ZINC MATTERS

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BEWARE OF STEEL WITH HIGH PHOSPHOROUS CONTENT

It should be common knowledge that to achieve a good quality hot dip galvanized coating thickness, in terms of ISO 1461, of a mean of about 85 microns on structural steel, the silicon content of the steel should be limited to the ideal requirements of the well known Sandelin Curve *(see Figure 1)*.

The two chemical elements in steel that most affect coating thickness and aesthetic appearance are silicon and phosphorous. When the silicon falls out of the two desirable ranges on the Sandelin Curve, an extremely thick and easily damaged mottled grey to silver or dark grey coat of zinc is the result. However, when the phosphorous content falls into the out-of-specification range, it affects the successful metallurgical bonding of the coating (i.e. the galvanizing will delaminate in large localised areas).

Ideal steels require a silicon content to fall between 0.02 to 0.04% (the so-called 'aluminium killed steel') or 0.15 to 0.25% ('silicon killed steel').

The maximum phosphorous content should be less than 0.02%.

Steels that fall out of these ranges are called 'reactive' steels when it comes to galvanizing.

ISO 1461 includes an Annex A, which addresses the essential information to be provided by the purchaser to the hot dip galvanizer. Even though the Annex is situated at the back of the Standard, it does not reduce its importance when specifying hot dip galvanizing to ensure the quality product we have come to expect from reputable hot dip galvanizers. This includes information about the chemical composition of the steel.

Most general galvanizers will accept steel for hot dip galvanizing as long as the component has been designed and fabricated taking into account some simple design rules. However, they cannot be aware of the potential reactivity of the steel in its black form with respect to molten zinc, unless they have sight of accurate material certificates which spell out the chemical composition of the steel.

For heavy duty coatings on heavy steel sections, usually required for underground mining conditions, a bit of reactivity is a good thing so that a hot dip galvanized coating thickness in excess of 150 microns can be achieved.

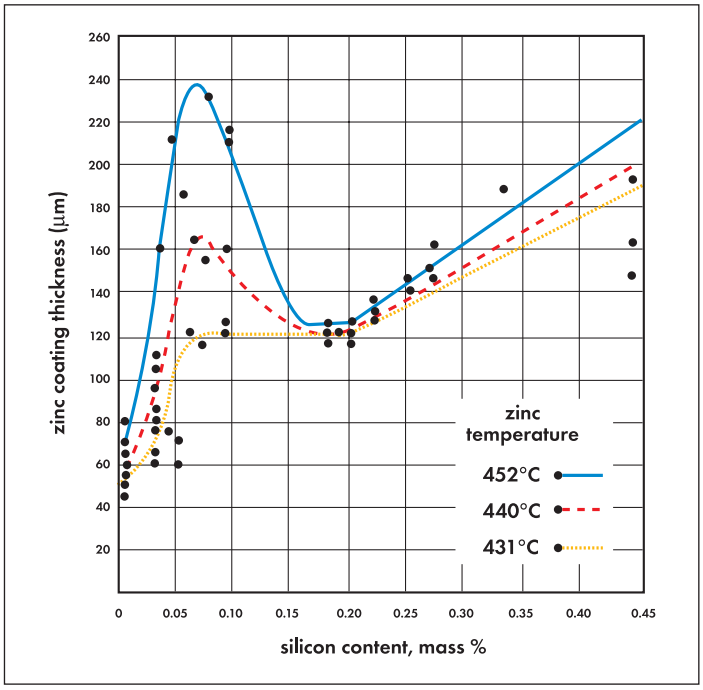

Figure 1: Bath temperature effect on the Traditional Sandelin Curve.

The galvanizer takes responsibility for hot dip galvanizing the steel but the choice of steel grade and chemical composition of the steel is the responsibility of the specifier, his fabricator and the steel supplier, particularly when the latter has been informed that the steel is to be hot dip galvanized!

As a general rule, the fabricator should take responsibility for checking the chemical composition of the steel and its suitability for hot dip galvanizing. When ordering steel from rolling mills or external suppliers the order must state that the steel is going to be hot dip galvanized.

However, when it comes to the so-called commercial quality steels, no chemical composition certificates are available and the purchaser or supplier should check the composition of the steel.

If the galvanizer is aware, that for a particular batch of steel, the chemical composition does fall into the 'problem steels' range he can then act accordingly. However, the methods he may use to limit coating build-up are generally insignificant in comparison to the coating buildup effect from extremely reactive steels. Should hot dip galvanizing of the steel be unsuccessful he may be able to offer a client a zinc thermal sprayed metal protective coating as an alternative.

International Zinc Association

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