WATER JETTING

Fitz's Atlas of coating defects

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SURFACE PREPARATION

The performance of protective coatings applied to steel is significantly affected by the state of the steel surface immediately prior to painting.The principal factors that are known to influence this performance are:

- **the presence of rust, millscale and previous coatings;**
- **the presence of surface contaminants, including salts, dust, oils acid greases;**
- **the surface profile.**

International Standards ISO 8501, ISO 8502 and ISO 8503 provide methods of assessing these factors, while ISO 4628-3 provides guidance on evaluating the degradation of paint coatings by degree of rusting and ISO 4627 covers the evaluation of the compatibility of a product with a surface to be painted. Other national standards and codes of practice contain recommendations for the various protective coating systems to be applied to the steel surface and these should be referred to for guidance on such items as:

- **suitability of the cleaning procedure and standard specified;**
- **suitability of the coating system for the environmental conditions to which the steel will be exposed;**
- **compatibility with any remaining paint coatings.**

The International Standards referred to above deal with the following aspects of preparation of steel substrates:

ISO 8501 - Visual assessment of surface cleanliness.
ISO 8502 - Tests for the assessment of surface cleanliness.
ISO 8503 - Surface roughness characteristics of blast-cleaned steel substrates.
ISO 4627 - Paints and varnishes - Evaluation of the compatibility of a product with a surface to be painted - Methods of test.
ISO 4628-3 - Evaluation of degradation of paint coatings.

In the following sections include guidelines on the preparation of steel substrates before the application of paints and related products and include reproductions of visual assessment guides of surface finish and cleanliness by high pressure water jetting.

WATER JETTING

These guidance notes are intended to be a tool for the visual assessment of preparation grades by means of high pressure water jetting (which may also include ultra high pressure jetting).They have been produced by the use of water only, with no abrasive material included.They have been endorsed by the paint manufacturers listed below for use with their various paint products. However, specific recommendations with regard to the suitability of this technique for use with any specific paint product and under any particular environmental conditions should always be sought from the paint manufacturer concerned.

Akzo Nobel (International Coatings Ltd)
Choguko BV
Hempel UK Ltd
Jotun-Henry dark Ltd
Sigma Coatings
W&J Leigh & Co. Ltd

As with dry blast cleaning,the roughness characteristics of the surface should also be considered by reference to ISO 8503, although it should be noted that preparation by high pressure water jetting does not create a profile nor significantly change an existing profile.

The definitive document on high pressure water jetting, ISO standard ISO 8501 - Part 4, is in the course of preparation.

Caution

When water jetting at lower pressures is used on old coatings which have not been completely removed, it is strongly recommended that checks on adhesion and chemical compatibility between old and new coatings are carried out, particularly for solvent softening and lifting of the old coating. Frequently different generic types of coating are used when overcoating.

TERMS AND DEFINITIONS

Water jetting - this method consists of directing a jet of pressurised water onto the surface to be cleaned. The water pressure depends upon the contaminants to be removed, such as water-soluble matter, rust and paint coatings.When detergents have been used in the cleaning operation.rinsing with clean fresh water is necessary.

A number of terms are used synonymously with “water jetting” including “hydrojetting”, “aquajetting”, “hydroblasting” and “aquablasting”.

Terms containing the words'blasting'can be confusing as they may be associated with the use of abrasives and hence” high pressure water jetting” (Wa) is the preferred description.

High pressure water jetting involves the use of water at pressures of greater than 70 MPa (700 bar).

Ultra high pressure water jetting involves the use of water at pressures greater than 140 MPa (1.400 bar) and may remove millscale from partially weathered steel, but does not impart a surface profile to the steel substrate.

INITIAL SURFACE CONDITIONS

The initial surface condition applies to steelwork that has previously been blast cleaned and painted with either shop primer alone or with a full coating system.

Three degrees of damaged paint coatings by rusting, blistering, flaking are specified/and two of damaged shop primer.

DC1 A surface where the paint coating system has degraded to a major extent. This degradation being similar to that illustrated in ISO 4628-3, Ri 5 or when completely degraded.as illustrated in ISO 8501-1, rust grades C and D.

DC2 A surface where the paint coating system has degraded to an extent similar to that illustrated in ISO 4628-3, Ri 4.

DC3 A surface where the paint coating system has degraded to an extent similar to that illustrated in ISO 4628-3, Ri 3.

DS1 An iron oxide epoxy prefabrication (shop) primer surface that has been damaged by rusting, welding, or burning.

DS2 A zinc silicate prefabrication (shop) primer surface that has been damage by rusting, welding, or burning.

PREPARATION GRADES

Three preparation grades/indicating the degree of cleaning/and three degrees of flash rusting are specified.The preparation grades are defined by written descriptions of the surface appearance after the cleaning operation with representative photographic examples.

The photographs are designated by the initial surface condition before cleaning followed by the designation of the preparation grade,e.g. DC3 Wa2.

Description of preparation grades

The letters Wa designate surface preparation by high pressure water jetting.

Wa 1 Light high pressure water jetting

When viewed without magnification.the surface shall be free from oil,grease, loose rust, and foreign matter.Any residual contamination shall be randomly dispersed and firmly adherent.

Wa 2 Thorough high pressure water jetting

When viewed without magnification, the surface shall be free from visible oil.grease and dirt and most of the rust, previous paint coatings and foreign matter.Any residual contamination shall be randomly dispersed and firmly adherent.

Wa 2 ½ Very thorough high pressure water jetting

When viewed without magnification the surface shall be free from all-visible rust, oil, grease, dirt, previous paint coatings,and foreign matter except slight traces. Some discoloration of the surface may be present adjacent to pitted areas but should show only as slight stains.

FLASH RUST GRADES

Three degrees of flash rust are specified. They are defined by written descriptions together with representative photographic examples.

FR1 Heavy flash rust

A surface when viewed without magnification exhibits a layer of yellow / blown rust that obscures the original steel surface and is loosely adherent. The rust layer may be evenly distributed or present in patches and it will readily mark a cloth that is lightly wiped over the surface.

FR2 Medium flash rust

A surface when viewed without magnification exhibits a layer of yellow / brown rust that obscures the original steel surface. The rust layer may be evenly distributed or in patches, but it will be reasonably well adherent and will lightly mark a cloth that is lightly wiped over the surface.

FR3 Light flash rust

A surface when viewed without magnification exhibits small quantities of a yellow-brown rust layer through which the steel substrate can be observed. The rust/discoloration may be evenly distributed or in patches, but will be tightly adherent and not easily removed by light wiping with a cloth.

PROCEDURE FOR THE VISUAL

ASSESSMENT OF STEEL SUBSTRATES

Either in good daylight or in artificial illumination (agreed between the parties) examine the steel surface and compare it with each of the photographs using normal vision. Place the appropriate photograph close to and in the plane of the steel surface to be assessed.

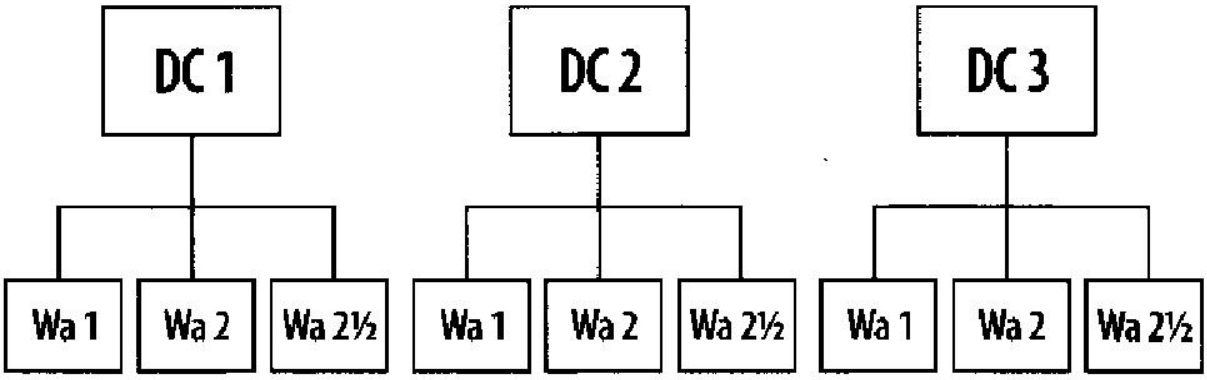
- **For the initial condition record the assessment as the worst degree that is evident.**
- **Assessment of the cleaning degree shall be made when the surface is dry and before flash rusting occurs.**
- **Assessment of the flash rust degree (if any) shall be made immediately prior to paint application.**

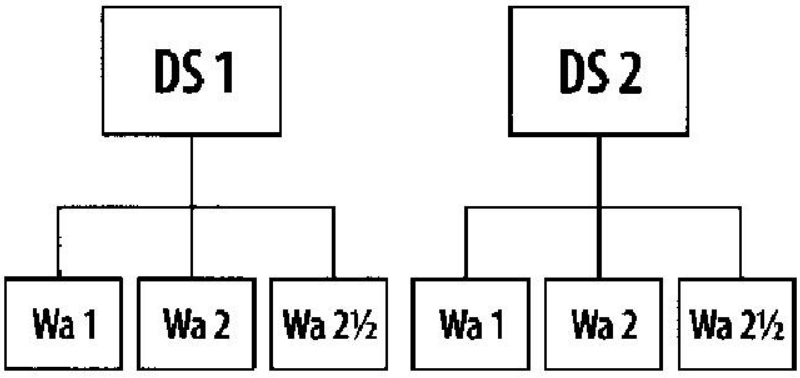
PHOTOGRAPHS

Five photographs show the condition of the damaged painted steel designated DC1, DC2, DC3, and DS1 & DS2.

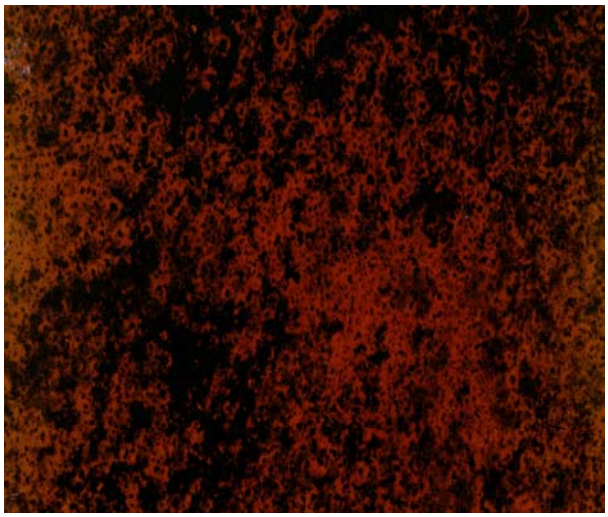
Fifteen photographs show the three degrees of preparation (Wa 1, Wa 2 and Wa 2 ½) for each of the original conditions.

Three photographs show the flash rusting degrees FR1, FR2 and FR3.

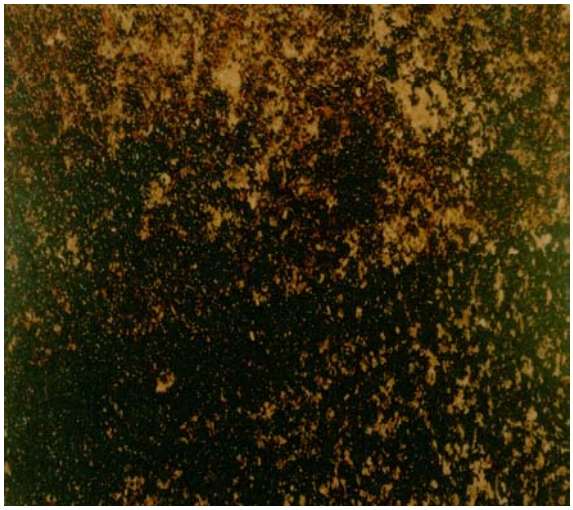




INITIAL SURFACE CONDITION
DC1



DC1 Wa1



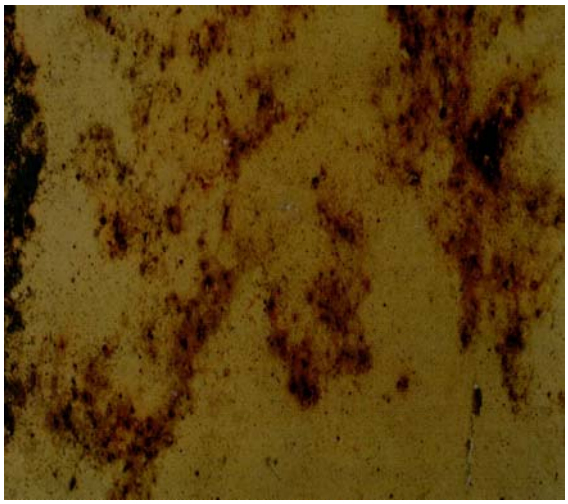
DC1 Wa 2



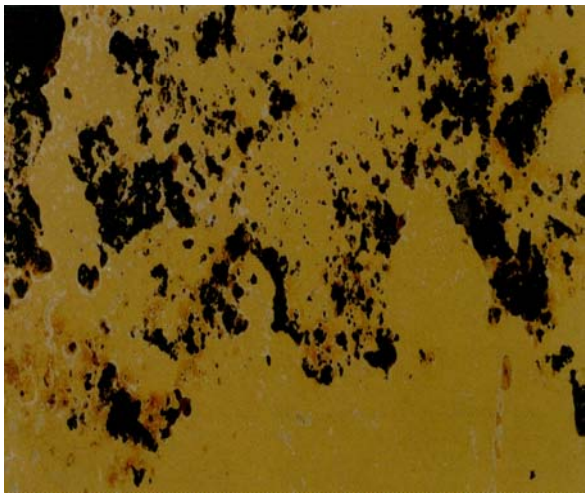
DC1 Wa 2 ½



INITIAL SURFACE CONDITION
DC2



DC2 Wa1



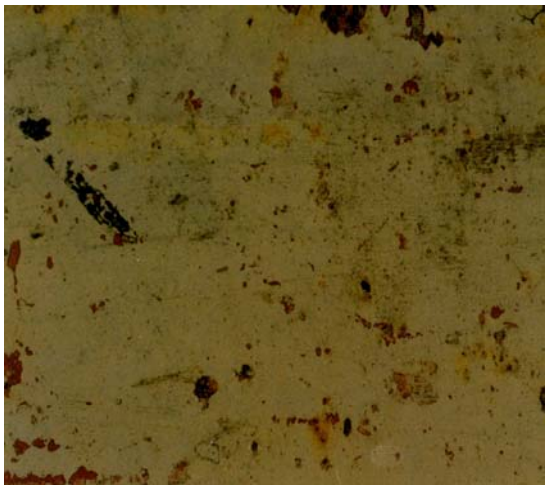
DC2 Wa 2



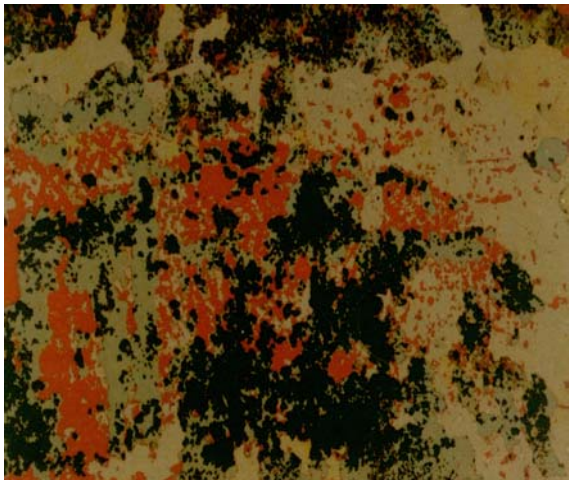
DC2 Wa 2 ½



INITIAL SURFACE CONDITION
DC3



DC3 Wa1



DC3 Wa 2



DC3 Wa 2 ½



INITIAL SURFACE CONDITION
DS1



DS1 Wa1



DS1 Wa 2



DS1 Wa 2 ½



INITIAL SURFACE CONDITION
DS 2



DS2 Wa1



DS2 Wa 2



DS2 Wa 2 ½



DEGREES OF FLASH RUST



FR1



FR2



FR3