Advice & Counsel

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Legal Troubles

Dear Advice & Counsel,

My company is fighting a lawsuit with one of its customers. The customer sent us some small cylindrical-shaped steel parts. The parts were about 3/8 in. (9.5 mm) in diameter, 1 1/2 in. (38 mm) long, with a blind hole (hole does not go all the way through the cylinder) that was about 3/16 in. (4.8 mm) diameter and 1 in. (25.4 mm) deep. The packing slip indicated "zinc plate, clear chromate" and nothing else. We applied between 0.0001 in. (2.5 μm) and 0.0002 in. (5 μm) of zinc (measured after chromating), and a clear chromate. We know we did a good job for this customer, delivering the parts in a timely manner. To shorten the story, now we are being sued for damages, because the parts contain rust and debris on the inside walls of the blind hole (where apparently no plating occurred). Obviously, we feel that this was an unreasonable expectation on the part of the customer, who feels it was reasonable to expect the entire parts to be plated inside and out. Who is right? What guidelines are there in the industry about what is, or is not, a platable surface?

Signed, Della

Dear Della,

While I'm no Perry Mason, I will try to answer the question. The real key to avoiding your situation is to create a contract between your company and your customer that clearly establishes what your customer can and cannot expect you to deliver. Such guidelines are available from the metal finishing industry trade association, NAMF (National Association of Metal Finishers). The Chicago chapter (Chicago Metal Finishers Institute) has provided its members with suggested contractual language that could offer protection from a situation such as yours. When you provide a quote for the job, you need to provide "fine print" that absolves you from unreasonable expectations.

Who is right? You are. But that is irrelevant because you are in litigation—you lose if you win (legal expenses), or if you lose (legal expenses plus judgment). The best course is to always inform the customer in a clear manner what you will deliver, *before* you actually do the work.

As for guidelines, there are ASTM specifications for most commonly plated metals/substrates. These generally do not deal with your specific problem, however. Most platers put language in their contracts indicating that any surface that cannot be touched by a 1/4 in. (6.4 mm) solid sphere will not be subject to the specified requirements. You could increase or decrease this sphere to suit your needs/process. Obviously the inside diameter of your parts could not be touched by such a sphere, and would not be subject to your customer's requirements.

AESF published a booklet many years ago, titled "Design Precepts for Quality Plating." The author is unidentified (if you are out there, let me know who you are), but the source is Battelle Memorial Institute, a very prestigious organization. Here is some useful information from that booklet (some editing and rewriting done by this author):

"Good uniformity of electroplate thickness is obtained on gently curving, convex surfaces. Corners, edges, fins, ribs and other protuberances "steal" more than an equal share of the deposited metal. Grooves, serrations, holes, concavities and deep recesses are starved of their share. Thickness in deep narrow slots and blind holes sometimes is only 1/5 or 1/4 the thickness at adjacent, significant areas.

Plating solutions with the ability to improve thickness uniformity have only a minor effect on achieving good thickness uniformity on a complex shape. Complexity of shape is a dominant factor, especially for plating decorative and corrosion-protective

nickel and chromium.

The area that acquires the thinnest electroplate is commonly the area of first failure for any part subjected to abrasion, corrosion or wear. Plating specifications recognize this fact by requiring a minimum thickness on significant surfaces. Minimum thickness requirements have been increased, in parallel with the development of reliable data showing the dependency of durability on coating thickness.

The part manufacturer must pay particular attention to placements of welds, and specify that the weld metal match the basis metal in composition whenever possible. Welded areas should be pore-free and smooth. When the part is subjected to service, rough, porous welds will be the first evidencing corrosion.

Weld splatters must be completely removed from any areas that are to be plated if they are expected to provide the same level of service as areas that are weld splatter-free.

Indentations, cavities, grooves and narrow slots contribute to complexity and greatly prolong the time required to deposit a durable, minimum thickness. These areas corrode first when the electroplated product is exposed to a corrosive environment.

The inside angle, defined by two perpendicular planes, always prolongs the plating time for depositing a durable thickness at areas adjacent to it. Thickness in a sharp right angle is less than half the thickness 0.6 mm (0.25 in.) away and less than 1/3 of the thickness at points 25 mm (1 in.) from the angle.

Edges of parts should be beveled or rounded off to a radius of at least 1.64 in. (0.4 mm), but preferably 1/32 in. (0.8 mm). The plate on sharper edges will be beaded, which may destroy the design concept.

Convex surfaces should be adopted in preference to flat surfaces. Use a 0.015 in. (0.4 mm) per in. (25 mm) crown to improve metal distribution and hide substrate imperfections.

If fins or juts are required, their height should be reduced as much as possible. The angle at the base and the tips should be rounded off with a radius of at least 1/16 in. (1.6 mm). Broad, hollow ribs are better than narrow, slender ones. Multiple, parallel fins should be spread out to make distances between centers at least four times the width.

The inside and outside edges of flat-bottomed grooves should be rounded off, and their depth should be limited to 50 percent of their width. Better still, limit the depth to 30 percent of their width. Adopt U-bottom in place of V-bottom grooves.

Inside and outside edges should be chamfered or rounded. If chamfered, the minimum angle defined by the chamfer should be 110 degrees. If rounded, the minimum radius should be 0.4 mm (1/64 in.) for an indentation with a depth of 1.6 mm (1/16 in.), or as much as 9.5 mm (3/8 in.) for an indentation of 37 mm (1 1/2 in.).

Blind holes are vulnerable features for almost all finishing processes, including electroplating. Deep, small holes entrap air, which is an insulator that prevents electrodeposition. Cleaning solution drawn into a hole must be removed by rinsing before plating to avoid contamination of the plating bath. Complete removal requires special handling if no opening is provided for draining. The depth of blind holes should be limited to 50 percent of their width, if possible. Blind holes with a diameter less than 5 mm (7/32 in.) should be avoided. The deposition of a specified minimum thickness at the sides and bottom of small holes is not feasible, and they are always exempted from minimum thickness requirements."

I believe that last paragraph directly answers your second question.

Dear Advice & Counsel,

A while back, you wrote an article about the sources of mercury in metal finishing discharges. I thought you would be interested in the enclosed article. Any comments?

Signed, Merkur

Dear Merkur,

The article you sent (*Chicago Sun-Times*, Friday, July 18, 1997, page 12) describes a custom by a group of immigrants, of ingesting mercury capsules for "medicinal" purposes. Quote from this article: "The study found that people carry mercury in purses and amulets, mix it with bath water and scrub water, burn it in candles and put it in glasses of water under the bed. Users also swallow mercury in capsules and drinks.

The article continued: "Mercury is a silver-colored metal that is liquid at room temperature. When swallowed, it mostly passes through the body, but small amounts that are absorbed can be harmful."

One of 16 stores in Chicago selling mercury indicated that their customers believed the capsules relieve intestinal gas in *babies*.

There has been no indication of an increase in the mercury content of the Metropolitan Water Reclamation District of Greater Chicago sewage sludges, at this date, but they are informed and are on watch. **P&SF**