# Cast iron

## Cast iron as a substrate for paint

## Introduction

Although coating of cast iron structures and components is similar to the coating of carbon steel there are, however, some differences that must be considered.

Cast iron is generally treated the same way as ordinary mild steel as regards surface preparation. However, certain limitations must be considered in terms of paint systems due to the nature of this substrate:

The content of (mostly flaky) graphite particles in ordinary "grey cast iron" is high and the graphite is noble compared to the iron matrix.

Under humid conditions some degree of (mainly superficial) so-called graphitization may occur rendering the surface porous.

Such surface porosity gives rise to poor wetting/adhesion of paint and tends to impair the formation of an even, non-porous film.

## Scope

This guideline is intended to supplement the general knowledge of the skilled professional as well as the relevant product data sheets & safety datasheets.

This Hempel Technical Guideline discusses surface preparation and the selection of primers including the use of the Scata comparator for visual inspection of steel casting surfaces.

## Selection of primers

If priming with zinc or aluminium pigmented products is required, the following must be observed, primarily for zinc-pigmented products:

- Do not specify a zinc silicate; actually, little or no film at all will be formed directly above the individual pore, i.e. "popping" must be expected.
- A "low zinc epoxy" may be considered, as the zinc particles are fewer and well insulated within the paint film. Excess epoxy binder is available for sealing the porosity.
- However, a straight epoxy primer is the best choice for cast iron.
- Certain highly pigmented primers may not be suitable as they do not contain enough binder to saturate the pores. If such products are specified a mist coat should be applied first.

For cast iron with no or a low amount of porosity, zinc rich primers are more suited, and zinc epoxy with e.g. 80% zinc dust in the dry film has been used successfully in many cases. In such situations it will also be possible to use zinc silicate.

Thermal spray (zinc) is also an option, that has been used e.g. in the wind turbine industry.

## Surface preparation

Remove any oil and grease by fresh water washing with a suitable detergent followed by fresh water rinsing to remove remaining salts and other contaminations. Blast clean to the cleaning grade according to ISO 8501-1: 2007 as specified in the specification or data sheet of the primer to be applied. Remove any remaining dust before applying the paint. Both metallic and not metallic abrasives can be used. Grit is recommended.

Prior to priming, residues of moulding sand should be removed - most efficiently by abrasive blast cleaning and de-dusting (vacuum cleaning).

For companies involved in regular painting of cast iron, it may be worthwhile to use the so-called Scrata comparator: It is a comparator for the definition of surface quality of castings.

## The Scrata comparator

When it comes to deciding the level of quality for a surface, it is very hard to define it by using numbers and words, therefore the Scrata Surface Comparators method is more suitable.

The plastic comparator plates are replicas of relevant characteristics of surface finish. Using the comparator is a way to reach agreement with casting suppliers on the required surface quality. They also provide a basis for acceptance.




Photo 1. The scrata comparator

The comparators form the basis of **ASTM A802/A802M – 95 (2010) Standard Practice for Steel Castings, Surface Acceptance Standards, Visual Examination.** This standard comprises 31 comparators that define features such as:

- Surface Roughness (A)
- Surface Inclusions (B)
- Gas Porosity (C)
- Laps and Cold Shuts (D)
- Scabs (E)
- Chaplets (F)
- Surface Finish - Thermal Dressing (G)
- Surface Finish - Mechanical Dressing (H)
- Welds (J)
- Hot Tears
- Mechanical Dressing - Chipping

| | Number of Comparators | Comparator Categories | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | Hot Tears | Chipping |
| ASTM A802 | 31 | 1-4 | 1,2,4,5 | 1-4 | 1,2,5 | 3,5 | 1,3 | 1,2,3,5 | 1,3,4,5 | 1,2,3,5 | - | - |

A larger, 48 comparators set applies to **ISO 11971:2008 Steel and Iron Castings – Visual examination of surface quality.**

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