

"This set of instructions was written by Paul Wilczynski, who is the IDS 3D Manager for the Industrial Design Department at the Academy of Art University in San Francisco. It is based upon Paul's 35 years in the design prototyping business. It has been used to finish over 150 clay vehicle models since 2003, with no failures in any paint job. In order for it to work, the materials and methods must be followed exactly, with NO SUBSTITUTIONS."



ACADEMY OF ART UNIVERSITY

IDS 217 MODELMAKING 3

HOW TO PAINT A CLAY MODEL

By Paul Wilczynski

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FIRST THINGS FIRST...

Follow the procedures carefully and **TO THE LETTER**. Do not try to rush suggested drying times. So-called "shortcuts" such as using forced hot air to shorten drying schedules, will actually cause more problems than they will solve. **PLAN TO ALLOW AS MUCH TIME AS NECESSARY TO ACHIEVE A CLASS "A" FINISH.** To go through all the steps called out in this paper, and to give each step its proper attention before moving on to the next, will take a minimum of 30 hours, spread out over approximately five to six working days!

Do **NOT** substitute materials, no matter what the guy in the shop, fellow students, your girlfriend's uncle, etc., tell you. We teach this painting as a **SYSTEM** here at the Academy. Ask yourself (and him, if necessary!) how many clay models they have painted, before accepting them as authorities on finishing **YOUR** time-intensive and easily-damaged model.

BEFORE WE BEGIN:

Your model needs to be steeled carefully and free from any loose clay bits. Be sure that all inside corners and edges, highlights, peaks, etc. are just as you want them. Once you have begun painting your model, you will **NOT** be able to make any corrections whatsoever!

Slicking the model is unnecessary and actually can be counterproductive.

NOTE: DO NOT SLICK THE MODEL WITH A SOLVENT (especially WD-40).

You will experience serious paint adhesion problems. A surface which has been slicked with water only, may be painted, but possibly could have a finish which is less durable than a surface which is merely carefully steeled. In the case of painted clay models, "slick" is usually "too smooth"!

Please note that in no case do I EVER recommend attempting to finish a 1/5 scale clay model using spray cans, or “rattle cans”. There are two very good reasons for this insistence:

1. The products available in spray cans are formulated for hobbyists and homeowners, not professional designers or painters. These paint formulations are usually enamels which use either mineral spirits or water as solvents. Neither is suitable for any sort of a durable model finish.
2. Spray paints have so many formulations that absolute compatibility is doubtful, even among products carrying the same brand name. The result is inevitably wrinkling or adhesion problems, resulting in the failure of the paint finish.

There are three exceptions to the “rattle can” rule, having to do with GUIDE COATING the model, and with painting the WHEELS and TIRES:

1. If you desire silver wheels on your model, Autoglym, a British Company which manufactures detailing products for luxury cars, makes the best silver wheel paint known to man. It’s called (of course!) Autoglym Wheel Silver, and it comes in a huge 20 ounce spray can.
2. For finishing scale model tires, there are two good products which duplicate satisfactorily the low sheen of new black rubber. The first is made by Spruce Paints, and it’s designated as their Flat Black Lacquer spray paint. It comes in a 12-ounce spray can. It blushes easily, so don’t spray it on cold or rainy days. The other paint which works well to simulate black rubber is Krylon Ultra Flat Black Enamel spray paint. It is much less sensitive to high humidity and low temperatures.
3. The Spruce Flat Black lacquer is also excellent for guide-coating your model to reveal surface flaws during dry or wet sanding procedures.

STEP # 1—SEALING THE CLAY SURFACE

Using a spray gun, spray on two thin wet coats of Zinsser B*I*N Sealer. This is made by Zinsser. It comes in a white can with a red and white bulls-eye on the label. If required, B*I*N can be diluted with a small amount of denatured alcohol.

B*I*N can also be procured in large spraycans. *Do NOT use a similar Zinsser product called “KILZ”! It will not work under the paint system described in this paper.*

Let the first coat of B*I*N flash dry (10 minutes) before applying the second coat. Now let both coats dry overnight.

Scuff the surface GENTLY and VERY CAREFULLY and thoroughly with fine Scotchbrite (brown color). Stay away from edges, and avoid overdoing this step, or you will cut through the sealer coat. The idea here is to slightly rough up the sealer for better bonding of the next coats.

STEP #2—POLYESTER PRIMER

A medium coat of Duratec or Evercoat polyester primer surfacer (PPS--gray color, product # 707-002) is next applied. Use an HVLP gun, gravity feed, with a 1.4 nozzle and 25-35 psi air pressure at the inlet of the gun. Mix only enough for one coat at a time. A good rule of thumb is 8 ounces of paint and exactly 5cc of MEK peroxide catalyst. MEASURE—don't estimate! Spray a test panel first and, if necessary, dilute the mixed primer with acetone. ***The surface of the Duratec or Evercoat PPS should be smooth***, with a minimum of dry spray patches or orange peel. Adjust the gun and, if necessary, the viscosity of the primer (by thinning it up to 20% with acetone) in order to achieve this smoothness. NOTE: Don't worry about little air pinholes that might show up, where the clay may not have filled in completely. Up to about 1/16" (1.5mm) these can be filled with polyester spot putty (Evercoat product # 100416). This putty is used after the model is painted with PPS and sanded, but before the urethane primer (STEP #3) is applied.

Clean the gun thoroughly between coats of PPS, using acetone. WAIT 30 MINUTES and mix and apply a second coat of PPS. Wait another 30 minutes, and apply a third. If you wish, as many as 4 coats can be applied—just be sure the previous coat has “kicked-off” before applying the next. The PPS should be “green” (i.e., gelled and dry to the touch but still soft and not completely hardened), while these multiple coats are applied. Now clean the gun again after the last primer coat.

When the PPS coats are FULLY hardened (4-8 hours), guide coat and dry-sand carefully with #150 aluminum oxide paper. Use a rubber block wherever possible. This flattens the surface and allows you also to crisp up any details you want to get really perfect. Never use a wood block on a clay model. It will groove the surface of the clay! Now's the time to fill any imperfections with Evercoat polyester spot putty (PSP). There are several Evercoat products suitable for this operation. I prefer # 400, but #s 416 and 421 are suitable, too.

STEP #3—URETHANE PRIMER

Once the sealer and polyester primer-surfacer are used to prep the model, I strongly advise that the urethane primer, basecoat, and clearcoat should be from the same manufacturer, and that all three be recommended by the manufacturer

as a compatible COATING SYSTEM. With this in mind, I will refer to PPG products by name and part number from this point forward. Each major manufacturer sells an equivalent system.

Re-prime the model with two coats of PPG NCP 280 Urethane Primer-Surfacer. This is mixed 2:1 with NCX 285 catalyst. This can be reduced if necessary to improve flow, by adding one part of DT reducer to five parts of the catalyzed mixture. Spray with the same gun at the same settings as STEP #2 above. Allow 10-15 minutes between coats. This primer has a minimum 4 hour cure time. When fully cured, guide coat the model and wet sand with #600 Wet Or Dry. Now you are ready to apply the color coats.

STEP #4—COLOR COATS

I suggest PPG Deltron 2000(DBC) for the color coat (topcoat) step of the paint process. It is by far the easiest to apply of any paint topcoat I've ever used. Pick a color from the thousands available in solids, metallics, micas, and pearls. One pint each of window and body colors should be sufficient. The window color should be chosen to contrast with the body color. Lighter body colors are preferable to very dark colors, because they photograph and show off the contours of the model best.

You will also need 4 ounces each of the taillight and headlight colors, if you choose to paint them.

Begin by cleaning the surface of your model with a suitable wax and grease remover such as Grow Chemical # 1705 Grow Super Clean. We stock this in the IDS shop for your use. You should use a clean cotton cloth to soak the surface of the model and a second clean, dry cotton cloth to wipe the Super Clean off the surface of the model. ***Do not allow the wax and grease remover to dry on the surface of the model!***

When the model has been thoroughly wiped dry, wet again with 1705 and once again wipe the model's surface dry.

Next, lightly wipe the surface with a tack cloth. We also stock these in the IDS shop, at a very reasonable price. These can be re-used for many paint jobs.

We supply your color coat paint already mixed and reduced. If you wish to further mix or reduce it, or tint it to change the color slightly, pour it from the can into a clean paper or polyethylene mixing cup.

NOTE: DO NOT USE ordinary wax paper cups. The wax will migrate into the liquid paint and cause paint imperfections, primarily fisheye craters. Foam coffee cups are out, too--they will dissolve in seconds due to the solvents

in the paint. Clear styrene cups also dissolve. They just take a little longer. These are not recommended, either.

Always strain the paint mixture as you pour from the mixing cup into the gun cup. A strainer/funnel with nylon screen is preferable to one with cheesecloth, because of dust and lint present in cheesecloth. Nylon is a finer mesh, too.

Now (finally!) you are ready to begin spraying!

ALWAYS SPRAY A COUPLE OF COLOR CHIPS BEFORE YOU SPRAY EACH COLOR, FOR PRACTICE AND TO CHECK COVERAGE AND COLOR.

Spray the window areas and headlight and taillight areas first and allow to cure thoroughly (at least 4 hours).

Mask these areas and paint the body color. Adjust the gun so that it puts out enough paint to be wet, but not enough to run or sag easily. Try 30 psi at the inlet, medium opening on the pattern, and then adjust the paint volume to suit.

Be sure to apply enough paint to completely cover the model's surface. A minimum of three medium coats are necessary. Wait ten minutes between coats. It is not necessary to scuff the model's surface between coats!

Wait 2 hours and carefully unmask the window and lighting areas. Detail these areas if necessary by touching up the paint with a tiny high-quality brush. At this point, you are ready to clearcoat.

STEP #5—CLEARCOATING

I have seen more models ruined by badly-applied clearcoat than by any other part of the painting process. There are three primary reasons for this occurrence.

The first reason: Failure to follow the manufacturer's instructions with regard to mixing and application of the finish. Always follow these **TO THE LETTER**.

The second reason: Poor time management. Since clearcoating is the very last step in painting a clay model, the process of clearcoating has acquired a mystique bordering on the magical. Students often are intimidated, and they will delay applying the clearcoating, waiting until the night before a presentation to spray it—a huge mistake.

The third reason: Simple fatigue. The application of clear topcoats requires a superior level of alertness, a careful attention to technical detail, and much patience. You can't stay alert and do your best work when you are exhausted.

A model should be clearcoated within 24 hours of the application of colorcoats. The clearcoating, in turn, should be completed no less than three days (and, if possible, five days), before the presentation. This is in order to give the clearcoat time to harden and shrink (at least 24 hours!), so that if final color sanding and subsequent buffing of the paint is desired, this may be accomplished comfortably prior to application of emblems, logos, INTs or tape lines.

If you have not clear-coated before, or feel the slightest bit intimidated at what is undoubtedly the most critical and time-sensitive stage of the clay model painting process, by all means practice clearcoat spraying before painting your precious model! Spend several hours perfecting your technique, paying special attention to the amount of paint you are applying in order to achieve the gloss level you desire. It is most helpful to spray surfaces that are vertical, in order to learn how much paint is too much, and how much it takes to run or sag.

I recommend PPG Concept 2042 (DCU) High Solids Polyurethane Clear for clear coating a clay model. Mix the 2042 with the temperature-appropriate DT series reducer and DX catalyst at a ratio of 4:1:1 (2042/reducer/catalyst).

DO NOT ESTIMATE QUANTITIES! Measuring the quantities and ratios of paint, reducer, and catalyst is **CRITICAL** to success in this important step. The IDS shop sells special purpose clear polyethylene mixing cups. These are available in half pint or quart sizes, with mixing ratios printed on the side. These are disposable and a real time saver. They also allow you to work as you should—**VERY CLEANLY!**

After you mix the paint / reducer / catalyst, stir thoroughly with a **CLEAN** stirring strip. Then cover the polyethylene mixing cup and let the mixture sit for about 10 minutes to allow the chemistry to begin to work. At 75 degrees Fahrenheit, you will have 60-90 minutes to apply the clearcoat for optimum results.

When you pour the mixture from the mixing cup into the gun, always use a new, clean strainer. You will get a free one with every can of custom-mixed paint from the IDS shop.

ONCE AGAIN, SPRAY A COLOR CHIP SO YOU GET ACCUSTOMED TO HOW THIS PAINT MATERIAL APPLIES.

Air pressure at the inlet of 30 psi with a medium pattern and medium thickness is recommended. Clear coating involves a certain amount of technique: move the gun smoothly, plan your pattern of coverage (**DON'T BE RANDOM ABOUT THIS!**), and don't apply too much clear—it runs and sags easier than color coats do, because HS clear is, to put it mildly, **HEAVY**.

My rule of thumb regarding clear coat application is: Put on a light-to-medium coat of 2042 and WAIT for it to “flow out” a bit—about 30 seconds to a minute should elapse before you evaluate gloss level and formulate an opinion.

A common mistake is to apply the clear so the surface of the model is high in gloss immediately upon application. This usually results in too much clear being applied in one coat, with the consequence of runs and sags in an otherwise competent paint job.

Better to proceed with caution and give the model a couple of lighter coats, waiting only 2-3 minutes between coats. Once you’ve clearcoated a half dozen or so models in a short time, you will learn the tricks of nearly-perfect clearcoat mixing and application.

Allow the clearcoat to cure and harden at least 24 hours. Now you can color sand and buff the model—the final step to perfection.

STEP #6—COLOR SANDING AND BUFFING

This step is optional. The better the surface quality of your clear coat, the less important color sanding and buffing becomes.

In a clean quart-size polyethylene mixing cup, mix a pint and a half of water with 4 ounces of Windex and add a teaspoonful of vinegar. This wetsanding solution will lubricate the sandpaper and keep it from loading up with clearcoat dust.

Wet or Dry sandpaper should be used WET in this case. CUT a sheet of sandpaper into FOUR strips, working the “short” way. Fold each strip into THREES. This prevents the paper slipping under your block or fingers. Exchange paper frequently, as soon as you can feel the paper losing its cutting efficiency.

USE a rubber or stiff foam block for flat or low-crown surfaces. Use your fingers wherever they will fit.

STAY AWAY FROM EDGES—they will sand through very rapidly. DO NOT SAND THROUGH THE CLEARCOAT!

Begin color sanding with #600 paper. When the entire surface (except edges) is carefully sanded, wipe the model down with a damp paper towel. Allow it to dry a minute or two, then check again for areas you might have missed. Next sand the entire surface again with #1000, wipe and dry and finish with #1500. Your model is now ready to buff.

You can choose between hand-rubbing out and buffing, or doing it with a machine. A 1/5 scale model is at the bottom size limit for successful machine

buffing. I don't advise using electric buffers on scale clays—electric buffers are too large, unwieldy, and difficult to control. Should you want to try machine-buffing your model, I recommend a right-angle air buffer with a 5" diameter lambswool pad for larger areas, and then switching to a foam pad for smaller details and inside curves and edges. Smallest details can be done with a 2" diameter buffing pad. If the idea of overheating your clay model with too much pressure on the buffing pad, troubles your mind, It is safer to take the extra time and effort and just do it by hand, If you do, a cloth diaper is by far the best applying and rubbing cloth you will ever find. You can find these at K-Mart, Target, or WalMart. Use a separate diaper for each grade of compound!

Next tip: prepare a spray bottle of Windex or plain water for occasional use to lubricate and cool the surface of the model during buffing. This prevents dry streaks of buffing compound or "burn-through", which on a clay model is difficult to repair.

The buffing process involves three steps. The first step is called cutting, and it takes the 1500-sanded dull surface and buffs it up to a semi-gloss surface with lots of swirl marks. The second step is called highlighting. It takes the surface from semi-gloss to high-gloss with a minimum of swirl marks and surface "halos" around point highlights. The third step is waxing, to fill in the tiny random scratches which cause "halos", and to protect and glaze the surface of the model.

For the first, or cutting step, I recommend 3M Perfect-It III white rubbing compound, product #05933. Work a small amount over the surface. NEVER BEAR DOWN ENOUGH TO HEAT THE CLAY, or the whole thing—model and all—will be ruined. As you continue to buff, the surface will change from dull to semi-gloss. A consistent semi-gloss surface is the clue that it's time to highlight.

Highlighting is done with 3M Perfect-It III Machine Glaze (Product #05937—quart size.) Use the same technique that was used in the cutting step.

Any tape lines, INTs, decals, or labels MUST be applied prior to waxing. They will not stick otherwise.

To fill and protect the final surface, a good quality wax is needed. I recommend Zymol cleaner-wax (Product#z503), or Meguiar's Gold Class Clearcoat Wax (Product # G7016), available at most auto paint stores. Apply with a soft clean COTTON cloth (t-shirt or diaper) and buff for a perfect shine. Both these waxes are solvent-free, allowing you to "build coats" for added shine and best protection.

