

Copy Cad® & Zinc Plating

Zinc and cadmium plating are somewhat unlike most other types of plating in that they are sacrificial to underlying steel. Over time, the coating gives up its life to protect the underlying metal from rusting. As this happens, the coatings develop a dullness, which eventually turns to a whitish powdery surface. This is the 'rust' of zinc, an oxide. When the life of the zinc/cadmium is over, the part will begin to rust. If these types of sacrificial coatings are damaged, a scratch as an example, the coating forms a protective film of oxide over the scratch, preventing it from rusting. This is unlike other types of plate, such as nickel, where the edge of the damaged coating would begin to rust, and it would eventually get under the nickel and push it away from the steel.

Life expectancy of these coatings may be pre-determined by the thickness of the coating. However, a given thickness in one situation may last much longer in a less harsh environment.

Cadmium and Zinc plates do not cope well with acid environments, and premature accelerated action may take place, reducing the life of the coating. This can be reduced by 'chromating' the parts, or treating with a lacquer etc.

When removing old cadmium plate, consider that the metal removed is highly toxic. It is very inadvisable to remove this using abrasive means, which may produce an airborne breathable dust.

The operating instructions for Copy Cad® and Zinc plating kits are the same, except that Copy Cad® does not use Brightener and the surface is prepared to provide a dull flat finish.

To achieve the flat dull gray look of Copy Cad® or cadmium, treat the surface to provide a dull finish immediately before plating. Either bead blasting, or cleaning with the nylon abrasive wheel, which is included in all Copy Cad® kits, best achieves this. Mount the wheel on a bench grinder or fast electric drill. Copy Cad® does NOT use any brightener, as this addition to the solution will produce a bright shiny surface, which is undesirable.

The Zinc plating kit requires that the surface be reasonably shiny before plating. Light buffing and polishing will provide an adequate pre-plate surface. Add ZINC BRIGHTENER to the plating solution to maintain the bright shiny appearance of the zinc plate. If for some reason, you obtain a dull gray heavy plate, then a simple way to brighten this is to use a WIRE WHEEL on the part and buff it lightly. It will shine up to a 'store bought' finish in no time.

Copy Cad® & Zinc Plate will also accept numerous chromates, which allows you to color the finish. A popular color for cadmium and zinc is a golden yellow. This can be achieved with our Yellow Chromate system. Immerse the plated part in the chromate solution. When the desired color is reached, remove the part and rinse in distilled water.

When plating cast iron with Copy Cad® or Zinc, it is advisable NOT to soak the parts in acid pickle, but bead blast them instead.

READ MSDS AND WEAR ALL PROTECTIVE GEAR

Tank Setup For 1.5 Gal Kit

For 3 Gal Kit, multiply by 2

For 4.5 Gal Kit, multiply by 3

For 15 Gal Kit, multiply by 10

Degreasing Tank

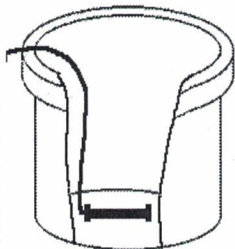

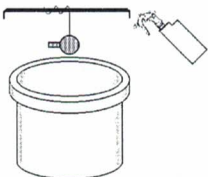


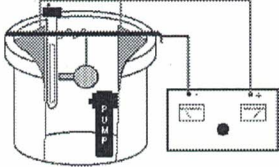

1. In one of your plastic tanks, add 1.5 gallons of distilled water.
2. Add 12oz of SP Degreaser Powder
Heat and mix well. Degreaser works best at hot temps

Plating Tank

Making up the Copy Cad Plating Solution

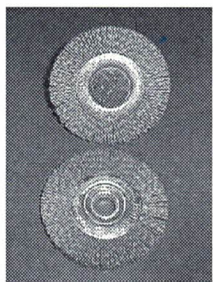
1. Add 1.5 Gals of Distilled Water to your tank
2. Add 13 fl oz of Part A Concentrate
3. Add 36 oz of Part B powder
4. Add 1/2 teaspoon of Zinc Brightener
5. Mark liquid level with permanent marker
6. Cut strip up anodes (see page 24)
7. Install anodes in tank (see page 24)
8. Install Tank Bar (see page 9)
9. Install heater and pump. Heat to approx 110F

Refer to the chart on the following page for plating steps.

PROCEDURE	SETUP	OPERATING PARAMETERS	EQUIPMENT	SAFETY
1. SURFACE PREPARATION	Light Buff & Polish for a bright Zinc Plate look Bead blast or Nylon Abrasive Wheel for Cadmium look			
2. DEGREASING		140- 200F No agitation 5 mins immersion 12 oz. SP Degreaser 1.5 gal Distilled water	1 x Plastic tank 1 x tank lid 1 x heater 1 x 2lb SP Degreaser	
3. RINSE IN DISTILLED WATER SPRAY				
4. WATER BREAK TEST	 Oil/dirt film makes water bead up		 No oil/dirt film allows water to cover part	
5. CALCULATE TOTAL SURFACE AREA AND AMPERAGE REQUIRED (0.14 AMPS PER SQUARE INCH)				
6. OPTIONAL ACID ETCH IN 5% MURIATIC ACID:WATER SOLUTION FOR 2-3 SECONDS				
7. TANK MAKEUP		<ul style="list-style-type: none"> • 110°F • Agitation (pump) • 13 fl oz Copy Cad/ Zinc Part A • 36 oz Copy Cad/ Zinc Part B • 1/2 teaspoon zinc brightener • 1.5 Gals Distilled Water • 0.14 amps/sq in • pH = 5.5-6 	<ul style="list-style-type: none"> • 1 x Heater • 1 x Tank • 1 x Tank lid • 2 x Zinc Anodes • 1 x Filter/pump • Copy Cad/Zinc Part A + B • Zinc Brightener • Distilled water 	Wear rubber gloves and goggles. Do not ingest. 
8. BRIGHTENER ADDITIVE	ZINC BRIGHTENER SHOULD BE ADDED AS NEEDED, 1/2 TEASPOON AT A TIME. DO NOT ADD IF CADMIUM LOOK IS REQUIRED.			
9. PLATING TIMES	Time 20 mins 30 mins+	Application Most applications, including chromating Highly corrosive environments	Plate Thickness 0.001"	
10. ADD LOST WATER	After plating, top up the tank with DISTILLED water to the original waterline.			
11. CHROMATE	1. Immerse in 2-5% muriatic acid:water solution for 3 seconds 2. Rinse, remove, then rinse again 3. Chromate in choice of Clear/Blue, Yellow, Black or Olive Drab Green			

Surface Preparation For Copy Cad®

The most important part of Copy Cad® plating is to achieve a dull 'flat' even finish to the metal prior to plating. Any shiny areas will make the Copy Cad® plate shinier, which will look more like a zinc plate.



There are several ways to achieve this 'flat' finish.

1. A Nylon Abrasive wheel (supplied in the Copy Cad® kit)
2. A SCRUBBER wheel. A cool running wheel made of an abrasive 'cloth' impregnated with a fine abrasive aggregate. Leaves a fine satin scratch brushed effect
3. Bead Blasting. Using a fine glass bead, this cleaning technique surpasses all other for the right effect.

Surface Preparation For Zinc Plating

Most commercially zinc plated items will not have much preparation done to them. They will not have been highly polished, merely cleaned well. Usually the steel is fairly clean and new, so it has a certain amount of shininess to it. The parts may be polished or left without any work. The overall end result will vary depending on the final surface preparation. The additional of ZINC BRIGHTENER to the solution will make them plate shinier than COPY CAD®, even on a dull flat surface.

Plate a dummy piece of metal for about 30 minutes to purify the system, prior to plating your first work piece. (You will only need to do this again, if you think the solution is contaminated)

Operating The Copy Cad® & Zinc Plating Systems

When adjusting the amperage, if the plating solution froths, turn down the current. You will need to turn off the air agitation to view these bubbles. Remember, the thicker the plated coating, the longer it will last.

Timing is everything. Smaller nuts, washers and bolts can be done with excellent results in 8-12 minutes, while larger ones can take up to 15-20 minutes. By watching the bubbles and the reaction rate of the part being done, one notices that the bubbles or foam begins to dissipate once the process is almost finished. By removing the part and dipping into fresh water, you can check the texture of the finish.

The finish can vary from a flat silver cad color to a shiny almost chrome finish. This is the result of bead blasting versus cleaning material with a fine grinder pad. Bead cleaning is recommended, as your finish will be true to the cad finish.

The pH range of the solution is 5.5 to 6.0. Lower with hydrochloric acid. You should not have to raise it but use ammonium hydroxide to do it. The bath can run as low as 4.7. So if you lower it too much, there is no need to re-adjust. pH below 4.5 can cause the starter chemical to be removed from the solution, pH above 6.3 can precipitate zinc.

Notes on Plating Cast Iron

Cast iron needs current. 25 square inches is about .2 square feet. So you will need at least 20 amps per sq. ft X .2 = 4 amps to plate a part. The part might need activation. Make up a 10% solution of muriatic acid and water and soak the part for a minute or two then rinse, then plate.

Finally, make sure the bath is in spec. Keep the pH below 6 and add 0.5% starter (call us for this chemical). Good agitation of the plating solution also helps. Iron is a contaminant but usually only causes the part to turn black in post plate operations, i.e. nitric acid dip or chromate conversion coating. 5 mls of 3% hydrogen peroxide will precipitate the iron.

Copy Cad/Zinc Plating Troubleshooting

Problem	Cause	Remedy
No deposit	No current (or gassing from part)	Check all electrics
Plate peels off or blisters	1. Poor preparation 2. Inadequate cleaning 3. High current	1. Improve all cleaning aspects 2. Check part with 'water-break' test. Acid etch part. Check SP Degreaser is OK. 3. Lower current
Blackish discoloration	Impurities in solution (copper or cadmium)	Plate a dummy for 20 mins.
Rough Plate	1. Amps too high 2. Suspended particles in solution	1. Reduce current 0.14 amps/sq in surface area. 2. Filter solution (no charcoal)
Overall haze	1. Low brightener 2. Poor cleaning 3. Inadequate agitation	1. Make one brightener addition 2. Improve cleaning 3. Increase air agitation
'Burnt' Plate (Dark gray)	Too much current	Lower the amperage Raise the bath temperature
Slow plating speed	1. Low zinc level 2. Weak pickling solution	1. Increase anode surface area 2. Make up new pickle solution
Bright plate on high areas only	1. Insufficient Brightener 2. Insufficient current	1. Make one brightener addition 2. Increase amperage
Bright plate except very low spots	Too much Brightener	Remove by filtering through charcoal, then replace
Dull or blotchy plate	1. Insufficient Brightener 2. Part not polished properly 3. Poor cleaning	1. Add brightener 2. Strip the plate off and re-polish, or plate with copper, polish the copper and then re-plate. 3. Improve all aspects of pre-clean.
Blistering	1. Poor cleaning or pickling 2. Metallic contamination 3. High current 4. Low zinc level	1. Improve pretreatment 2. Plate a dummy for 30 minutes. If unsuccessful, dump solution and make a new mix. 3. Lower current 4. Increase anode surface area
Black fingerprints on plated parts	Body acids attack freshly plated zinc	Refrain from touching freshly plated parts with fingers for at least 4 hours. Use a light abrasive cleaner to remove marks.
Patchy plate, plating thickly and erratically. Lumpy and shiny	Low in chemical concentrate.	Add more Zinc Concentrate until problem disappears.

Chromate Processes

Chromating is a process used primarily on zinc plating, zinc die casting (pot metal), and cadmium plating. 'Golden Cad' is really a cadmium plate that has been 'chromated' with a yellow chromate.

Zinc and cadmium are electroplates or metals which are readily attacked by mild acids, and will deteriorate rapidly, even if daubed lightly with tomato ketchup! To 'harden' the plate it is placed in a mild solution of special acid (the Chromate). This slightly attacks the plate, oxidizing it. The oxide forms a tough corrosion resistant crust, which protects the softer zinc or cadmium metal.

Chromates will only work on zinc die cast (pot metal), or parts previously plated with zinc, cadmium or Copy Cad. Prepare the part for chromating by zinc or 'Copy Cad' plating steel, or bead blasting pot metal. The plate needs to be in excellent condition, fresh and bright, otherwise defects will occur in the treatment. Do not handle the parts with your bare hands prior to dipping, as you will leave body oils in the form of fingerprints, which will show up on the finished item.

Old pot metal, (probably 25 years +) need to have fresh metal exposed without any oxidation present. To achieve this on carburetors, blast clean with baking soda and then rinse off in fresh water before dipping. If the result is blotchy, then blast clean again, and zinc plate the part to provide an even, fresh layer of zinc over the part.

Note: Baking Soda dissolves in water and will therefore not clog any important carburetor ports.

When using any of the following processes, it is important that the parts are rinsed thoroughly and they are allowed to dry overnight before handling.

Yellow Chromate

Iridescent Yellow Chromate Process has an oily look to it, with ripples of yellows, blues and greens. It is commonly found on brackets, brake boosters and carburetors.

The Yellow Chromate Solution contains Chromic Acid. Wear gloves, goggles, apron and a respirator with acid/gas cartridges.



Mixing The Yellow Chromate

For YELLOW IRIDESCENT FINISHES.

Add 1 gal of DISTILLED WATER to a plastic tank

Add 1 oz of CHROMATE LIQUID

For DEEP YELLOW - BRONZE FINISHES

Add 1 gal of DISTILLED WATER to a plastic tank

Add 2 oz of CHROMATE LIQUID

Using the Iridescent Yellow Chromate

Raise the temperature of the solution to 80 deg. F - using an immersion/aquarium heater.

Hang the part from a copper wire and immerse in the solution for 30 seconds (or until the correct color is achieved) swirling it to agitate. Remove and rinse in fresh water (Failure to do this will result in the part continuing to darken beyond the desired color). Set aside and air dry using a small fan.

Variations on the amount of chromate solution will achieve different effects. Less chromate will produce a light brass color and more will produce a dark bronze. Experiment!

When the process seems to no longer work effectively, add more liquid to the solution.

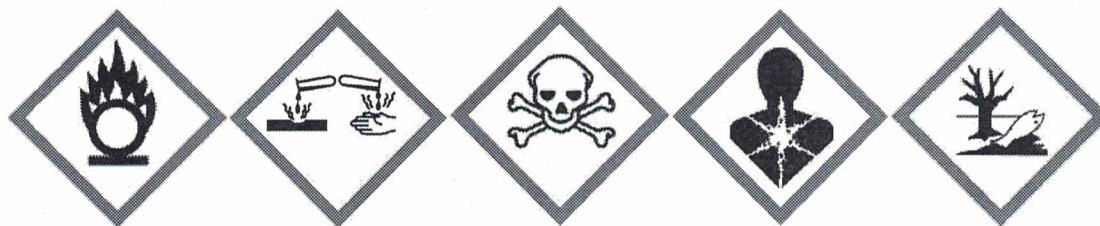
Store the unused liquid in a marked, glass container, in a locked area.

Olive Drab Green Chromate

Olive Drab Green Chromate is a single dip process consisting of two components. Olive Drab #1 & Olive Drab #2. The color is usually found on carburetors. The system is specifically designed to provide a Olive Drab Green color to previously zinc plated parts as well as pot metal. The chromate system only works on zinc metal (pot metal), zinc plate or cadmium, so all parts should be either manufactured from pot metal, or coated with zinc or cadmium plate. The system may also be used on 'Copy Cad' plate. The finish has performed well in salt spray tests.

Mixing Olive Drab Concentrate

NEVER COMBINE PART 1 AND PART 2 AT FULL STRENGTH. A VIOLENT REACTION WILL OCCUR. The Olive Drab Chromate contains Chromic Acid. Wear gloves, goggles, apron and a respirator with acid/gas cartridges.



In a plastic pail (HDPE preferred) add 2 gallons of distilled water.

Pour in all of the Olive Drab # 1. Avoid Splashing.

Pour in all of the Olive Drab # 2. Avoid Splashing.

Mix the solution carefully, avoiding splashing. The solution is now ready for use.

Using the Olive Drab Green Chromate

Raise the temperature of the Olive Drab Green solution to 80 deg F, using an immersion/aquarium heater. Hang the part from a copper wire and immerse in the solution for 30 seconds (or until the correct color is achieved) swirling it to agitate. Remove and rinse in fresh water (Failure to do this will result in the part continuing to darken beyond the desired color). Set aside and air dry using a small fan.

Olive Drab Troubleshooting

Problem	Cause	Solution
Dull streaks/bare spots	Poor rinsing after plating	Increase rinsing/agitation
Bronze to reddish color	Temperature too high	Lower Temperature
Olive color too iridescent	Solution too weak	Evaporate off some water
Dull powdery film, not adhering	Temp of air drying too hot	Adjust to 120 deg F or less
Poor corrosion resistance	Temp. of drying is over 160 deg F.	Reduce temperature
	Leaches out chromate	Reduce temperature
Poor dye absorption	Immersion time in dye too short	Increase immersion time
	Dye temperature too low	Increase temperature
	Chromate film too thin	Increase dip time
Chromate wipes off	Can occur is the concentration is low or high, most commonly high	Immerse the part in the chromate for 10 seconds with mild agitation. If the chromate wipes off, add 0.5% by volume chromate and retest. If the wipe off is still evident, increase the immersion time to 20 seconds

Black Chromate

CASWELL's Black Chromate Kit is a single dip chromate process consisting of two components, Black Chromate A and Black Chromate B. This system can be used over CASWELL Zinc and Copy Cad Plating Systems and will give a consistent and uniform black color.

The Black Chromate A solution contains chromic acid, which is a corrosive acid. Wear gloves, goggles, apron and a respirator with acid/gas cartridges.



Mixing Black Chromate

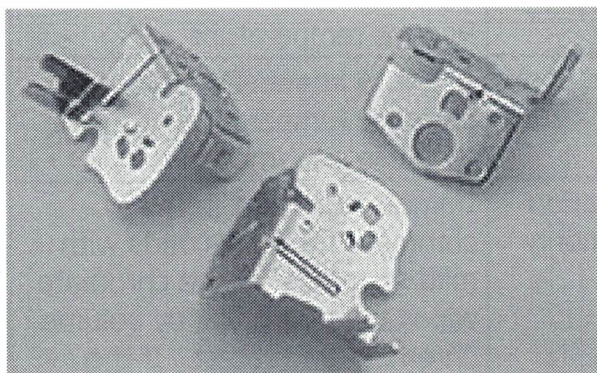
1. In a 2 Gal or larger plastic tank, add 7 pints (112 ozs) distilled water at room temperature
2. Add the contents of the bottle of Black Chromate A. Avoid Splashing
3. Add the contents of the bottle of Black Chromate B. Avoid Splashing

Using Black Chromate

Solution temperature should be 70-90 deg F for best results.

1. Rinse the part in distilled water after plating.
2. Hang the part from some copper wire and dip into the solution. Parts should be immersed for approx. 30-120 seconds. You may have to experiment with the time to get the right color.
3. Rinse the part in distilled water
4. Allow to air dry or dry with a hair dryer (air temp not to exceed 160 deg F)

Blue/Clear Chromate



Our Blue Chromate imparts a clear to blue/clear protective chromate finish over zinc or Copy Cad plated parts.

It's a single mix chemical, with excellent salt spray test results.

Mixing Blue Chromate

Blue Chromate contains chromic acid, which is a corrosive acid. Wear gloves, goggles, apron and a respirator with acid/gas cartridges.



1. In a plastic container, add 32 fl oz of Distilled Water
2. Add 8 fl oz Blue Chromate Concentrate. Avoid Splashing.

Using Blue Chromate

1. Hang the part from some copper wire and dip into the solution. Parts should be immersed for 15-40 seconds, depending on depth of color required.
2. Rinse the part well in distilled water
3. Allow to air dry, or dry with a hair dryer (do not exceed 150 deg F)