

YouTube Model Builders eMag

A Free YouTube Model Builders e-Magazine
Produced by YouTube Model Builders.

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COMMUNITY

YTMB LIVE! SHOWS
YTMB HANGOUT SHOWS

VOLUME 3

www.YouTubeModelBuilders.com

JANUARY 2017

ARTICLES YOUTUBE CHANNELS COMMUNITY TIPS & TRICKS

Rust Dirt & Grime

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Blending Science with Models
- The Many Layers of
Rust, Dirt, and Grime

Be Sure To Check Out Columns From
Jack Hykaway, Geno Sharp, The Track
Planner, Harry M. Haythorn,
and Andy Crawford

BE SURE TO CHECK OUT

YouTube Model Builders LIVE!
Join Us LIVE Every Month

Cover Photo: JD (Loggin' Locos)



Welcome YouTube Model Builders!

We are excited to present this January, 2017 issue of the **YouTube Model Builders eMag** to the community. The YouTube Model Builders “Team” is committed to putting the “eMag” together with the assistance from the model railroading community at large.

We deliver a useful and informative publication for model railroaders who travel this vast net of information. In this publication, we include many informative, tutorial-based articles, information on happenings in the community, listings of up-and-coming YouTube channels, information about the **YouTube Model Builders LIVE!** show, **Hangout Presentations**, along with general information that is inspirational in building of our model railroads.

Our Vision:

To establish free, online resources as a primary source for model railroad techniques and inspiration in an ad-free, selfless service environment.

Our Mission:

The mission of YouTube Model Builders is to inspire individuals for sharing model railroad building techniques through the use of YouTube and other free online resources. Our goal is not only to share knowledge in a community but also assist individuals who are learning or looking for inspiration through the online model railroading community.

— The YouTube Model Builders Team

Editor's *Note...*

Welcome to 2017 everyone! We now begin our third year of the YouTube Model Builders eMag and we have many exciting new themes in the works. Some of the themes include Model Railroad Photography, Electronics and Control Systems for Model Railroading, and Prototypical Operations (please see [page 45](#)). We encourage you, our readers, to contribute articles and photographs of any model railroading related topic to the eMag, and to suggest topics we should cover.

In this issue we follow in the footsteps of the previous Craftsman issue ([November, 2016](#)), with a focus on rust, dirt, and grime. Modeling these as prototypically accurate as possible, representing the various colors and textures, goes a long way in our desire to become more proficient modelers. I encourage you to go out and explore, observe, and feel rust, dirt, and grime. When you physically go and sense these, you automatically get a better understanding of how you are going to model these naturally-occurring elements.

To help us better understand the chemistry of rust and oxidization Eddie Bauer of Weathering Solutions writes about the behavior of rust and how the science behind it helped them develop their decals. Edward Traxler does a deeper dive into the various forms of rust and the chemistry behind it. He also details techniques for modeling rust and textures with a great example of using the "Hairspray Technique."

In his column, the Track Planner writes how interaction with a client led to the evolution of his track plan design and about the lessons he learned from the process. Harry Haythorn gives us insight into the history of snow plows deployed by the Union Pacific, and Jack Hykaway presents us with information, along with some wonderful pictures of General Electric's recent ET44AC and ET44C4 locomotives in his article "A Lean, Green Machine." Geno Sharp shows us how to model grime on a dime using simple and cost-effective techniques. In his "Food for Thought" column, Andy Crawford discusses the wide gulf between the real world and how we envision rust, dirt, and grime on our models. All-in-all a very interesting read!

Happy Model Railroading and a Happy New Year!

– **Loggin' Locos**
Editor-In-Chief



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The rusted remnants of the boiler house from the burned-down Mower Lumber Company mill at Cass Scenic Railroad in West Virginia. The mill was originally owned by West Virginia Spruce Lumber Company (1902—1910), then by West Virginia Pulp and Paper (1910—1942), and finally by the Mower Lumber Company (1942—1960), when it finally closed.

Cover Photo: JD (Loggin' Locos)

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Andy Crawford



YouTube Model Builders HANGOUTS

We have different types of Hangout Shows each month!

For the latest schedule updates please go to www.YouTubeModelBuilders.com.



Hangout Shows are topic-driven and are hosted by Johnny of Southeast Rails and Barry Rosier. The shows include various topics and interesting guests such as Miles Hale and Bill Beranek (The Track Planner).



The MRR Tech Show is hosted by Barry Rosier and Mike Dettinger.

The MRR Tech show is all about the technology of model railroading. Covered topics include DCC, JMRI, animations, 3D-printing, and much more.

Calling all geeks!



During this Thursday night show, open presentations are topic driven and fellow YouTube modelers join in to discuss various model railroading topics.

*Thank You To All Those Who Contributed To
The YouTube Model Builders eMag in 2016!*

Andy Crawford
Bill Beranek – The Track Planner
Blayne Mayfield
Bruce Petrarca
Chris Heili
Christopher Williams
Chuck Zeiler
Derrell Medley
Deryk Glass
Donnie Dixon
Douglas Wilson
Dude Lindler
Eddie Bauer
Edward Traxler
Geno Sharp
Harry M. Haythorn
Jack Hykaway
JD (Loggin' Locos)
Joe Steimann
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John Hill
Jonah Hemingway
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Lloyd Henchey
Mark Mead
Máté Mogyoró
Modeler Man Mike
Philippe Moniotte
Porvoo Model Railroaders Club
Richard F. Piccuilla
Ron Pare
Shane Mason
Stephen Borleske
Steve Juranics
Thomas Wyssmann
Tom Conboy
Travis Dewitz
William Graham
Yoaman Smith

Please click on the individual names above to view their YouTube channel or website (if available).

Happy New Year!

YouTube Model Builders Presents



Workshops Begin January 25th, 2017

All Newbies Welcome!

Please join YouTube Model Builders along with Chris Heili and guest panelists, who will build live, various projects using the Arduino platform. * Projects include lighting, sensors, servo control, and animation. Each project is quite easily accomplishable by any beginner hobbyist.

Let's explore and learn together some of the coolest projects in model railroading. We encourage you to ask questions directly to the presenters and chat live with them during the workshops. Share videos, pictures, and comments of your accomplishments on our [YouTube Model Railroaders Google+](#) community page.

* Participation in workshops requires an [Arduino based project kit and breadboards](#). For more information, please see the [YouTube Model Railroaders Google+](#) community page and posts announcing the workshops, or email Chris Heili at mrltrains@gmail.com.

YouTube Model Builders Proudly Presents The FineScale Live Build Show!

Show Begins February 7th, 2017

Have you been reluctant to approach wood and craftsman structure kit construction? Are you fascinated with highly-detailed weathered structures and dioramas you see within model railroading publications? Then this is the show for you!

Join Miles Hale and Barry Rosier, along with your hosts Andy Crawford and Johnny of Southeast Rails, as they take you from beginning to end of constructing highly-detailed wood structures and scenery - from box opening to complete dioramas.

In this show you will:

- Learn from a live, “camera-down”, clinic-style approach to construction.
- Obtain practical FineScale modeling tips and techniques.
- Understand multiple methods for each step of the construction process.
- Develop your modeling skills and overcome the fear of FineScale modeling.
- Build confidence in your own abilities as a modeler.

Please join us, build along, and learn as you go. We encourage you to ask questions directly to the presenters and chat live with them during the show. Then share videos, pictures, and comments of your progress on our [YouTube Model Railroaders Google+](#) community page.

Fe₂O₃

Blending Science With Models And How It Led To Weathering Solutions' Creation Of Weathering Decals™



By Eddie Bauer

All Photos Provided by Eddie Bauer

Rust is known to be the cancer of the ferrous metal world. Mankind has gone to great lengths to protect tools and equipment from the ravages of this naturally occurring, yet deteriorating force of the elements. Also known as iron oxide, it occurs when iron-based metals such as steel are produced with oxygen in the Bessemer process. Over time, the metal comes into contact with moisture from rain, humidity, or sources introduced by man; oxidation occurs and the process of rusting begins. It is an enemy of everything from sewing machines to automobiles. Many ways have been discovered over the past century to keep rust at bay. Most notable are sealing the object with paints, sealers, oils, zinc (galvanizing), and so on. These sealants work great until forceful contact manages to break the protective surface. If not addressed quickly, the damaged object will rapidly show a fine tint of orange, ultimately growing larger and spreading as time passes. Many variables play into the equation that dictates how quickly rust spreads. Some of these include climate of atmosphere (i.e., humidity level) and proximity to salt or abrasive materi-

als like sand. Other factors include the characteristics of the equipment; e.g., rust will progress differently on a smooth-sided grain hopper versus an SD40-2. Next, consider the use of the object. What does it do? What does it haul? How rough and tough is its design, and how will it be treated? An example would be a new Caterpillar D8 dozer fresh from the factory; rolling down the rails on a flatcar or down the highway on a trailer and not yet pressed into service, it is completely painted in a bril-

liant shade of yellow, blade and all. But as soon as those tracks hit the ground and it's used as intended, areas of the painted surface are now compromised from contact, and within mere days it will begin to rust. The same holds true for almost any equipment in the industrial world.

Understanding the HOWs and WHYs when evaluating your model for a weathering job and applying rust effects, ultimately will

Figure 1. This gondola with a load of pipes shows its scars, which are typical given its universal duties.





Figure 2. This Illinois Central coil car gondola shows rust cascading downward on the cover from where the stacking supports attach to the "hood."

so quickly? The Santa Fe "War Bonnet" or "Bloody Nose" scheme faded out almost right out the paint shop door and within a few short years, the paint would oxidize, blister and rust would set in, almost from the inside out.

The real-life or prototype railroad world holds millions of tons of rolling rust, and you don't have to look hard to find plenty of examples. Some basic research or inquiry will let you know what a piece of equipment is designed to handle; for instance, open top gondola cars haul everything that does not need to be protected from the weather. One major commodity transported in "gons" is scrap metal. The way a car is loaded and or handled with such loads can impact its rate of deterioration. (See Figure 1.) While on the subject of "gons", those that haul coil steel have an optional cover that can be placed over freshly-milled rolls of coiled steel. This cover plays no part in the structural integrity of the

make your project have a starting and stopping point. Consider things like perceived age, the era you are modeling, the car type, the construction, the commodity commonly handled, etc. Until recently, these patterns have been difficult to duplicate in the modeling world. Rust plays a major visual role for a weathered model. Many of the top-shelf, die-hard modelers spend long hours or even days hand-painting different weathering patterns on various pieces of rolling stock to match what we see in the real world. This is not a skill learned overnight, and it takes a steady hand to pull off a nice weathering job. Time consuming and tedious, it can require many different colors, shades and intensities of paint to get it right. That's where the idea of **Weathering Decals™** was born. Many obstacles and hurdles were encountered along the way. Issues relating to merging half a dozen software programs and integrating them into the ever-advancing printing technology has been nerve racking and extremely time consuming to say the least. Thanks to our network of experts and James

Donohue's hard work, we are now reaping the fruits of our labor.

Since railroad equipment is used and abused out in the weather, locomotives and rolling stock have been constantly modified and design improvements have been made to minimize the damaging effects of rust. Now outlawed for most applications, lead paint was among the most durable of sealants. Also, have you ever noticed how some shades of paint fail

Figure 3. An example of rust leaching from rooftop and side panel seams on this MoPac 89' auto parts hi-cube boxcar (photo taken 2014 in St. Louis, MO).



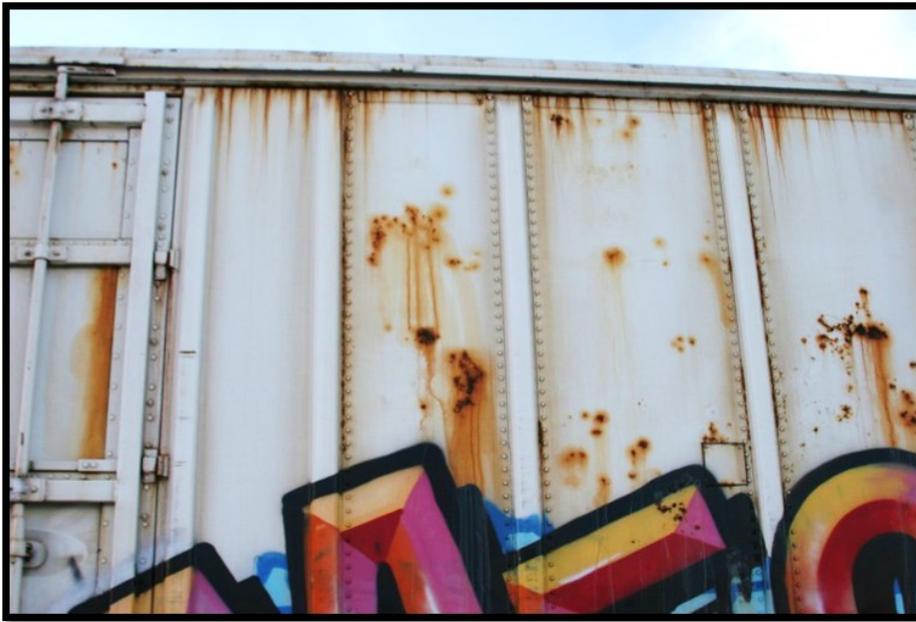


Figure 4. This UP mechanical reefer is a good example of the rust that can set in after 45 years of use.

car; its sole purpose is to shield the coil from the elements (slowing the rusting process) as it makes its journey from the mill that produces it to the customer who takes delivery. Given its minimal purpose, these coil car covers mostly are made of much lighter gauge sheet steel. After one or two handlings, this thin skin becomes banged up, gouged, and scratched, and in no time begins to fail. (See Figure 2.)

More prevalent rust patterns are seen when rolling stock, such as an 89-foot hi-cube auto parts boxcar (shown in Figure 3), has seen 40 years of service. In-train forces over the decades cause the seams to be stressed. Ultimately, the fatigue gives way to oxidation, most generally evident on the exterior areas where the thin-gauge side panels are riveted to the roof. Loaded more often than not with forklifts, sometimes the boom mast of the forklift contacts and even stretches the roof profile, straining

the seams on the rooftop itself. After loading or unloading is complete, it's not uncommon to see a forklift operator use his fork to secure the door closed. The door becomes bent up, tracks and hinges fail, and deep gouges can be imbedded into the car body. Vertical streaking patterns known as leaches develop, in

which the rust staining is denser at the top (the point of origin) and, as precipitation washes it down the side of the car, it transitions into a lighter fade (see Figures 4 and 5). This is a difficult pattern to paint & replicate in the model world as the smallest amount of excessive pressure will result in a “swoosh” and not be a convincing vertical streak.

Not all rust patterns are the same. You must take into consideration many factors, too numerous to list. You may have things such as accidental/incidental damage from a side-swipe, be it at the industry moving the car(s) or the yard crew switching. Maybe it is more of a naturally occurring effect, such as impact with falling rocks from a trackside bluff. It could be something like a chemical reaction from the commodity itself, such as soda ash spillage from loading that reacts with precipitation. One of my favorites is the obvious stenciling “DO NOT HAMMER” commonly found on covered hop-

Figure 5. A build plate is a good starting point to determine the age of equipment. (Photo taken 2015.)



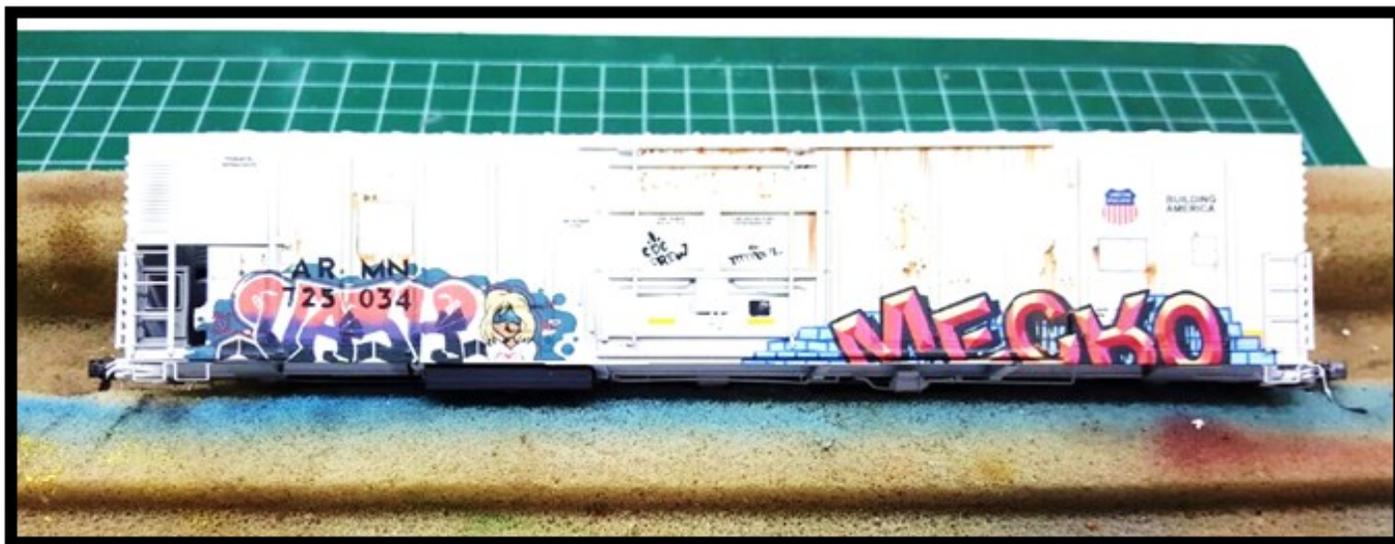


Figure 6. With decals applied and awaiting a final dull coat, this car is looking good.

pers; a lot of times the customer receiving a load may not be properly equipped with the vibrating device designed to get stubborn lading to drop. Instead they will use either a pneumatic or electric “hammer” to “beat” the hopper bin on the underside, thus damaging the protective finish and resulting in almost immediate rusting.

Whatever the reason contributing to the cause, the effect is rust. Just always keep gravity in mind; it’s a force that is here to stay, and Newton’s Law pulls rust and residue straight downward from its point of origin. Understanding rust, how it evolves, how it behaves, and how it impacts real-world objects, can go a long way in improving our ability to produce a more realistically weathered model railroad.

Everyone on the Weathering Solutions team would like to extend our thanks to [JD \(Loggin’ Locos\)](#) and his crew for giving us an opportunity to contribute to the YouTube Model Builders eMag. We are always happy

to share our knowledge and experience, and we look forward to learning from our fellow modelers any tips, tricks, and proven techniques they share. This hobby is much like the real world of prototype railroading in the sense that it is constantly changing as new technologies and resources become available, and you can never stop learning. One of the best resources is the Internet; instead of waiting on your letter carrier to deliver that hardcopy of your favorite periodical, you just have to wait on JD and his team to solicit contributing authors, painstakingly

edit and upload the eMag for the whole world to enjoy.

If you would like to learn more about our products and how they can benefit your modeling efforts, I invite you to give our website a visit. We are looking forward to going live with the one-and-only Mr. Bill Graham on the March **YouTube Model Builders Live! Show**, and we hope to have you onboard for that. Lastly, we have all intentions (weather permitting) of attending our first Amherst Railway Society Train Show in Springfield, MA on

Figure 7. Our decals have other applications around the layout.



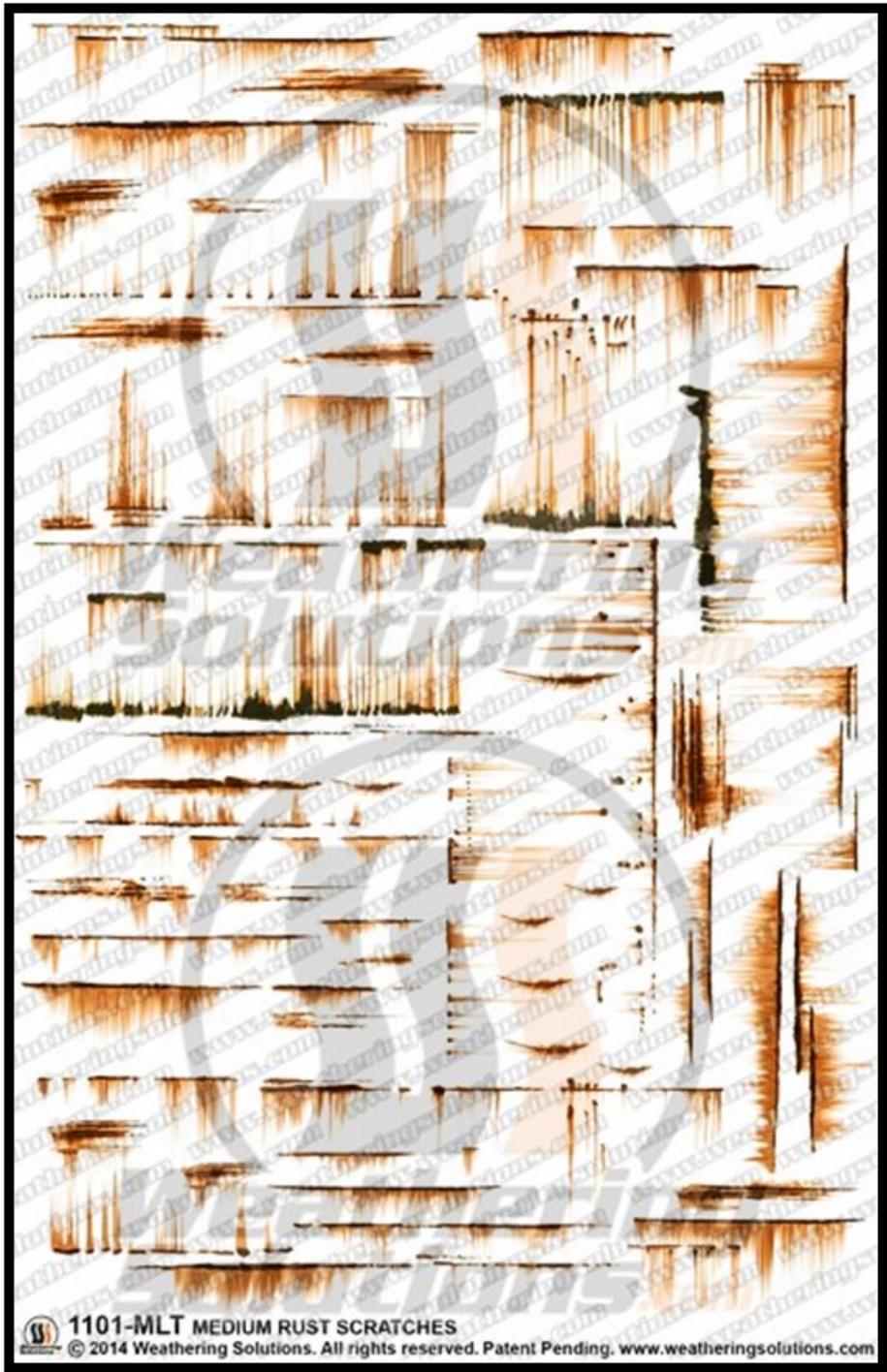


Figure 8. One of our more popular products (#1101-MLT, Medium Rust & Scratches).

January 28th and 29th, 2017; if you are attending, please stop by our booth, say hello, and take an up-close look at all of our models. (See Figures 6 – 8.) Till then, stay safe and Happy New Year! 🚂

About the Author

Eddie Bauer's first exposure to trains and railroading dates back to 1981 when his dad took him to the town of Glencoe, MO to ride a 12" gauge

live steam railroad. The railroad is called the Wabash, Frisco & Pacific, and by the time he was 13 years old, Eddie was firing and running the locomotive. In 1996 he hired on with the BNSF as a conductor and was quickly promoted to Train Service Engineer in September of '98. He spent much of his 16-year career working in Springfield, MO, taking mercenary work assignments over 8 mid-western states. He resigned in 2012 to work in partnership with Joe Steimann on bringing the [Weathering Decals™ Company](#) to reality. Aside from the time he spends working for a property management company, Eddie enjoys camping, hunting feral hogs, fishing and float-ing.

To learn more about Weathering Solutions' products and how they are applied, please visit Weathering Solution's [YouTube channel](#) and their [Website](#).



YouTube Model Builders LIVE! Want to see live shows discussing modeling techniques, YouTube resources, and Web resources?

Check out the LIVE show that airs monthly.

— Free to you!

THE MANY LAYERS OF RUST, DIRT, AND GRIME



By Edward Traxler

About the Author

Coming from a military family and as retired military himself, Edward Traxler has lived in many places around the nation and the world. After retiring in 2006, he joined an On30 module group. He created two 4-foot modules that were part of the display at the 2001 Narrow Gauge Convention in North Carolina and used them as the basis for his layout. He has been active in the hobby ever since, and his craftsmanship is evident from his work showcased in this article. He can be found on YouTube at <https://www.youtube.com/user/eTraxx>, on Twitter at <https://twitter.com/LCRRinO>, and his Deep River RR blog website at <http://etraxx.com>.

Cover Photo Courtesy of JD (Loggin' Locos). All Other Photos Provided by Edward Traxler.

I'm not much into planning when it comes to rusting something; I "just do it" without a set procedure in mind, of which I am aware. Writing this article has forced me to think about it, though. Let me begin by describing some characteristics of rust.

A General Discussion About Rusting

In my view, rustiness can be broken into several broad levels:

1. Extremely rusty, perhaps with just a bit of original paint left.
2. Mostly rusty, with patches of paint.
3. Painted, with rust showing through in patches. (This means there will be sections where paint is being colored with rusty shading.)
4. Painted, with minor streaks of rust or rusty discoloration.

An example of the first category would be the old, prototypical tank shown in Figure 1.

Let's also talk about different colors of rust. (The following is taken from the online sources "[What do the different colors of rust mean chemically?](#)" and "[What is 'black rust' on steel?](#)")

Rust isn't a single chemical compound, but several. They all contain varying amounts of iron (Fe), oxygen (O), the hydroxyl ion (OH), and water (H₂O). What "rust" we get when iron corrodes is affected by the amount of oxygen, water, and time.

Commonly called *iron oxides*, these

substances have chemical and mineral names. The three most common are:

FeO = ferrous oxide

Fe₂O₃ = ferric oxide, hematite, and red iron oxide

Fe₃O₄ = ferrous ferric oxide, magnetite, and black iron oxide

We modelers are more concerned with the colors of these different rusts rather than their chemical makeup. Those colors often depend on whether the rust is made up of dense solids or fine particles:

- *Grey to brownish-black.* When iron rusts quickly and is kept wet, the first product is usually the mineral magnetite, which is made up of fine particles.
- *Grey to shades of red.* Sometimes, magnetite will oxidize further into hematite. The fine powder form is cherry-red to reddish-brown.

- *Red to red-brown, to yellow-brown.* Hematite slowly changes to gamma-FeO[OH], called *lepidocrocite*. The "iron stain" that is seen under dripping water faucets is lepidocrocite. When finely powdered, it is dull orange (ferrous oxide).
- *Orange to yellow-brown.* In time, lepidocrocite changes [by crystallization] to alpha-FeO[OH], called *goethite*, which is a fine powder.

From all of this, we modelers can get a general rule-of-thumb for rust colors: newer rust appears more orange in color, while older, more established rust is darker.

Creating Rust on a Model

Of course, there isn't a single, set procedure for rusting something. You can use one method or combine several methods on a single model. The method, or methods, you use depend on what you want

Figure 1. This tank suffers from years of neglect.





Figure 2. The surface of this scratch built tank has patchy rust, but is mostly rusted in other areas.

to see as a result. In general, there are two basic approaches to rusting a surface:

1. Create a rusty surface and then apply paint afterwards. Then, you selectively remove paint to reveal the rusty surface underneath. If done correctly, this procedure gives you a lot of control.
2. Rust the surface after painting. This can be done several ways such as using washes and/or powders, a sponge, or careful use of a brush. Using all three methods works even better.

Consider the tank shown in Figure 2, which I scratch-built. I wanted to model the second and third levels of rust, as described earlier. In some areas, rust has discolored the paint so it has a rusty tinge while in other places the paint has flaked off completely showing the rusty metal beneath. In this case, the first approach to rusting (completely paint-

ing the tank rusty, then painting the tank green, then removing some of the green paint) eased the process, since there simply is so much rusty area. (If you are interested in building and weathering this tank, see the [plans and step-by-step description](#) on my website.)

Another type of rusted object commonly found around structures and

railroads are pipes. My piping (see Figure 3), has received some attention and nice compliments. I keep telling people that it really is simple, and it is. This is an example of the second rusting approach (a base coat of primer, followed by washes).

The Hairspray Technique

Recall the first approach to rusting: applying the rust, overlaying it with paint, and then selectively removing some of the paint to expose the rust. One popular way of achieving this is known as the *hairspray technique*, in which hairspray is applied to the model between applications of the rust and the paint layers. This makes it easier to remove some of the paint layer, since the hairspray is water soluble. I suggest that you use hairspray that comes in a fine-mist aerosol can rather than a spritzer bottle, as this will give you more uniform coverage.

Hairspray is applied in the same way you would apply paint with a spray can: hold the model 12-18" away,

Figure 3. The ever-present rusty pipe.





Figure 4. The dusty victim of my rusting efforts.

Tips on Top-Coat Application

Michael Rindaldi, a world-class military modeler, is the author of a series of books on that hobby, and he gets into detail about different paints. When he discusses chipping using the hairspray technique, he writes that Tamiya has certain things that make it a better choice. Tamiya is acrylic enamel paint and will create chips that are quite small. Lifecolor and Vallejo paints are both vinyl acrylics and will dry to a shell, which simply is not as easy to chip as Tamiya.

When using Tamiya for the hairspray technique it is very important to use water to thin the paint and not Tamiya's thinner. The reason is that the thinner will make the paint adhere too well; with the hairspray technique, we basically want the paint to "float" rather than adhere to the underlying surface so you can chip it with water.

The upper layer of paint should be sprayed in a normal opaque manner if you wish the paint to show chip-

and press and release the nozzle before and after sweeping across the model to keep from puddling. You can use a hairdryer between coats to speed up drying time.

Generally, here are the steps I take for the hairspray technique:

1. Apply the base coat; this can be primer, metallic paint, rust, or whatever you want to "peek through" the upper layers of paint. Let it dry.
2. Apply two coats of hairspray, letting each coat dry before proceeding.
3. Use an airbrush to spray on paint. (I have used a spray can for this successfully – just how well that works depends on the paint; some paints work better than others for removal.)
4. Next is the step known as *chipping*. Using water and brushes (as described in more detail, be-

low) you remove the paint where you don't want.

5. It could be that the locomotive has been acquired by a short line and repainted more than once, in different paint schemes. If you wish to model this, you can repeat steps 2-4, above, so that the older paint layers show through newer paint layers.

Figure 5. A base coat of "rust" has been applied.





Figure 6. Inexpensive paints are used to add texture and color variation.

ping. If you want to show wear, then you can spray lighter coats and not completely cover the underlying surface.

If you plan to mask parts of the surface to create a more detailed, top-layer paint scheme, be careful! When you remove the masking tape, you could pull up all paint applied over the hairspray. I suggest you may want to use a low-tack tape or – even better – brush the area with a liquid masking film.

Tips on Chipping

The supplies for chipping are simple: water in a small container, brushes for chipping, and toothpicks to help start a chip. I suggest one brush with short, stiff bristles, another with a flat, thin bristle, and perhaps another with an angled tip.

To start, brush a relatively small area of the surface with water and let it sit. It may take moments or minutes, but at some point the hairspray (but not the paint) will start dissolving. You start working the surface, usually against a sharp edge, using a sharp pointed object such as

the end of a toothpick. The short bristle brush works for most of the chipping but may prove too aggressive in some areas, so switch to a softer bristle brush, in such cases. The trick is to proceed very carefully with a light touch. Once the hairspray has let go it is too easy to remove too much paint. Proceed carefully, slowly, and precisely. Take your time.

A Step-by-Step Example

Let's see what we can do with the On30 Bachmann Davenport locomotive, shown in Figure 4 as it was before I started the process. (This Davenport was somewhat weathered already; I pulled it off a shelf where it had collected some dust!) Although I am using an On30 loco, these techniques can be applied to any scale. And, I decided to go all out on rusting the model since that is the purpose of the article. You most likely will not go to this extreme in your own rust, dirt, and grime, but the methods still apply to your project.

One of the first things to consider is whether to disassemble the model prior to painting, and if so, how far? For me that is determined – at least in part – by what I am using to apply the paint. If an airbrush, then you have a lot more control and you can (and should) paint as fully assembled as possible. When using a spray can,

Figure 7. After applying hairspray, the interior and exterior are painted.

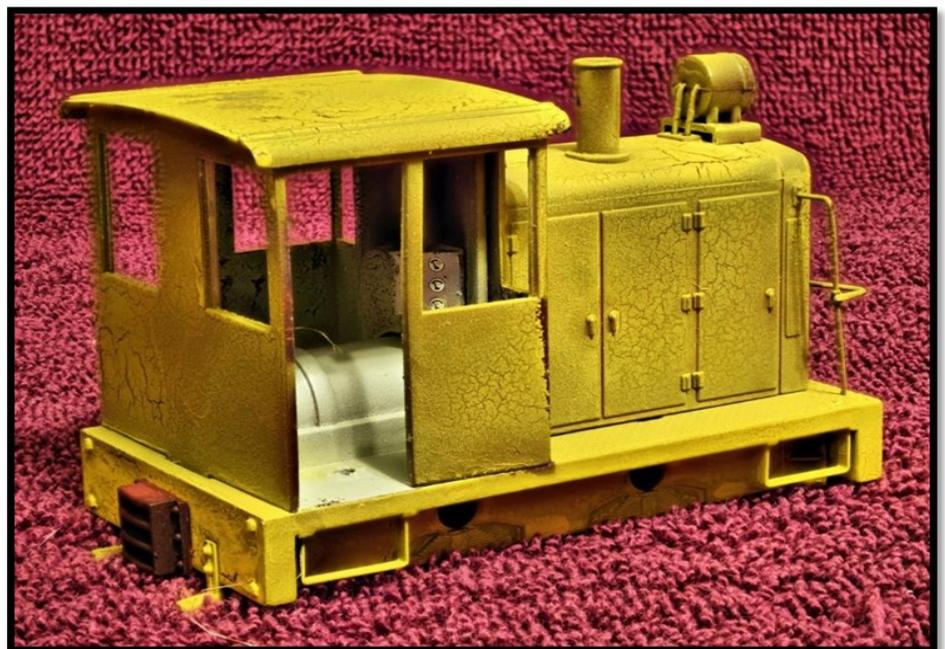




Figure 8. The locomotive shell, after chipping.

this can be a problem with its relatively heavy spray, which can lead to paint build-up at the inside corners. There also are areas – such as the inside of the cab – where disassembly makes obvious sense. In my case, I removed the shell and disassembled its parts.

Another thing that must be decided is whether you wish to strip the old paint off the shell prior to painting anew; automotive brake fluid will work as a paint stripper in many cases, with the caveat that it can soften and melt **SOME** plastics. A lot of people have used a product called *Simple Green* to strip acrylic paint from models.

In this case, I did not worry about stripping off the old paint. But, I did want to ensure that the model was completely clean, so I soaked it in *Simple Green*. (This also removed all the decals, so if you want to keep the decals intact, I suggest using something less aggressive to clean the model.)

The next step was to apply the base coat of rust color. I popped out the windows and then sprayed the model with Rust-Oleum Flat Brown. (See Figure 5.) The only reason I chose this paint was I had it on hand. It really doesn't look much like rust at the present (more like the model is made of chocolate) but is fine as a base color.

To simulate different shades and types of rust, I use acrylic paints available from the big box and craft stores. I have found that these cheap, readily-available paints work fine; my main interest is the colors and how creamy the paint is. For this project, I used these paints:

- Apple Barrel PAVEMENT (item #21490E) – a dark gray with blue in it.
- Apple Barrel FLAG RED (item #21469E).
- Apple Barrel BROWN OXIDE (item #20511E).
- Ceramcoat RED IRON OXIDE (item #020200202W).

I used these paints to bring texture and additional color to my rusted surface. (Figure 6 shows the outcome.)

1. I thinned some BROWN OXIDE with water, blotched over the surface of the model with a sponge, and let it dry.

Figure 9. Pin washing brings out the shadow lines.





Figure 10. A view of the finished loco, after OPR and reassembly.

yellow paint crazed on me. This could have been caused by not letting the hairspray dry before spraying on the paint, or by spraying on the hairspray too thick. In any case I didn't care; the more crazing of the paint the better for this specific chipping project, in my opinion.

Next was the chipping process. Remember to take your time and to work across the surface in small areas. Chip both the interior and the exterior. You can chip as little or as much as you like. You may wish to chip more in areas that would be more likely to have wear. (See Figure 8.) The brush is moved across the sharp edges to chip those areas; this works well as it chips there easiest. The flat areas chip fine once the water sits for a bit. This is where you may have to start with a stiff bristle brush to puncture the paint and switch to a softer brush for more delicate control.

Next, the locomotive is *pin washed*; this is done using a diluted paint to highlight areas of the model. You can make your own but I use a product called *Dark Wash* by MIG (they also have brown and neutral washes). If you make your own wash, I

2. I mixed some PAVEMENT and FLAG RED together to get a dark purple color. (I have noticed that you will often see a purple cast to old rust; it's the magnetite, I guess.) I thinned the mixture with water, blotted all over the model, and let it dry.
3. I thinned some PAVEMENT with water, blotted it over the model with a sponge, and let it dry.
4. This left the surface with a blotchy bluish, purplish, brownish look. So, I thinned some RED IRON OXIDE with water, blotched over the model, and let it dry.
5. Finally, I made a second pass with the RED IRON OXIDE using a sponge and brush, and deliberately left puddles to dry.

is used for machinery interiors because it shows fluid leaks well. I mixed up some flat white, olive green, and yellow Tamiya paints to create something that was "good 'nuff" to represent industrial green. (See Figure 7.) The exact combination of colors isn't that important; what is important is the use of Tamiya paint, for better chipping results.

I decided to paint the exterior yellow, to better show off the weathering. As you can see in Figure 7, the

The next step was to paint the interior of the cab. This was slightly tricky in that I needed to mask off the exterior. Industrial green often

Figure 11. The "gizmos" after applying the top layer of yellowish paint. Notice that I didn't try to cover the gizmos completely, so some of the rust showed through before I even began chipping.



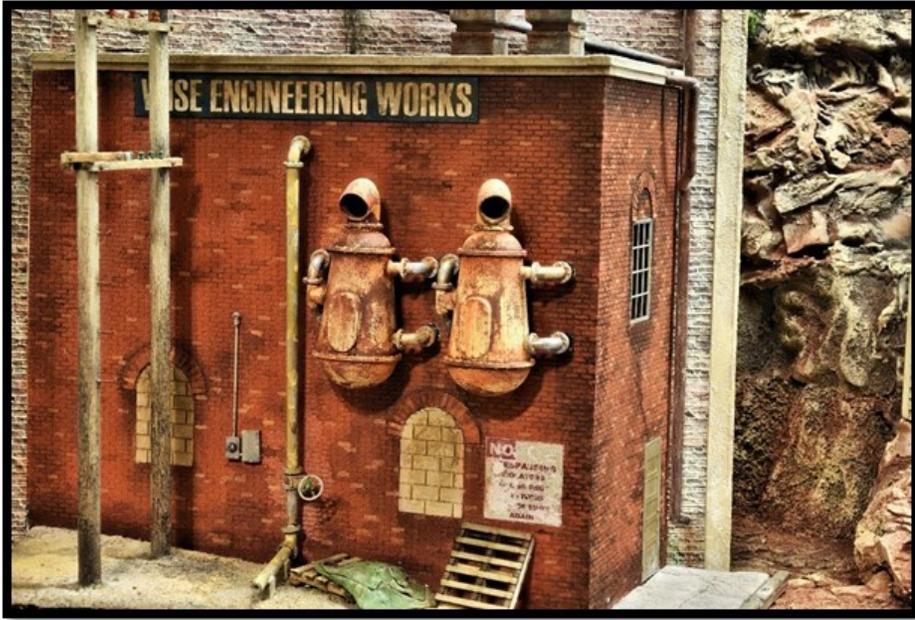


Figure 12. I'm not sure what they do, but these rusty "gizmos" are a great accent for the Wise Engineering Works building.

suggest a solvent based paint as you can use thinner to clean up if necessary.

To apply, get some of the wash on a brush and touch the tip of the brush to engraved and embossed details, anyplace that you want to "pop". Capillary action draws the wash into the details nicely. If you get too much on the surrounding surface, simply use a cotton swab dampened with thinner to remove the excess.

The process is often quite subtle and hard to see without comparing to a previous photo. What you are trying to create here is a shadow effect. (See Figure 9.) This is something that you may not notice without looking for it because if done correctly, you assume it's a shadow, in which case, it is "job well done!"

With the pin wash completed it is time for *oil paint rendering* (OPR). As far as I know, this term was coined by Michael Rinaldi. This simply means using a palette of oil colors

related to the model's paintjob to enhance, contrast, fade, shadow, highlight, or add rust, dirt, and grime to the paintjob. As seen in Figure 10, I have used browns and reds applied lightly and thinly so the paint acts like a filter or tint. One trick that works for me is to put the oil paint out on a piece of cardboard so it absorbs the oil, leaving mostly pigment to work with.

Finally, if you wish, you can touch up the model by applying some grated chalk or weathering powders in various reds, browns, and black to blend everything together.

Other Applications of the Layered Approach

The technique used to weather the Davenport can be applied just as effectively to a wide variety of odds-and-ends you might find around structures and railroads. For example, I wanted to create some "gizmos" for use on my layout. After building them, they were given a

base coat of American Accents TERRA COTTA acrylic paint, followed up by splotchy washes of red and brown acrylics. Hairspray was applied, and then a thin coat of a yellowish paint. (See Figure 11.) After chipping, I applied Velejo DARK GRAY and RUST acrylic washes (though I could have used oil washes). The finished gizmos were attached to my Wise Engineering Works structure, as shown in Figure 12. (What are gizmos, you ask? Whatever you want them to be.)

Conclusion

In the end, we tossed many elements into a box and shook hard. We tossed in a rust initial surface, hairspray, a paint, chipping, pin washes, and oil paints. Out came a weathered model (perhaps too heavily weathered for any purpose but an article such as this.)

The results speak for themselves. Using these techniques, you can create wonderfully-weathered structures, locomotives, and rolling stock, too. You may want to experiment on a cheaper model or structure as you learn this layered approach to adding rust, dirt, and grime, but you will develop your skills quickly. 🚂

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[Railroaders Community! This is the place to be to discuss model railroading, YouTube production, and most of all, share your model railroading layouts and videos!](#)

A Perspective On Track Planning



By William (Bill) J. Beranek —The Track Planner

The Evolution of a Track Plan

This column is an extension of the [January 10th YouTube Model Builders Tuesday night show](#) titled “Operationally Pure Layouts.”

On my [YTMB show in November of 2016](#), I discussed modelers’ tendencies to bite off more than they can chew and eventually hitting a brick wall while building their first “full-size” layouts. I also discussed the various emotional stages modelers go through while they’re committing to more than they can handle. It seems to be a predictable pattern (see side bar). To be clear, I define a full-size layout as one that goes beyond the 4’ x 8’ sheet of plywood; in other words, I’m writing about a layout that fills a bedroom or uses a significant portion of a basement.

The first emotion, *excitement*, clearly feels good. The eagerness to get started and the expectations of what will be can be overwhelming for some. Construction starts while the second emotion slowly creeps in, *self-doubt*. Things aren’t going as planned; personal construction skills

aren’t quite what the modeler thought they would be. Self-doubt is followed by *frustration*. This stage comes from a multitude of issues; the modeler has underestimated the complexity of the layout, he/she has underestimated the amount of time the layout is taking to build, and the expected monetary costs are beginning to exceed the established budget. After frustration, the next emotion is *dissatisfaction* with the whole project, and for some, the last emotion is *anger*. Dissatisfaction and anger are usually the points where the modeler “hits the brick wall!”

When doing my YouTube shows, I always wonder: are people paying attention, or are they just watching and waiting for the giveaways? Are people really listening? During the “biting off” show, one person who was listening just happened to be a current client of mine.

I was working with the client, developing a track plan for his basement. We had bounced around a few ideas, based on information he supplied me. As we were going through the

various options, I naturally assumed that I was heading in the right direction. Boy was I wrong!

We had been communicating on almost a daily basis when suddenly, the emails stopped coming. What happened next was a reality check and a teaching moment for me.

After a few days, I got an email from the client advising me that he had watched the show and felt I was talking directly to him. His exact words were, “*I watched your talk and presentation on YouTube Modelers, and it hit me that you were totally talking directly to me! I completely identified with everything you said.*”

I didn’t realize that the show and communication were happening at the same time. Plus, I didn’t know the client would be watching. During our communications, I was not picking up on the client’s anxieties about the designs I was suggesting. He advised me that he liked many of my ideas in versions 1.0 and 2.0, but they were a major departure from what he had in mind. While watching



Google+ Hangouts! If you like real time video chat with other model railroaders, watch for these LIVE Hangouts to join. Ask questions, help others with their modeling videos, or just join in live chat and simply “Hangout!”

Over Expectations

The excitement of building a new layout can be so strong that it can be all-consuming for some individuals. Some have already built the 4' x 8' layout, usually with some success. They feel they are now prepared to move to the next level. Many have gotten bored watching trains run around in circles; they want bigger and better. Their assumption is that going bigger has to be good and it can't be that hard.

Unfortunately, going bigger is harder. Numerous new issues pop up and benchwork becomes exponentially more complex. Here are two examples: 1) aisle widths – which normally aren't a problem with a 4' x 8' layout – should be one of the first things you worry about on a full-size layout, and 2) reach distances – which, again, are not issues with a free standing 4' x 8' layout – become a big issue on larger layouts, and an issue I've seen many modelers ignore, until it's too late.

There are numerous other factors that seriously impact a full-size layout. Those factors need to be dealt with before construction starts.

Over Estimating Skill Levels

Building a full-size layout requires an additional set of construction skills that, frankly, not everyone has. Knowing how to design and build proper benchwork is vital to having a successful, full-size layout. Simple box frame construction might work well on 4' x 8' layouts, but it doesn't always work well for full-size layouts. Understanding and implementing the advantages of L-girder benchwork construction versus simple box frame construction can make or break a great track plan.

I've seen many full-size layouts constructed with 2x4s, when simple 1x4s, 1x3s, and 1x2s would have been more than adequate using the L-girder method. For most layouts, using 2x4s is a waste of lumber, labor, and money.

I highly recommend that when you start construction of a full-size layout, you should take the time to understand the advantages of L-girder benchwork. It will pay major dividends in the long run.

Underestimating Time & Costs, and Hitting the Wall

Building a full-size layout requires serious planning and a certain skill level. Many modelers underestimate the amount of time and money required to build a full-size layout. Time and money issues are relative, but eventually they both can catch up with everyone. There comes a point where the modeler becomes disenchanted with the process, when things are not going the way he/she planned. At that point, the modeler "hits the wall" and everything stops.

Going forward, he or she has two options: 1) step back, take some time off, rejuvenate, and then come back and get to work; or 2) walk away. There is nothing wrong with the first option; I've recommended it to my clients when they've hit the wall. Remember, model railroading is supposed to be fun! Don't make it a job!

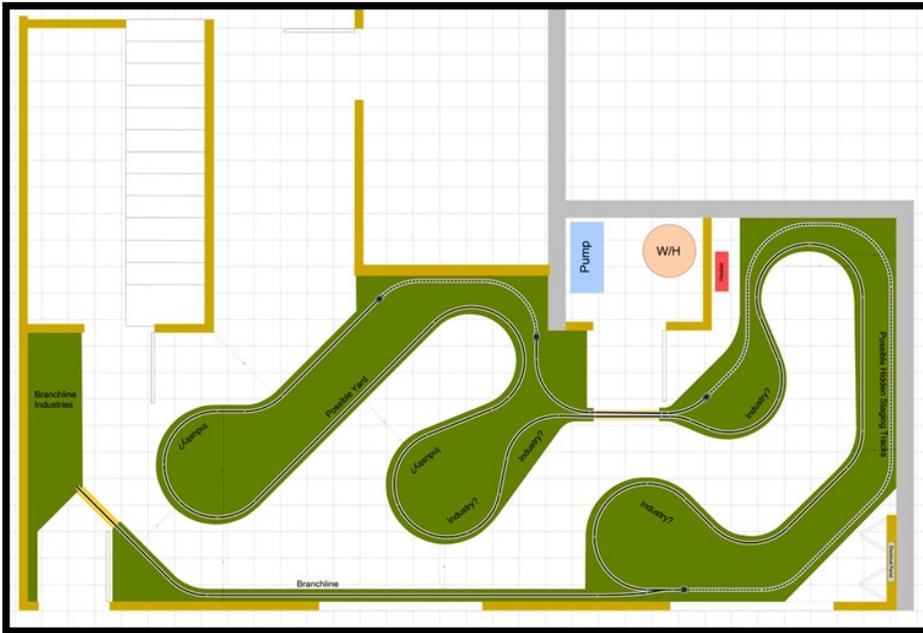


Figure 1. The original layout plan.

the show, he realized the designs were probably beyond his present capabilities. He really wanted to build a simpler layout.

The space I had to work with was unusual. There were three doors to deal with, an enclosed electrical panel in a corner – which also housed a whole-house internet/Wi-Fi system – a wall heater in another corner, and the client wanted room for a workbench. Below are descriptions and preliminary pictures of the first two plans, along with the plan that was eventually accepted by the client.

Track Plan Version 1.0

Figure 1 depicts my original plan. A walk-along design with a long mainline run, three peninsulas, three view blocks, lots of places for industries, room for hidden staging, and even a branchline. The plan had a lot of operational possibilities, maybe too many.

Overall, the client liked the plan, but was not comfortable with its complexity. He also had major issues with the two lift-outs, having to build three peninsulas, and not being able to easily get to the electrical panel in the southwest corner of the room. At this point, I was still “assuming” I was going down the right path, so I

decided to lessen the complexity of version 1.0 and came up with version 2.0.

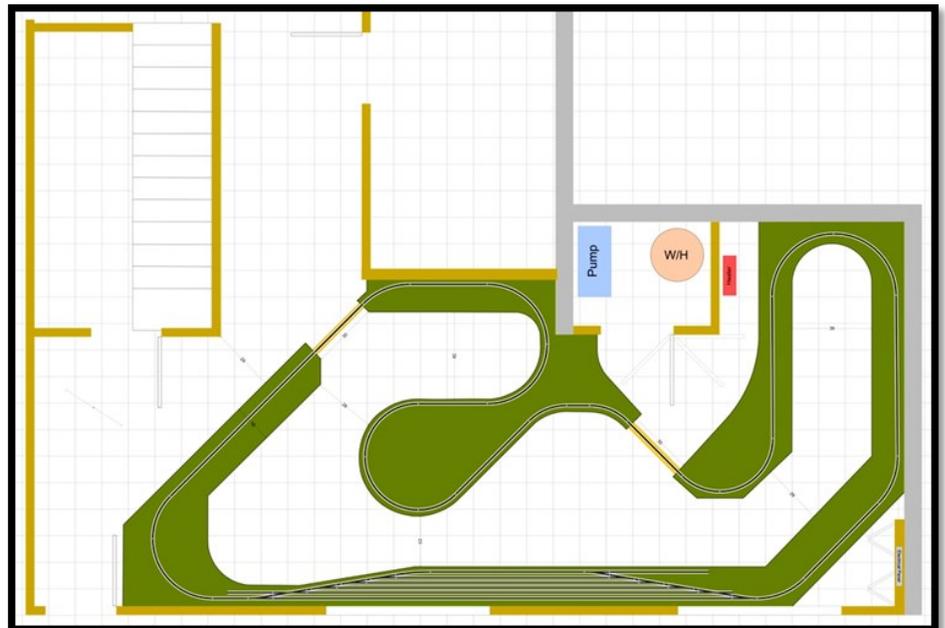
Track Plan Version 2.0

Figure 2 shows version 2.0 of the plan; it is a similar, but slimmed-down version of plan 1.0. I removed two of the peninsulas, removed the branchline, and did away with the hidden staging. Version 2.0 did retain the long mainline run, some industrial switching areas, and the walk-along design.

As on version 1.0, I included two lift-outs, which again was a concern to the client, and I had not resolved the issue of getting easy access to the electrical panel. I explained to the client that, because of the way the basement was laid out, lift-outs were going to be unavoidable, based on the designs I came up with.

When the client rejected version 2.0, I knew I had to go in a different direction. Without hesitation, I went back to the drawing board. I

Figure 2. A simplified approach



re-read through the initial information the client had sent me. Therein was the answer!

During our initial talks, the client had sent a drawing of his track plan idea (see Figure 3). Upon viewing the plan, I felt the design was too simple and didn't use the available space to its fullest potential. I "just knew" the client would be happier with what I came up with; again, I was wrong!

The Final Track Plan Version 3.0

Figure 4 shows the track plan accepted by the client. Obviously, it is a simpler track plan and, in the end, very close to the client's original idea.

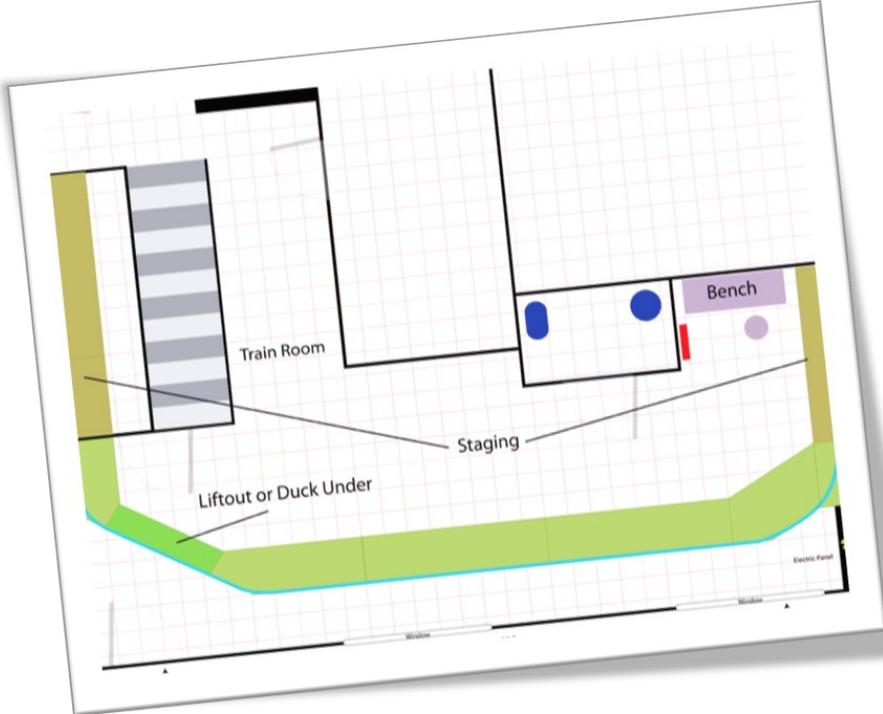
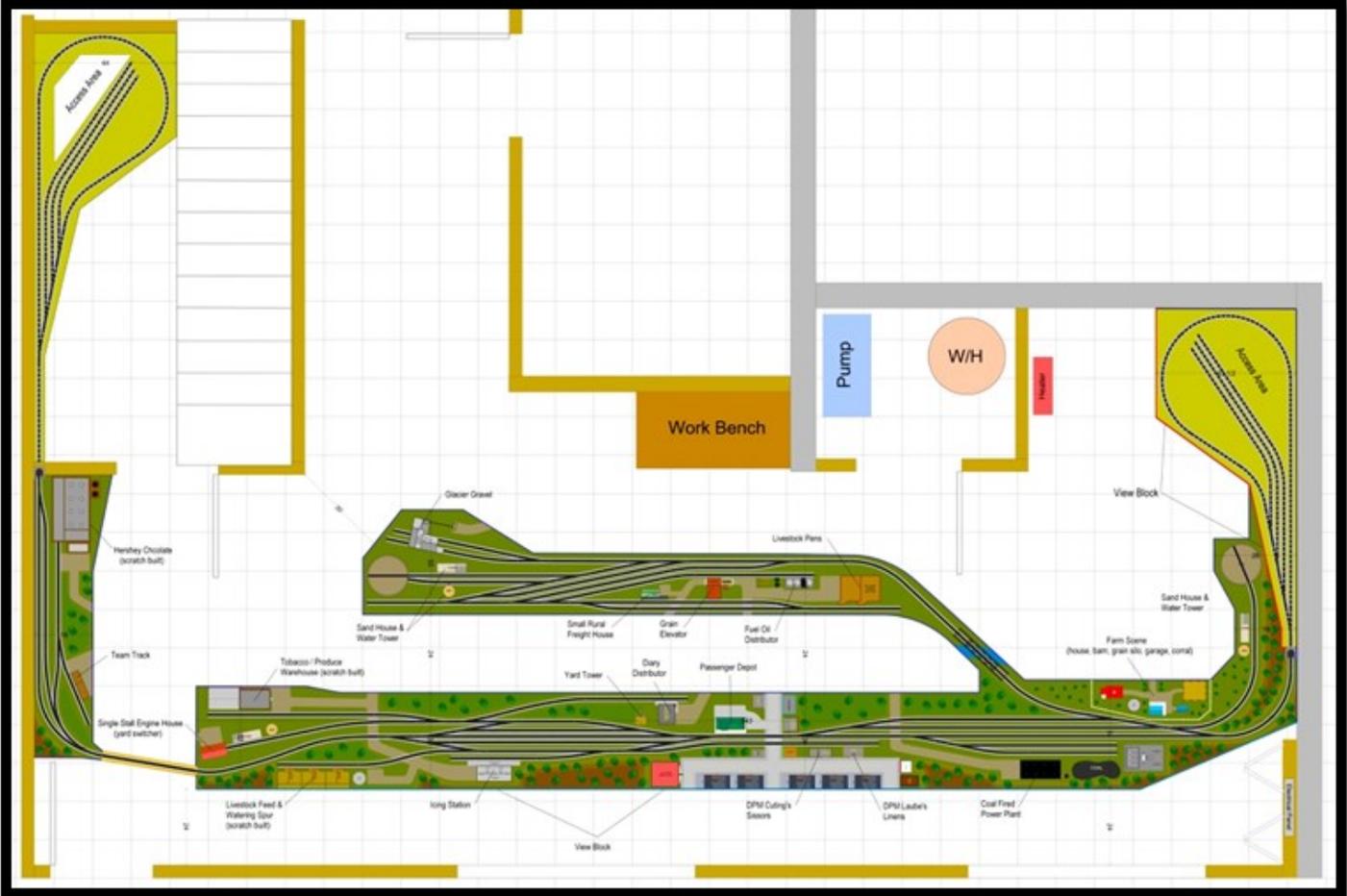


Figure 3 (above). The original drawing supplied by the client.

Figure 4 (below). Version 3.0, the final track plan.



Version 3.0 is an “operationally pure, point-to-point” track plan. The plan has an expanded branchline, which will play a major role in the overall operation of the layout. I did away with the long mainline run, but included two hidden staging yards with reverse loops for continuous running. Even though we simplified the track plan, we didn’t sacrifice operations.

I addressed the electrical panel and Wi-Fi access issues by creating a narrow, 24" aisle between the layout and the south wall. The client agreed to keep one lift-out. Many of the trackside industries are ones important to the client.

Much of the prototypical operation will take place between two areas: 1) the hidden staging yards will allow traffic to come onto the layout from both directions, and 2) the branchline and interchange yard will create interesting prototypical operational possibilities.

The layout can be operated in a prototypical manner with trains “coming from somewhere” and trains “going to somewhere.” To find out more details about version 3.0, [click on this link](#), to watch the [January 10th YouTube Model Builders Tuesday night show](#). In this show I did an in-depth discussion of the track plan’s operational possibilities.

In Summary

As I said earlier, this project was a teaching moment. Eventually, I realized I was designing what I liked and what I thought the client should have. I was convinced I could come up with a “bigger and better” plan.

Bigger is not always better. In the end, with the help of the client, I was able to design a plan that fit his needs. The evolution of this track plan would not have been possible without the client having a clear picture of what he wanted.

The client is very happy with the results. He now feels comfortable constructing the layout as designed. In the end, for him, the simpler plan was the perfect plan.

At the end of the process, I received a thank you email stating, “I’m amazed at how fast you are able to concept everything. I guess that’s what 30 years of MRR experience rewards you with.”

I appreciated the kind comment, but what I really appreciated, was the client not settling for what I thought he should have. Lesson well learned!



About the Author

Bill Beranek - The Track Planner has over forty years in the model railroading hobby. Bill enjoys golfing, travelling, and of course designing “prototypical operations” focused track plans. He has been a member of a local 135+ member model railroad club since 2003 and has served twice as the club’s president, twice as a board member, and is currently serving as the club’s treasurer.

Bill is currently working on his latest triple-deck HO scale layout depicting the SP&S (Spokane, Portland & Seattle Railway) in southern Washington and the OTL (Oregon Trunk Line) on the upper level in northern Oregon in the mid-50s.

You can find more about Bill—The Track Planner at:

www.thetrackplanner.com.

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Snow Fighting Equipment on the Union Pacific

Welcome to the first installment of the UP Hub in 2017. I hope everyone had a wonderful holiday season and that you are all ready to get back to modeling. The snowy weather inspired me to write about some of Union Pacific's snow fighting equipment, which has kept UP's mainlines open for generations.

In the 1870s and 1880s, most of UP's locomotives were fitted with large wedge-type plows in the winter months to combat the snow on the plains and mountains of the west. By the late 1880s, Union Pacific had started mounting the large wedges onto flat cars. Most of these early plows were made of the most common building material of the day, wood. Wooden plows needed to be rebuilt and repaired frequently, as the wood would not hold up to the demands and physical stresses of snow clearing for very long, compared to the more modern materials we use today.

In the particularly snowy winter of 1883-1884, a Canadian by the name

of Orange Jull, with help from the Leslie Brothers, developed the first successful rotary-type snowplow. The Leslies soon purchased the manufacturing rights and went into the snowplow business, thus creating the Leslie-type rotary plow. Leslie plows featured a large rotating blade on the front and worked just like a snow-blower – the blade chopped the snow up and the plow shot snow through a chute to the side of the right-of-way.

From 1885 to 1905, the brothers

turned to numerous locomotive builders to build a total of 64 snowplows. In 1905, they sold the manufacturing rights to the American Locomotive Company (ALCo). ALCo built 71 plows, four of which were for export, until 1937. The last four steam rotaries were produced by Lima-Hamilton under contract from ALCo in 1949 and 1950, following the massive blizzard of 1949. These four plows were delivered to the Rock Island, the SOO Line and to the Union Pacific shortly after they were built.

My HO-scale snow fightin' equipment.





My Broadway Limited Imports UP 2-10-2 #5044 with large plow pilot.

From the 1880s to present, Union Pacific owned and operated a total of 20 rotary snowplows, 3 of which were built by the UP. Since then, many plows have disappeared from the roster.

Today, the rotary fleet only consists of five units, three of which are operational. Two of the three active rotaries are former Southern Pacific units that have been upgraded and rebuilt from steam power to modern diesel power. The third plow is UP 900082, which is the last rotary built in the United States. 900082 was built in the Omaha Shops in 1971, the 12-foot blade is powered by a self-contained 2,500-horsepower diesel engine and

weighs in at 284,800 pounds.

The rotary snowplows aren't the only type of plows employed by the Union Pacific. As I stated above, there were many plows built on gondolas, flatcars, and retired steam locomotive tenders, several of which are still in use within the UP system today.

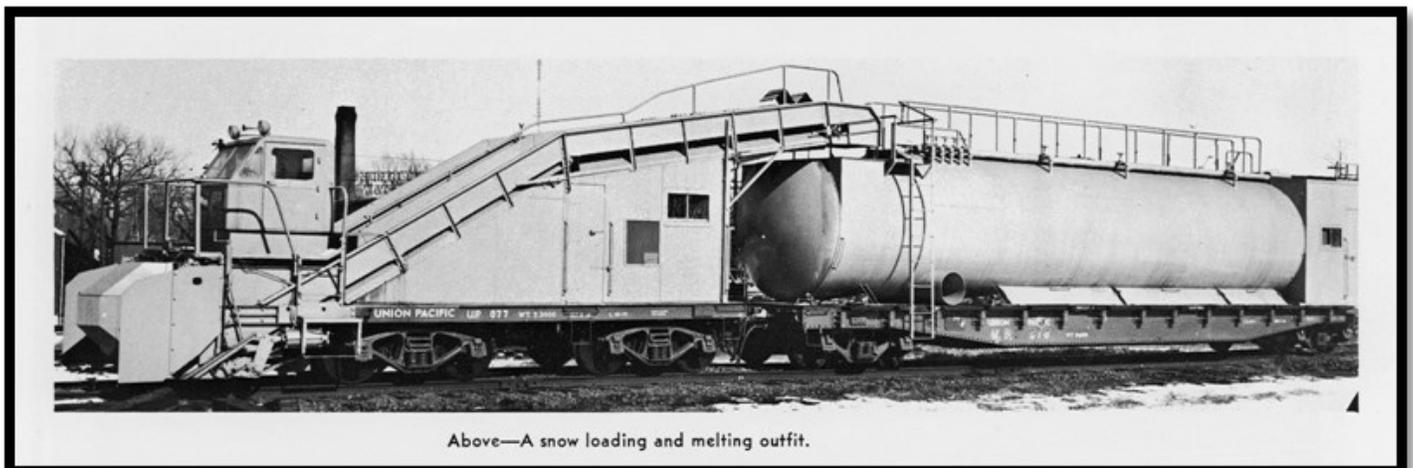
Besides the home-built types, there were plows built commercially for the UP, including the ones manufactured by the Russell Snowplow Company. There were a total of two Russell snowplows on the roster, numbered 03009 and 03010. Jordan ballast spreaders were fitted with steel wedges in the winter time

to help clear snow, however most of these later fell out of use as the modern railroad uses small self-propelled ballast spreaders. Many locomotives were also fitted with large wedge type plows, most notably the 5000-series 2-10-2s and 10 of the 1500-series F-3As, a Single F-7A (No. 1483), and the 500-series F-9As.

As expected from the UP, their roster of "homemade" snow equipment includes the very unique snow loader, which used a conveyor to carry snow up and away from the tracks and into a large steam-heated tank car to be melted, and then poured out.

Challenger-class steam locomotive (4-6-6-4) No. 3977 was another one of UP's unique snow-fighting machines. The locomotive was fitted with a large steam pipe, which transported steam from the boiler to the tracks. The hot steam would melt the ice and snow buildup from switch points and frogs. No. 3977 was the only self-propelled snow fighting machine, and it can still be viewed on static display in North Platte, NE.

Photo of UP 077/078 snow loader in North Platte, NE in the 1960s. Photograph used with permission from UPHS.



Above—A snow loading and melting outfit.



Top to Bottom: Walthers' Jordan Spreader, Walthers' ALCo Rotary, and the Roco/IHC wedge plow.

Modeling UP Plows

Many of the plows and rotaries used by Union Pacific have been produced by model manufacturers over the years. We will start small and work up to the rotaries.

Roco/IHC produced a gondola-mounted wedge plow. This particular model has been in and out of production many times over the years, but they can be found on online auctions and at train shows. I paid \$8.99 for mine a few years ago.

The next most common plow available to modelers is the Jordan Spreader. This model has been produced in both brass and plastic kit forms. Walthers' UP Jordan Spreader kit (P/N 932-5351) is currently out of production, though you might get lucky enough to find one online or at your local train show.

The UP had many styles of wedge plows mounted on retired steam locomotive tenders. These included single- and double-track plows (with or without cabs) as well as flangers. Unfortunately, there are only two options to model these types of plows – one can either scratch-build/kit bash their own model or spend big money for a brass model available from several manufacturers.

Russell snow plows have been produced in both brass and plastic. Walthers currently has all of these plows in stock, except for the Union Pacific model. Search for part number 932-5752 for the completed model, or part number 920-110000 for the undecorated kit on their website.

The rotary plows have been produced in both brass and plastic, in several scales. The ALCo-Leslie

plow (the style used by most railroads from the 1920s and later), is available from Walthers. The model is currently out of production but it can be found. An interesting feature on this model is the operational rotary blade, which spins when track power is applied.

The more modern Lima-Hamilton style steam rotaries are the ones that Athearn has produced over the years in both kit and “ready-to-run” options. The current ready to run part numbers are as follows: ATH93801 (UP #900076) and ATH93819 (UP#900075). Both of these models have been discontinued; fortunately they are very common on the second-hand market. These models also feature powered rotary blades.

The Omaha-built rotaries have only been produced in brass by Overland



Athearn's Ready to Roll Lima Hamilton rotary (top) and Walthers' Russell plow (bottom).

Models (P/N 1301), and New Jersey Custom Brass (P/N RS-621). These three different units were numbered 900080, 900081, and 900082. 900082 is the only one of the three that is still in use today.

I hope you have enjoyed this look at the snow plows of the Union Pacific. Until next time keep the fire hot and the boiler full of water. Highball my friends! 🚂

About the Author

Harry is a rancher in Nebraska who works with his father and grandfather to help run their 22,000-acre, 1500-head of mother cow, ranch. Harry has been model railroading for over 20 years and models the Union Pacific Steam era from the 1930's to

the 1960's, in central and western Nebraska.

Harry is a Sustaining Member of the Union Pacific Historical Society and a member of the UPHS Streamliner 100 club. He is a National Model Railroad Association member cur-

rently working on his Master Model Railroader Certificate. Harry regularly posts videos on his YouTube page. You can follow Harry as he works on his 7th layout at <https://www.youtube.com/channel/UC6-MPHmYU3Cc2uEVfjZDIcQ>.

My friend Jack Rickett's OMI model of the Omaha-built 900082.



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COMMUNITY COLLAGE



In this first issue of 2017, we present a mash-up of collages from 2016. These include collages from [Douglas Wilson](#), [Philippe Moniotte](#), [Thomas Wyssmann](#), [Johan Kortman](#) and the [Porvoo Model Railroaders Club](#), [Harry M. Haythorn](#), and [Ron Pare](#).

If you would like to share pictures of your layout in the Community Collage, please contact us at YTMBeMag@gmail.com.



PICK 3

In each issue we share with you three YouTube Model Builders' channels that provide the community interesting ideas, tips, tricks, and resources. Here are three channels that will help you be more creative in your modeling efforts.



Bruce Kingsley

<https://www.youtube.com/user/brucek5>

Bruce is “living the model railroad dream.” He has designed and constructed a full-size diesel locomotive cab (known as the “Ultimate DCC Throttle”) from which one can operate locomotives and look through the cab windows to see the trains on the layout roll by.



marklinofsweden

<https://www.youtube.com/user/marklinofsweden>

This channel presents videos that share methods and materials that should help you improve your layout at a reasonable cost, even if you feel you don't have a lot of artistic skills. The videos are very nicely produced and cover a number of aspects of the hobby, including scenery, structures, weathering, and layout construction.



mike937739

<https://www.youtube.com/user/mike937739>

Mike uses his channel to demonstrate the many different skills he applies in building his N scale layout, the *Teddie and Shelbieville Railroad*. His latest tutorials show how to build twist-wire trees and cell phone towers.



Into Facebook?

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**Geno's
Corner**



By Geno Sharp

GRIME ON A DIME

All Photos by Geno Sharp

Hey folks, happy New Year! Welcome back to the corner. I hope the holidays were good to everyone and the New Year finds you all well!

For those of us modelers that found those bright and shiny new locomotives and rail cars under the tree, it's time to get those puppies out of the box and slang some dirt on that

thang! That's right: we're gonna make it look real, and as always, we are gonna do it on the cheap.

Just like any piece of equipment that is exposed to the elements all day every day, it's gonna get dirty. The grime on any piece of machinery used outdoors will build up over time. Fuel and fluids are gonna spill and leak, leavin' all sorts of streaks

and stains. (See Figure 1.) For those of you who follow my modeling, you know I like my stuff well-worn, trashed, weathered, and dirty.

Sometimes I have to stop myself and think, "Is this piece of equipment new or old?" New stuff is not going to be as worn as some of the old rust buckets still roaming the rails. With that being said, equipment





Figure 1. Pair of CSX diesels showing off their “in-service” look. These work-horses wear dust, grime, and rust as a badge of honor.

doesn't stay shiny-new for long, even the new stuff needs a dose of real life to make it a believable model.

Dirt and grime does collect rather quickly on a brand-new piece of equipment – new locomotives, freight cars, etc., don't look like they live in display cases once they've been placed into service. For example, when a new locomotive is delivered to a railroad, the railroad company presses it into heavy-haul coal service. That locomotive will not only gather regular, every-day road grime, it will also gather tons of coal dust as it travels with coal trains. As all that dust and grime gets wet from a passing rain shower, it will streak and stain the locomotive as it dries. The process is repeated over and over again until the locomotive is given a rare wash-down.

Keep in mind that you don't have to totally trash the look of a locomotive to achieve a noticeable weathering effect. As you can see in Figure 2, a very light application of grime

and dust on the locomotive gives it a good “in-service” look without making it look too worn-out. In Figure 3, a heavier application of dirt and grime gives the look of a real work-horse but still not much of age shows due to very little paint fade.

You don't have to spend a lot to get these great effects. As I have said

before, there are a lot of brand-name weathering and detailing products on the market that will do a fantastic job. However, there is also a huge selection of inexpensive products such as alcohol and powders made from art chalk sets (see Figure 4), along with cheap acrylic paints which will yield the same results.

Figure 2. Sometimes a light application of dust and grime gives the engine that perfect “in-service” look without making it look too worn-out.

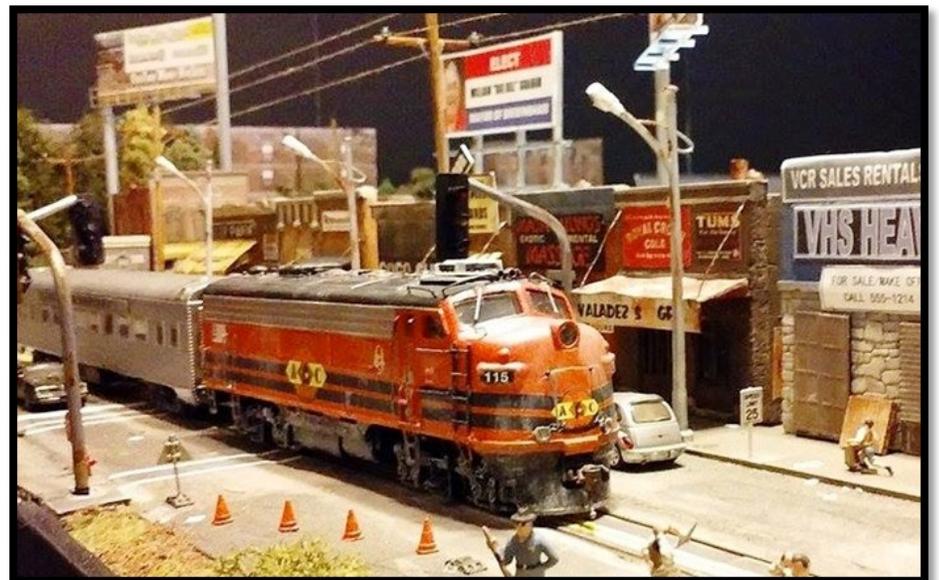




Figure 3. A heavier application of dust and grime shows that the engine has been placed through some significant work load. However, a light paint fade shows that the engine is not too old and just needs a good wash down.

One of the simplest ways to add a grimy look to a piece of equipment is by using a wash made from half cup of 70% alcohol and one or two drops of black acrylic paint. Start out with a light coat. Keep in mind that the wash will dry lighter than when it is first applied. Repeat the wash until you achieve the desired results. This wash will not fade the paint, but it will give you a dirty, well-used look. (See Figure 5.)

Another very inexpensive way to add a little character to your equipment is by creating homemade weathering powders. You can get artist's chalk sets for between five and ten dollars at most big box stores or online and you can grind your own powders using a cheap cheese grater. Primarily, I buy earth tone sets. These sets give you all the various shades of browns, grays,

and blacks, which are very useful for weathering and aging.

Use your custom-graded powders to add dust and grime along the bottom

sill, trucks, and fuel tanks. (See Figure 6.) This will give you a look of a well-used locomotive or freight car without over-weathering the equipment.

Figure 4. You can achieve great results by using powders made from low-cost art chalks, some rubbing alcohol, and basic acrylic paints.



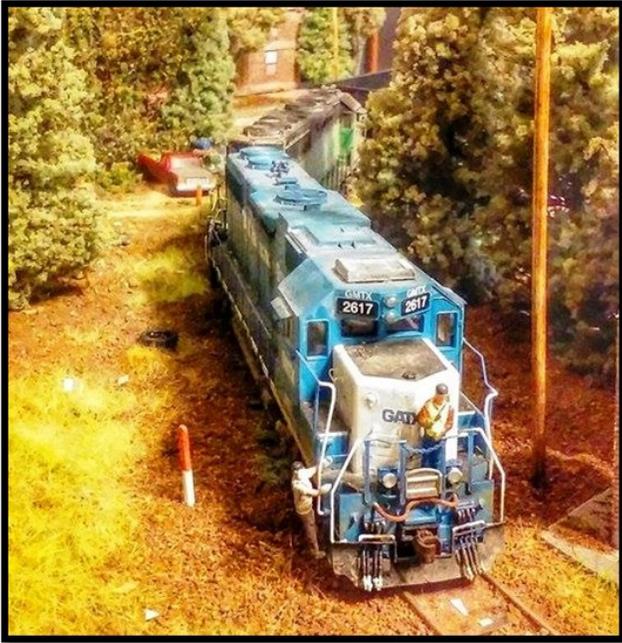


Figure 5. Using a wash made from 70% isopropyl alcohol and black acrylic paint will not fade the paint, but will give you a dirty, grimy look.

now a YouTube channel owner.

He produces a monthly layout blog video for his YouTube channel, [Gknos Custom models](#), as well as various "how-to" and structure build videos.

Geno is currently working on a new layout, a prototype version of The Norfolk Southern Anniston District - part of the NS Alabama division. His layout features many highly detailed and weathered scenes, and hand-laid track.

You can learn more about Geno's weathering techniques and about his Central City Belt Line on his YouTube channel [Gknos Custom models](#).



I hope that you find these tips useful, and that you will not be afraid to try them out. Keep in mind that sometimes less is more when it comes to weathering. We will see you next time right here in the corner. 

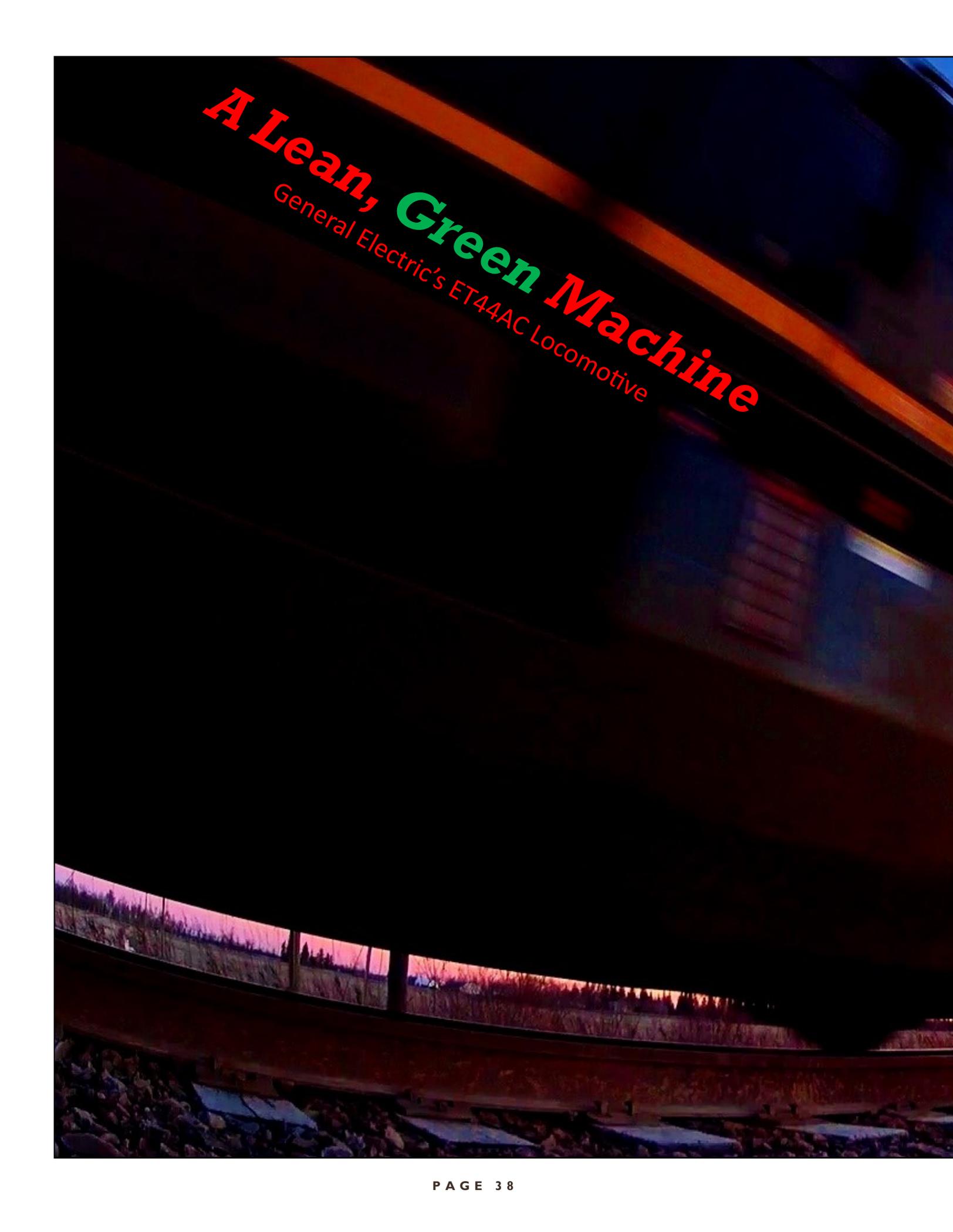
About the Author

Geno Sharp is a retired law enforcement officer with 21 years of service.

Geno has been involved in model railroading for over 30 years and is

Figure 6. Use powders to add dirt and grime along the bottom areas of the engines to achieve a well-used look.





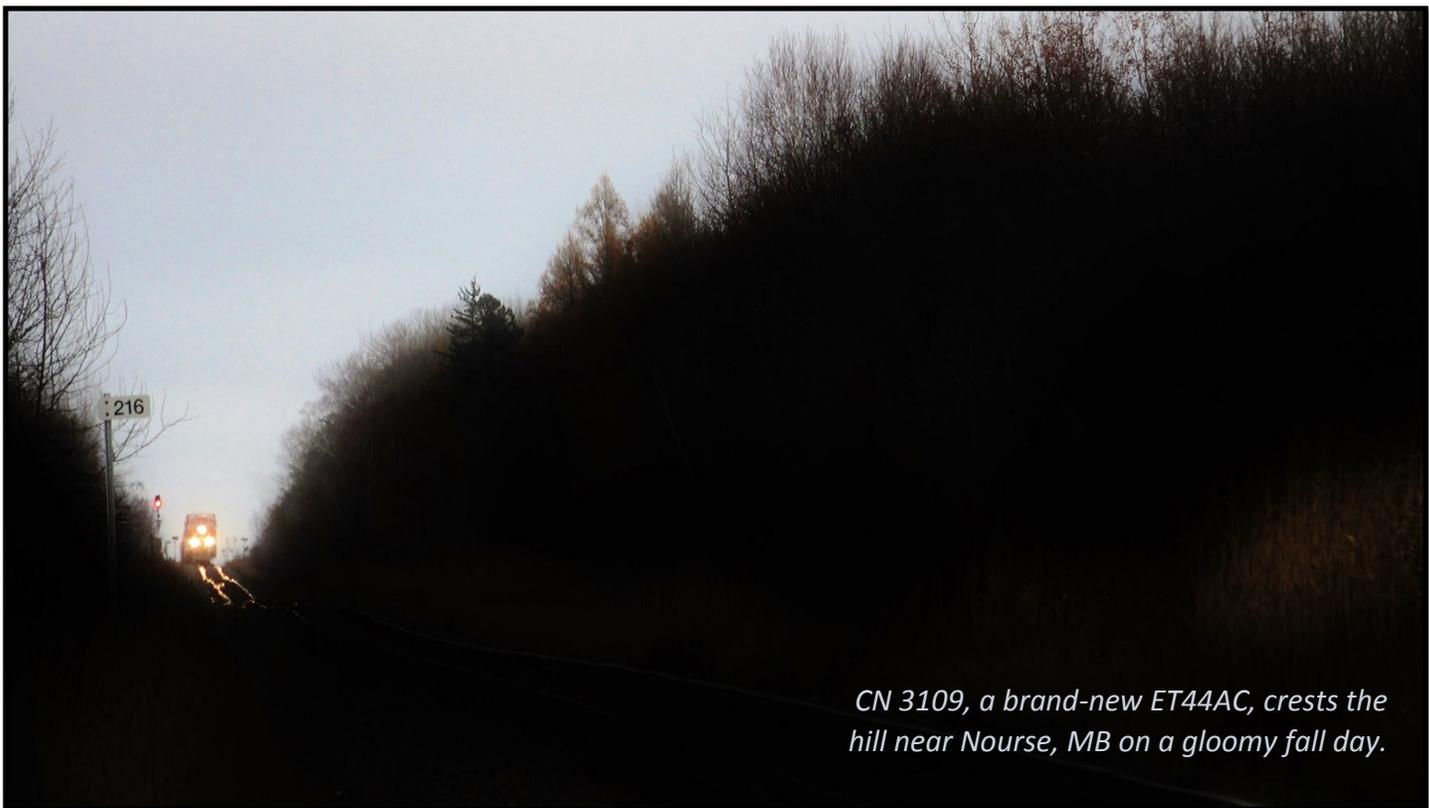
A Lean, Green Machine
General Electric's ET44AC Locomotive

A CN ET44AC is operating as a Distributed Power Unit (DPU) on the tail end of CN train Q101. The train was captured near Nourse, MB just minutes before sunrise.



By Jack Hykaway

All Photos by Jack Hykaway



CN 3109, a brand-new ET44AC, crests the hill near Nourse, MB on a gloomy fall day.

The distant hum of highway 15 is only barely audible over the sound of wind rushing through the bald tree branches near the hamlet of Nourse, Manitoba. Silence rules these woods now, more than ever – the creatures that roam these forests in the summer months have already settled down for winter, and the cheerful bird calls have migrated south with the warmer weather.

The thick cloud cover provides uninspiring lighting, typical of late fall in Manitoba. The landscape is just as drab as the sky. The hues of brown and gray in the dead grass and leafless trees are contrasted by one element of color in the scene: the signal at Milepost 216.5.

The new LED signal stands tall at the east switch of Nourse Siding, a 6,210-foot-long passing track. Occasionally, trains will meet at this point to pass one another on the mostly sin-

gle-track Redditt Subdivision. There are no meets scheduled here today, however. The signal stubbornly displays a “stop” aspect, which is bad news for the waiting railfan.

The lull continues for three hours before I get some good news. The dispatcher has given the go-ahead to a westbound train – the aspect on signal 2165 has improved to a “clear.”

Ten minutes pass before the headlight of the imminent westbound pops over the hill. A deep rumble unique to a new General Electric (GE) locomotive overpowers the traffic noise on the adjacent highway.

The shiny paintwork on CN 3109, a factory-fresh GE ET44AC, adds a much-needed splash of color to the scene. The new unit is proving why GE has had so much success with their new, Tier 4 compliant diesels – 3109 expertly handles the 60-or-so

cars on this short train, and hauls them down the smooth ribbon-rail at 60 MPH.

Canadian National (CN) is one of five Class I railroads that have purchased the ET44AC and/or ET44AC variants. Currently, the road operates a fleet of 121 ET44ACs, numbered in the 3000-series and the 3100-series.

The Deadline

January 1, 2015 was an important date for American locomotive manufacturers. At 12:01 AM that morning, the United States Environmental Protection Agency’s (EPA) strict Tier 4 guidelines came into effect. These new emissions standards regulate the amount of toxins released into the air by a diesel-electric locomotive. More specifically, the EPA Tier 4 standards heavily restrict nitrogen oxide (NOx), hydrocarbon (HC) and particulate matter (PM) emissions.



Carbon monoxide (CO) emission levels have remained unchanged from the EPA Tier 3 standards.

Locomotives built or rebuilt after these new standards were introduced in 2015 must comply with Tier 4 standards. Newly-built/rebuilt locomotives that do not conform to the standards are not permitted to run within the United States.

The implementation of the new Tier 4 standards, however, has not spelled the end to older Tier 3 power on American freight and passenger trains. Locomotive manufacturers have accumulated a large number of emissions credits in recent years by installing fuel-saving software on older locomotives, and they can now redeem their credits by constructing Tier 4 “credit locomotives.” In

You can watch [Jack's video of CN 3109 at Nourse, MB](#) on his YouTube channel. [Click here to watch.](#)

Above: CN 3109 blasts downgrade through Nourse, MB with a short train in tow. The brand-new locomotive is doing what it does best: hustling freight from coast to coast. Below: CN 3010, one of the road's 121 ET44ACs, leads a long string of colorful containers through the bright fall foliage near Dugald, MB.



short, a credit locomotive is a Tier 3 compliant unit, built after the Tier 4 standards were introduced. Credit units are certified by the EPA and are permitted to run within the USA.

The New Locomotive

GE's ET44AC and ET44C4 models are the latest in the manufacturer's "Evolution Series" lineup. At the heart of this 4400-horsepower beast is General Electric's turbocharged, 12-cylinder, EVO diesel engine. The ultra-efficient engine needs no after-treatment to decrease locomotive emissions by up to 70% compared to the older ES44AC (Tier 3 compliant) model.

The ET44AC sits on a slightly longer frame than the ES44AC, the model that it replaced. The new ET units



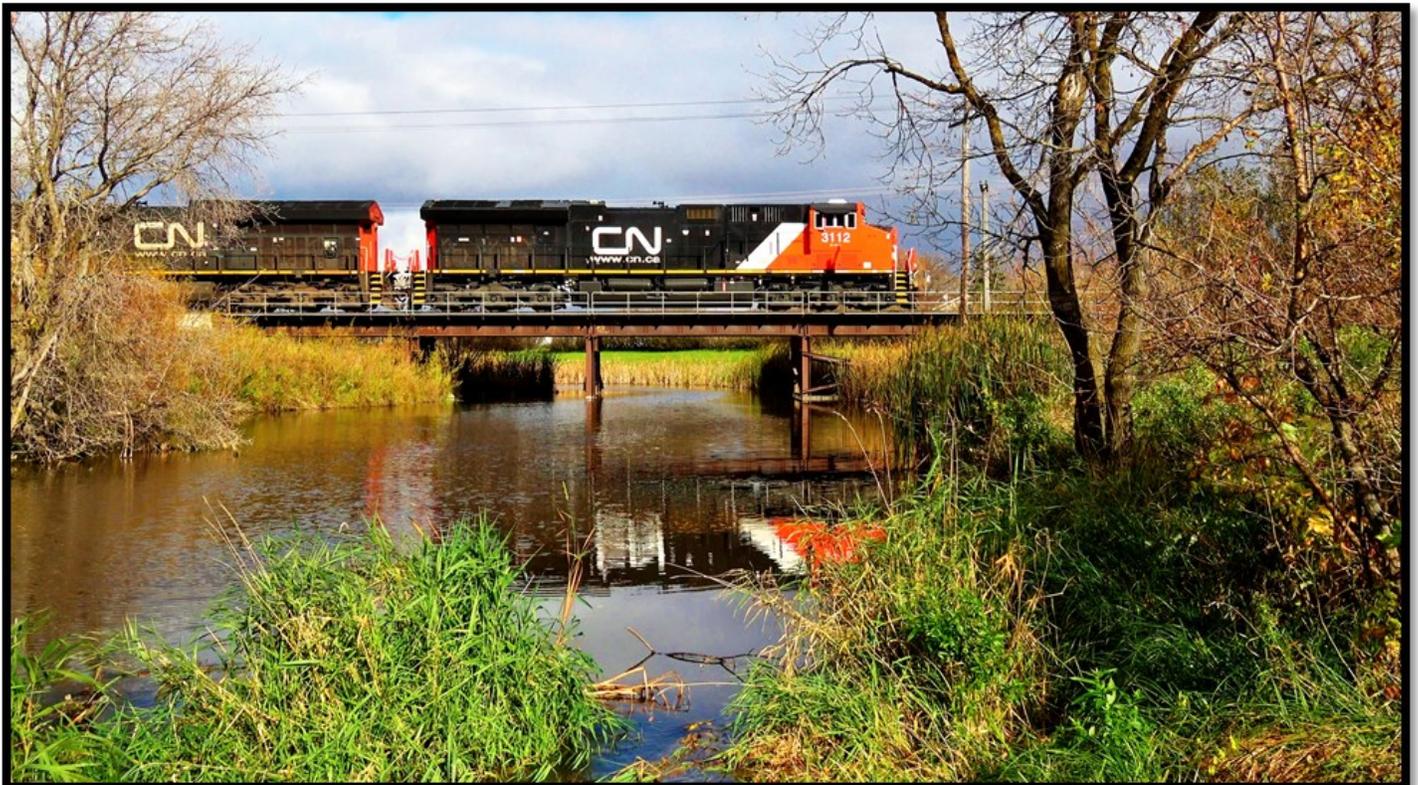
The control stand of an ET44AC locomotive. Computers, software and electronic displays help keep the locomotive operating as efficiently as possible.

are 74.5 feet long – sixteen inches longer than previous six-axle GEs. The advanced locomotive offers a state-of-the-art exhaust gas recirculation system to meet Tier 4 NOx standards, as well as an advanced

cooling system, among other engine modifications to improve fuel economy.

The cooling system and exhaust recirculation system are responsible

Two ET44ACs lead an eastbound freight train over the Seine River in Ste. Anne, MB on a gorgeous fall day. Note the large flared radiators on the rear of the units, and the exhaust housing that is flush with the radiators.





CN ET44AC 3090 idles beside M Building in Symington Yard. The large radiators are easy to spot.

for the most distinguishing physical features on the ET44s. The body-work of the ET44ACs and ET44C4s was modified to accommodate the necessary equipment for both the cooling and exhaust systems. The unique physical features of the locomotive make it easy to tell these units apart from others. ET44s include massive rear radiators, and early models of the locomotive feature an extended exhaust hood. Later models of the ET44s have had the exhaust hood reshaped so that it is flush with the rear radiators.

GE dominated the market in 2015, building new ET44ACs and ET44C4s for five of the seven Class I companies, despite the downturn in freight traffic volume. BNSF Railway – the biggest customer to date – purchased a fleet of 236 ET44C4s. CSX came in at a close second with 225 ET44ACs purchased, followed by Union Pacific at 200 units. Canadian National, with 121 locomotives and Norfolk Southern with 47 ET44ACs are the final two of the five railroads that have placed orders.

It's been just over two years since the Tier 4 emission standards first took effect, and GE has been cruising at full throttle right out of the gate. The ET44s are the product of decades of experience and GE's expertise in the locomotive-building industry. Watch for these lean, green machines on a mainline near you!



Please see next page for the ET44AC statistics table and information links.

Conforming to the EPA Tier 4 emissions standards, CN ET44AC 3090 is a lean, green, machine!



About the Author

Jack Hykaway is 17 years old and lives in Winnipeg, Canada. Model railroading and rail-fanning are his favorite hobbies. He spends his free time working on his HO scale layout, or trackside waiting for the next train to roar past. Jack has been in the model railroading hobby since he was seven years old. Like most people, Jack started with an oval of track, and a rugged train set. He built his present layout when he was 11 years old, and he is constantly upgrading it. However, there is still a long ways to go. Climb aboard and follow Jack's progress on the Silver Lake Junction layout on his YouTube channel at <https://www.youtube.com/user/WinnipegRailfanner1>.

ET44AC Statistics Table (Courtesy of General Electric)

| | |
|-----------------------------------|--------------------|
| Model | ET44AC |
| No. of axles | 6 |
| Maximum weight | 432,000 lbs |
| Weight per axle | 72,000 lbs |
| Truck gauge | Standard (4' 8½") |
| Emissions | EPA Tier 4 (USA) |
| Gross Horsepower | 4500 HP (3,356 KW) |
| Tractive Horsepower | 4365 HP (3,255 KW) |
| Maximum Speed | 75 MPH (120 KPH) |
| Max Dynamic Braking Effort | 98,000 lbf |
| Continuous Tractive Effort | 166,000 lbf |
| Starting Tractive Effort | 200,000 lbf |
| Fuel Capacity | 5,300 Gallons |
| Engine Model | GEVO 12 |
| Countries Used | USA, Canada |

What's the Difference?

GE produces two models of ET44 locomotives: the ET44AC and the ET44C4. The only difference between the two is that there are no traction motors on the central axle in each truck on the ET44C4, whereas the ET44AC has a traction motor on each axle.

Find out more about the ET44AC and ET44C4 at these links:

- General Electric: <http://www.getransportation.com/locomotives/evolution-series-tier-4-locomotive#overview>
- EPA: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1000A09.pdf>
- DieselNet: <https://www.dieselnets.com/standards/us/nonroad.php#tier4>
- *Trains Magazine Locomotive 2016* - Special Issue

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Here are some themes we are developing for our upcoming issues:

- **Electronics and Control Systems for Model Railroading**
- **Model Railroad Photography**
- **Modeling Passenger Trains**
- **Using 3D Printing and 3D Modeling in Model Railroading**
- **Prototypical Operations**
- **Modeling Narrow Gauge**

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We look forward to hearing from you soon!



Google Hangouts And Etiquette



By YouTube Model Builders

YouTube Model Builders works very hard to bring YouTube model railroaders together in what is called Google Hangouts. Google has many free resources for us to use and we look forward to taking full advantage of these resources.

What is Google Hangouts? It's an application that runs through a web browser that allows up to 10 people to connect with webcams. Using this forum for model railroading discussions is great! It builds friendships, inspiration for model railroad building, and most of all, a great place to air your designs, models, and share in your building adventures with others in real-time. Many of the YouTube video producers you know "Hangout" in these Google Hangouts.

Many builders simply place their webcam on their project they are working on

and show others what they are doing; it may be they are building a model, laying track, or working on anything model railroad related. Many look for feedback from the group, get questions answered, and elaboration on the many projects on which they are working. It's simply a great place to interact in real-time with other YouTube model railroaders.

These Google Hangouts are posted most every day on the [Google+ YouTube Model Railroaders Community](#) page. You are not required to use a webcam or even a microphone; you may only use the provided chat box if desired.

With the utilization of Google Hangouts by many model railroaders, YouTube Model Builders has scheduled specific types of events for the community members. Here are the Google Hangouts that we have arranged to

help bring more model railroaders together.

Topic Driven, Hangout Shows:

YouTube Model Builders invites specific guests to explain techniques in model building, and many times these individuals are invited to our topic driven hangouts based on videos they have produced.

Showing progress real-time, the topic driven hangouts are moderated by YouTube Model Builders staff, which keeps these hangouts on subject and informative. These Hangout shows are much like clinics as they are more so for instruction and techniques shared by the presenters.

We have several topic-driven Hangout shows. One of the shows is the FineScale show, which is hosted by [Andy Crawford](#)

and Johnny of [Southeast Rails](#). In this show, Miles Hale, along with [Andy Crawford](#) and [Barry Rosier](#) are going to take you from beginning to end of constructing highly-detailed wood structures and scenery.

One of the monthly Tuesday night shows includes guests such as Miles Hale and [Bill Beranek \(The Track Planner\)](#), while the Barry and Mike MRR Tech Show, which is moderated by [Barry Rosier](#) and Mike Dettinger, focuses on the more technical aspects of model railroading such as DCC controls and JMRI. There are plenty of opportunities to learn from many experts in model railroading through these Hangout shows. So come and join in!

General Moderated Hangouts: Thursday Nights

Where many hangouts (posted through the Google+ YouTube Model Railroaders community page), encompass many subjects and often have many people showcasing their layouts, YouTube Model Builders has a weekly scheduled, Thursday night, general moderated hangout, to specifically keep on the subject of model railroading. The Thursday night hangout is moderated by Johnny of [Southeast Rails](#) and the topic selection is really driven by community feedback.

YouTube Model Builders as a team helps drive these Hangouts, to spread the word, and get the YouTube Model Railroaders involved. Many people participate and as these numbers have grown, a simple etiquette is followed for the hangouts posted on YouTube Model Railroad resources.

Below is a simple guideline for participating in any YouTube Model Builders hangout event:

- Always keep the conversation G Rated.
- Refrain from political/religion based conversations.
- When not speaking, mute your microphone.
- Keep the hangout fun and on model railroading subjects.
- Remember, you're in a room with others, try not to monopolize speaking time. Allow others to get in their input.
- If you have your camera on, please be presentable – remember others can see you!

Following these simple etiquettes will make hangouts fun, and most of all, suitable for anyone who might want to join! We hope to meet you in a hangout in the near future if you don't already participate! If you have any questions on this subject, feel free to ask any one of the involved YouTube Model Railroaders to help get you into the fun sharing in the Google Hangouts. 🚂

Food For Thought...

Weathering the Whether of the Weathering Argument



By Andy Crawford

I have learned that our vision and our view of the world we wish to replicate in miniature affects how we think our way through that vision with regard to the effects of nature. In general, we often classify this modeling and the associated techniques as “weathering.” But this is a very wide category, and – as I often declare – there’s a wide gulf between the real world and how we envision this in our modeling. I also would argue that there is an equally wide gulf between the impression modelers have of one another, based on their approaches to the various persuasions of natural effects or weathering.

First, let’s break down the facts available to us from science. The summary explanation is that rust is iron oxide, typically red oxide, created by a reaction of iron with oxygen when in the presence of water or moisture. That reaction is corrosive and destructive. Unlike the patina that happens to minerals such as copper, which in and of itself is not necessarily destructive, the corrosive re-

action that creates iron oxide (rust) is destructive. As such, any iron, when exposed to a moist air mixture will, given enough time, produce surface rust, degrading the resistance of the surface to protect the underlying layers of iron. Eventually, with enough time, any iron will rust and turn entirely to rust and disintegrate. There are a few other types of rust, such as the way iron rusts when in the presence of chloride in underwater situations; this particular reaction creates green rust.

Nearly all metal and alloys oxidize in some way, but the results typically are not referred to as rust. Rust specifically refers to the effects of oxidation on iron and iron alloys such as steel. Understanding this chemical process – at least at a basic level – can greatly increase the effectiveness of your efforts to replicate it.

Now, I’d like to clarify a viewpoint. Natural effects are viewed as natural or organic occurrences to modelers, even those that fight the desire to

weather their locomotives and rolling stock. Few of us, for example, put grass and other scenery down intending to replicate the artificial turf such as that found in sports stadiums. Nearly all of us replicate the various colors, through ground foams or static grass, and the dirt coloration that occurs with the imperfection of natural scenery. This being the case, how different is it that we need to model the impact of Mother Nature on our steel structures, rolling stock, and locomotives?

An element of this column is to take the adversarial approach to a two-sided or multi-sided argument, or to argue for the road less traveled. The argument as to whether your equipment or not, is just too easy a target; so, while I’ve just argued the sentiment of whether or not to weather, we’ll leave this argument and assume you’ve taken a viewpoint on it.

If, in your modeling vision, you have allowed or intend to allow Mother Nature’s impacts to be visible, then it is better to debate “how to” ra-

ther than “whether to.” If, on the other hand, you’re in the camp of non-weathering modelers, I’m sure you have your reasons. This is not a unique case, and we all know modelers of that affinity. In fact, some of the better known publications are well-known for their lack of showcasing that attribute.

The remainder of this article is not intended to be a “how to,” not a dissertation on technique, nor even a “how I do” (as Modeler Man Mike likes to say, and I’ve unabashedly stolen for my own use; it’s just good, and you should consider making use of this terminology as well.). Instead, what follows is a focus on how to view rust, dirt, and grime ahead of technique discovery.

The argument I make here is to identify what elements of rust, dirt, and grime we can replicate for our modeling. The essence of this replication could be approximated by focusing on color, intonation, variety, and – my biggest element of concern – texture.

Texture can be very valuable for our modeling, and I rarely see it given appropriate attention. Texture is an important component to the finish of objects, and it’s often defined as some other quality. As an example, the differences between flat, eggshell, satin, semi-gloss, and gloss paint are in their texture. A highly glossy finish is a very smooth surface, and as such it more efficiently reflects light back to the viewer so that it looks shiny. Whereas a more flat finish has a more coarse texture, and therefore it refracts light in various directions, not directly at the viewer; it appears to be not as illuminated or

as glossy as smoother finishes.

There are a few reasons that cause or assist in this effect, such as the size of the pigment particles and how quickly the suspension liquid evaporates (called paint drying, and is very exciting to watch).

Environmental and surface characteristics also are significant factors to be considered. It’s interesting to understand how paint functions, and it will help your understanding, selection, and use of pigments and paint products.

But that understanding has a more direct use in how we are applying pigments and weathering agents. While we could simply paint with an appropriate rust color and apply the standard dull coat, flat finish to simulate rusting effects, my argument is that there is an element or opportunity that potentially can be missed.

I, among many other modelers, will always recommend modeling from photographs; but I would push an additional step into this discussion: there’s a real value to seeing, with your own eyes, rust and various weathered effects in their natural environment, or nature. That’s an additional benefit to those of us who often enjoy railfanning and shooting photos of prototype railroad equipment.

Seeing rust specifically gives you a much greater appreciation for the texture and varieties of rust. As I stated earlier, only particular metals (iron-based) oxidize as rust and only in an environment that supplies oxygen – often with the addition of hydrogen in the typical form of H₂O, a.k.a. water – but there is still a natu-

ral variety of colors and textures. This variety stems from the seemingly random quantities of the three components required to rust something: iron + water (or air moisture) + time. Since the particular ratio of those three factors will vary, you should consider this variety as you apply rust to your models. But the key, in my opinion, is to go and experience rust, first-hand.

To approximate the effects of rust texture, you need a composite of a flat, semi-particulate quality with some of the distortions in the iron that appear as bubbling or separating seam effects. The particulate effect can be simulated well using powdered pigments. I personally have gotten the best results when essentially making a paint from a paint pigment or a finely ground chalk added to a suspension liquid of 91% isopropyl alcohol or mineral spirits.

I use a variety of products such as MIG Ammo, AK Interactive, and AIM powders, as well as cheap artists chalk run across a foot scrubber to make a pile of powder. It would be best to have articles on these materials and use; however this is one of those areas where video truly is the best medium. Look for the YouTube Model Builders upcoming FineScale Build Show.

You would do yourself good to follow some great weathering modelers on YouTube or Mike Confalone’s great weathering series on [Train Masters TV](#). However, my “go-to” source for admiring other modelers work is [The Weathering Shop](#). Those guys have been showcased on TrainMastersTV and on Ken Patterson’s “What’s Neat” series for the



The essence of rust is well-represented in this photograph. Study the range of colors that give clues to the reactions that have occurred to compose such a variation of textures and intricate patterns of rust. Photo by Lairt Keiows; used under CCA-SA 3.0 license, available via Microsoft Clip Art.

[Model Railroad Hobbyist YouTube channel.](#)

In conclusion, there are considerations beyond just color to weathering at large, and rust, more specifically. But it also applies to dirt, grime, etc. There are many more considerations beyond color. Go out and experience them and create your own view of how far down that rabbit-hole you will go to meet your vision! 

About the Author

Andy Crawford, 38 years old, is a technology provider to mid-sized businesses and financial institutions, and a lifetime model railroader. Starting young in the hobby with a

train set, like many others, and after spending a decade as an armchair modeler, he returned to the hobby a few years ago, in full force. He models a very exacting replica of a 15 mile section of the Clinch Valley District of the famous Pocahontas Division of the Norfolk & Western Railway in 1952.

His interest in exacting replication of the prototype, fine scale craftsmanship, weathering, and prototypical operation can all be seen in his work. For him, recreating the experience of being a railroad professional, 1/87th the size, in the 50's is all the focus that is needed. You can check out Andy's YouTube channel here: <https://www.youtube.com/channel/UC8I2bTYfzVY37328sGPD9Bw>.



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