking, but generally dulls down the toy-like appearance of an out-of-the-box diesel. Remember that even though the model manufacturers may match a model's colors exactly to the prototype, when you view a prototype photo, you are looking through layers of atmosphere that subdue the color intensity. And for the prototype, even after only one trip, a new unit will accumulate some road dust, grime, and exhaust soot, dulling its new paint.

• If you are weathering a black unit, such as an Espee Black Widow F-unit, the black washes will have some effect on the lettering, but won't impact the black paint. For black or dark-colored diesels, try using a wash with Reefer Gray as the base. You have to be especially careful because the gray streaks tend to be more pronounced than lighter-colored units using the black wash, so build the wash layers up slowly, letting each application dry before adding more.

The Car Body — Blending the Weathering

After you are satisfied with the wash step, there are a few more techniques with the airbrush to blend and soften the distinctive effects of the wash on the unit. Before doing any airbrush work on the car body, you will need to decide how to protect the cab window "glass" and headlights from the weathering paint. Even the most heavily weathered unit will have clean windows and headlight lenses. If the window glass is already installed, there are two methods, and both work well:

Using tiny pieces of masking tape, cover all the "glass" areas and the headlights. Instead of trying to cut out a perfect size for the opening, cut out smaller pieces and fit them together into the edges and corners of the "glass" using tweezers. It isn't necessary to do a perfect job — just good enough to protect the majority of the surface from weathering paint. Another method is to use a product made by Microscale (the decal people) called Micro-Mask liquid masking tape. It is a clear, gel-like substance that you paint on the window "glass" with a fine brush. It dries into a film a short time after application. After you have completed weathering, you simply peel the material off the "glass" like a piece of clear tape. This technique generally works quite well, and when removing the film, be careful not to scratch the plastic windows. Using a sharp toothpick, you can first lift one edge of the mask, then using tweezers, carefully pull the mask off the window.

From here, there are generally three or four colors that are used to blend and finish the basic weathering on the car body. It depends on what you are trying to simulate, but in general:

Grime — Good basic lighter color that simulates the effects of road grime.

Mud or Rail Brown — Used to show the effects of dirt that washes up on the sides of units.

Weathered Black — For locomotives that spend a lot of time going through tunnels.

Cab units such as F- and E-units often have a distinctive "bow wave" effect that starts just after the pilot and sweeps back along the side, not unlike the wave effect a boat makes. Take a look at some photos of F-units, and you will see that effect. It was simulated on the SP F7 with an application of Floquil Mud lightly airbrushed along the sides of the units. It is subtle, but effective.

For a general overall dulling down, either Grime or Weathered Black will provide a good starting point. Work with extremely light applications. Remember, you are not painting the locomotive, but just "dusting" it, as real dust and grime would in real life. If in doubt about how heavily you should weather a unit, always stop and look at it a few hours or a day later. It is easy to add additional weathering, but impossible to remove it once applied. For units that spend a lot of time going through tunnels, such as Rio Grande locomotives, an overall dusting of Weathered Black can be effective, but go easy, and study the effect before it gets too heavy.

FURTHER WEATHERING DETAILS

Walkways

If you take a look at any hood units from above, you will see that the walkways are quite light in tone since they are covered with dust, dirt, and grime. Even black units will have walkways that look light gray. The contrast is quite distinctive and often not modeled. Using light applications of Grime or Earth with an airbrush will simulate that effect. You can either spray from the top down, which will coat the top of the handrails too, or spray from the side through the handrails, which will coat the sides of the handrails. Since the weathering coat is highly diluted and you are spraying with a lot of air and not much paint (double-action airbrush), the effect is usually acceptable. If the lightened handrails bother you, you can come back later and lightly spray them with some Weathered Black to darken them down, holding a piece of cardstock behind them to keep the Weathered Black off the side of the hood.

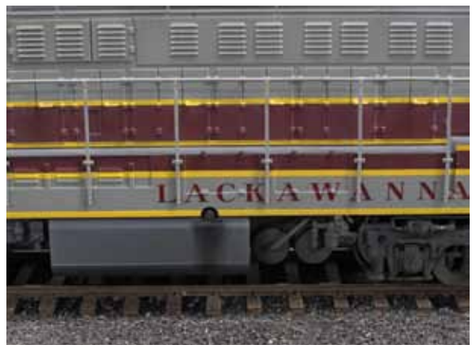
Another technique to weather walkways is to use weathering chalks, such as Bragdon Weathering Colors. Generally, the light grays and light browns work well and have the added benefit of not impacting the handrails.

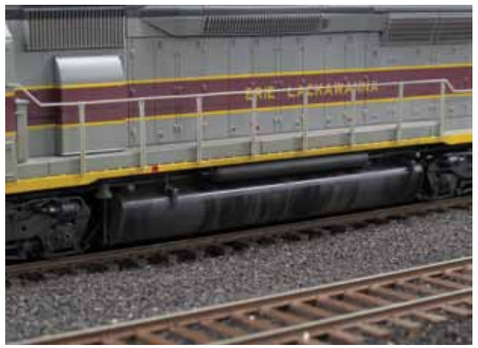
Roofs

The roof is important since we typically see our models from the top. Weathering on the roof of a diesel combines sun fading, accumulation of dust and dirt, and exhaust soot. Depending on the color of the roof, you may need to do some additional painting first. For example, if the model has a shiny black roof, it is recommended first to paint the roof a very dark flat gray color such as Weathered Black paint. That way subsequent weathering will be more noticeable.

If you study photos of the roofs of diesel locomotives, you will generally see a mottled effect from sun fading and accumulated dirt. Sun fading can be simulated by randomly lightly spraying some Grime on sections of the roof. Here again, studying prototype photos helps. If the roof is curved, such as on an Alco RS-3 or an F-unit, you can do some gray wash coats to show streaking from rain and snow. The final effect is exhaust soot. It is important to decide the principal direction in which the locomotive operates, so the dominant soot accumulation is in that direction behind the stack(s).

Spray light coats of Engine Black from a low angle to simulate the soot blowing back while the locomotive is moving. Feather the "soot" out with the heaviest effect around the stack(s). By spraying from a low angle, you will get the "shadow" pattern behind protuberances, such as fan housings, horns, and the like. Even though most F-units run in the cab for-



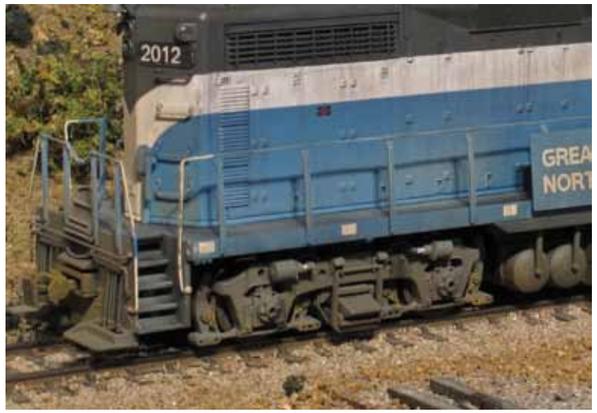


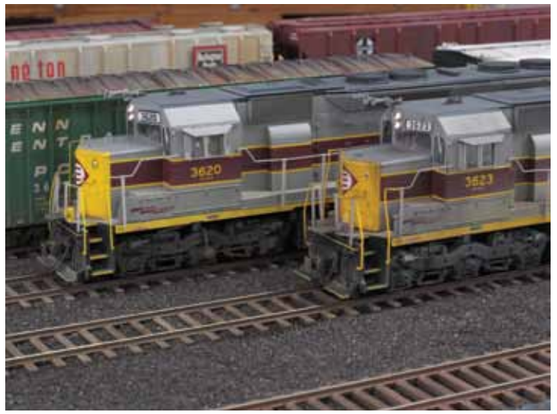
Fuel Tank

Far left: Fuel spills show up on the outside of fuel tanks, but the black is actually dirt adhering to the wet diesel fuel rather than the color of the diesel fuel itself.

Fuel Spill

Left: The SDP45 had a unique pattern of fuel spills due to the shape of the fuel tank. Rather than just having a pattern below the fuel filler, the fuel ran all along the top of the tank and down the sides, causing the multiple spill marks.





Handrails

Paint is worn off handrails by the crews alighting and boarding. Using a small brush, randomly touch the handrails with some gray or black paint. The brake shoes often show rust, and this can be simulated with a wash of rust paint applied with a small brush.

SD45s

One of the keys to weathering is variation. For example, both of these SD45s are weathered, but No.3623 shows the effects of heavier weathering. The variation makes for more realistic consists.

ward position, some are used as trailing units, and a little soot on the nose, again from a low angle, looks very realistic.

Fuel Spills

If you study photos from the 1970s and earlier, and examine the fuel tanks, invariably you will see the effect of fuel spills on the fuel tanks. While those spills appear dark or black, what you are seeing is not the color of the fuel, but the effects of dirt sticking to the wet or damp patches where fuel was spilled on the sides of the tanks. To simulate this, use the technique of dry-brushing.

Take an old stiff-bristled paintbrush and dip the end in Engine Black. Then, wipe most of the paint off the brush by rubbing it on some cardboard until you barely see any trace of paint. Now, stroke the brush from the fuel filler location down the side of the fuel tank in vertical strokes. If you want more effect, repeat the process. It is easier to build up the effect than to try to subtract too much by repainting the fuel tank! The effect you want is not a black stripe, but a feathering of the paint from the center outward.

Grease and Oil on Truck Side Frames

While you have your paintbrush out dry-brushing the fuel tank, you can use that same technique to simulate the effects of grease and oil on the trucks' sideframes. For locomotives with friction bearings, you would typically see the result of oil leaking out of the journal box covers. Make the effect random, so it looks like natural weathering rather than someone painting the effect on the surface.

Rusty Brake Shoes

To simulate the effect of rusty brake shoes, use the dry-brushing technique with Rust paint. As an alternative, you can do the same effect with a rust-colored wash.

Paint Wear on Handrails

Handrails on locomotives are painted a contrasting color for safety, typically white or yellow. These handrails get a lot of wear as crews climb on and off locomotives. Replicate this wear by randomly touching your dry brush with either Engine Black or Reefer Gray at locations where a crewmember would grab when getting on or off a locomotive.

Brake Cylinder Pistons and Glad Hands

A small detail that adds a lot of visual interest is to paint the brake cylinder piston rod a silver color, such as Platinum Mist, to simulate the polished piston rod on the brake cylinders. Use a very small pointed brush and just touch the surface of the piston rods to paint them. While you have the silver paint out, you can paint the glad hands on the ends of the air and signal lines if the model has those details.

FINISHING UP

Protecting the Finish

After you are satisfied with your weathering effort, the final step is to protect the finish with an airbrushed layer of Testor's Dullcote. Thin the Dullcote one-to-one with regular lacquer thinner, and then airbrush several thin coats over the model, especially those areas that you typically handle, such as the fuel tanks, trucks, and hood sides. Even though you have used solvent paints for the weathering layers, because these paints are so diluted, they are not as durable as a factory paint finish. Also, the Dullcote will provide an even, realistic dull finish to the model. This is especially important if you are only going to give a locomotive a light weathering coat.

Cleaning Wheels and Windows

Now that you have completed the weathering, the only thing remaining is to remove the masking material from the windows and headlights and clean the wheel treads. The easiest way to clean any stray paint off the wheel treads is to put the locomotive in a foam cradle and use a pipe cleaner dipped in lacquer thinner to clean the wheel treads. Touch track power leads to the wheel treads to have the wheels rotating while you are cleaning them. Don't use too much lacquer thinner, and try to keep the pipe cleaner on the surface of the wheel tread, so you don't remove any paint from the wheel rims that you carefully painted.

A Note About Consists

In most cases, diesels are operated in consists. While in the early days of diesels, the same locomotive consists such as an A-B-A set were generally kept together. In the late 1950s and early 1960s, railroads began to mix up units from different manufacturers. The point is that unless you are modeling the late 1940s and early 1950s, it is more realistic to vary the weathering on units within a consist, even if the diesels are the same model. As an example, the two Erie Lackawanna SD45s are weathered differently — one a bit more heavily than the other even though they might be lashed up together in the same consist.

Murphy's Law

Weathering is more of an art than a science. Even with careful planning and the best reference materials, sometimes the results don't always go according to plan. A case in point is the weathering of a Western Pacific F3 that was part of a Western Pacific consist. Since that unit was in the freight livery, as compared to the other A-B-B passenger units with the stainless steel side panels, I planned to weather that unit a little heavier than the first three.

One of my first steps was to paint the roof a weathered black since it was shiny black from the factory. An easy step….So I thought. I used a low-stick masking tape to cover the sides of the unit and painted the roof. No problem! Except when I carefully removed the masking tape, some of the "Western Pacific" lettering peeled off with the tape! This had never happened before and not with any of the other 100 locomotives I had weathered for the CMRM. I was horrified, but there was nothing to do but continue weathering. Now, I thought, this unit will have to be very heavily weathered.

My next step was a black wash, which I had done countless times without impacting any factory finish. To my added horror, as I applied the wash around the nose, the silver paint started to dissolve and run. At that point, I started a search on eBay for a new identical unit to replace this shell but couldn't find one. After that, I did a search of WP F-unit photos and found a B+W photo of one that looked a lot like the one that I just weathered — with missing lettering and all! So you see, as the saying goes, there is a prototype for everything.

The moral of the story is that no matter how carefully you plan, unexpected things happen, so be prepared to work with the results, even if they aren't exactly what you had in mind at the start. In this case, despite my thinking I had ruined one of the Museum's locomotives, the weathering effects were wholeheartedly accepted. Some volunteers told me how most of the WP F's looked even worse toward the end when they were relegated to freight service. Nevertheless, the golden rule of weathering is "less is more." You can always go back and add more weathering, but it is difficult to remove weathering once it is applied. RMC

WP F3A&B

Sometimes a seeming weathering disaster can be salvaged. In the case of this heavily weathered WP F3, masking the sides with masking tape inadvertently removed some of the lettering, which was actually prototypical.