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THROUGH THICK AND THIN

By Bob Cusumano

Whenever there's a paint failure, what's the first thing that someone checks? Yes, you've got it; they measure the thickness of the paint that you applied. And if it's considered to be deficient, the odds are that it will be blamed as the cause of the problem. Now, I'm not minimizing the importance of proper paint thickness, but a number of times I 've seen it be the excuse for the failure, rather than the reason for it.

There are some issues you should know about paint thickness so that you can defend yourself if you feel you've been unfairly judged. Let's start with the project specifications. It is common for the architect or engineer to write a specification similar to this; "ferrous metals that are shop primed shall receive two coats of alkyd industrial enamel, applied at a dry film thickness of 2.0 mils per coat". Many inspecting authorities interpret this to be a minimum of 2 mils per coat for a total of at least 4 mils. But this is not the case.

It should be recognized that it is impossible to field apply a coating at a totally uniform thickness; there will be high spots, and there will be low spots as shown in photo #1. Paint measurement techniques recommended by the ASTM and the SSPC recognize this, even when the substrate is relatively flat and non-porous as in the case of steel or concrete. When the substrate is textured and porous, then the variation of coating thickness can be even greater. It is further recommended that "spot measurements" be made for every 100 square feet of surface area, which in many cases may be impractical due to the size of the structure or if the tests are destructive. For these reasons, it is recognized that any one spot measurement, that is the average of the readings taken of any one sample, should be at least 80% of the minimum thickness specification. The average of all of the spot measurements should equal the specified coating thickness.

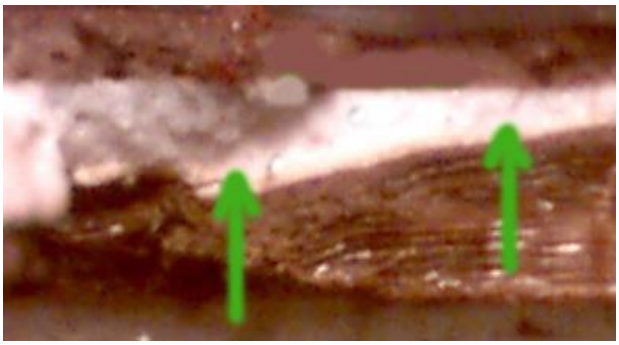

Photo 1

Photo 2

Let's say you've painted a steel beam with the specification indicated above and the beam has rusted (photo #2) and the cause is blamed on you not applying enough paint. Paint thickness measurements on the beam are as follows:

Location #	Reading #1	Reading #2	Reading #3	**Spot Measurement**
1	3.8	3.6	4.0	**3.8**
2	4.1	4.0	4.5	**4.2**
3	3.8	3.6	3.4	**3.6**
4	4.5	4.8	4.7	**4.7**
5	4.2	3.8	4.3	**4.1**
Average Spot Thickness				**4.1**

At first glance, you can see that six of the fifteen spot readings are below the specification of 4.0 mils, and might assume you are deficient, but let's look further. The three spot readings at each location are averaged to determine the spot measurement. That spot measurement should be at least 80% of the specification. Since the specified thickness is 4.0 mils, 80% is 3.2 mils. All five of the spot measurements meet this requirement.

Even though two of the five spot measurements are below the specified thickness, the average of the five spot measurements is 4.1 mils, which meets the overall specified thickness of 4.0 mils.

The location where paint thickness measurements are taken should be clearly noted. Then, if one or few beams, walls, or other structures are found to be deficient, but other components meet the specification, only deficient component will need to be re-coated.

Another issue to consider is the manufacturer's recommended film thickness. Most paint data sheets will provide coverage information such as "this product should be applied at a coverage rate of 400 square feet per gallon to provide a dry film thickness of 2.0 mils". Don't automatically accept these numbers look a little further. Each data sheet should list the per cent of solids in two ways, solids by weight and solids by volume. You want to make note of the solids by volume. This number can be used to calculate the dry film thickness achieved when the coating is applied at the manufacturer's recommended spreading rate. The formula for this calculation is as follows:

$$\frac{\text{\% Solids by Volume X 1604}}{\text{Spreading Rate}} = \text{Thickness (in mils)}$$

The 1604 is a physical constant. One gallon of any liquid, including paint, when spread at a thickness of one wet mil will cover 1604 square feet.

Let's assume that the industrial enamel we are applying to the steel beams has a solids by volume of 40%. Then, at the manufacturer's recommended spreading rate of 400 square feet per gallon, the resultant thickness per coat will be:

$$\frac{40\% \text{ X } 1604}{400} = 1.6 \text{ mils}$$

Therefore, if we applied two coats of the industrial enamel at the manufacturer's recommended spreading rate, we would achieve only 3.2 mils, not the 4.0 mils specified. If the architect or engineer specified this particular brand and product, then the specified thickness is wrong. It would be impossible to achieve the specified thickness in the number of coats specified.

While it's true that most failures are due to improper application, the allegation of not applying enough paint may make you the scapegoat, rather than the culprit. Understanding paint film thickness and how it is calculated is important for every painting contractor to understand and will help you defend yourself in these situations.