ISO STANDARD 4628
Evaluation of degradation of coatings

1. Introduction
All coatings suffer degradation over time, regardless of the exposure to which they are subjected. The irregularities which arise can be very varied, for example, blistering, chalking, flaking or rusting of the painted steel.
The assessment of the type and size of these defects must be made in the most universal way possible, so that any body involved can communicate effectively with all other interested parties. ISO 4628 “Paints and varnishes. Evaluation of degradation of coatings. Designation of the quantity and size of the defects and intensity of uniform changes to appearance” was created for the purpose of enabling the assessment and quantification of the main defects that occur in coatings.
The use of this standard must be the basis for defining the guarantees and expectations of durability of paint systems, in conjunction with reference to other standards, such as ISO 12944.

2. Summary of the standard
ISO 4628 is divided into 9 parts, each referring to different defects which can occur in paint coatings:
- ISO 4628-1:2005 Part 1: General introduction and defect designation system
- ISO 4628-4:2005 Part 4: Assessment of degree of cracking
- ISO 4628-5:2005 Part 5: Assessment of degree of flaking
- ISO 4628-6:2007 Part 6: Assessment of degree of chalking by tape method
- ISO 4628-7:2005 Part 7: Assessment of degree of chalking by velvet method
- ISO 4628-8:2007 Part 8: Assessment of degree of delamination and corrosion around a scribe
- ISO 4628-10:2005 Part 10: Assessment of degree of filiform corrosion

All parts of the original standard have been transcribed for the Portuguese Standard, with the exception of part 6 which is included in ISO 4628-6:2007.

Part 1 of the standard establishes a general system for designating the quantity, intensity and size of the defects and alterations to the appearance of the coating, as well as summarising the principles to be applied in the interpretation of ISO 4628 in its entirety. The other parts of the standard show representative photographic examples or other systems for the assessment of specific types of defects.

As regards corrosion protection, the most significant defects are blistering and the degree of oxidation/rusting which can be assessed using parts 2 and 3 of the standard.

Below we give a summarised version of the three parts.
2.1 ISO 4628-1 General introduction and designation system

This part of the standard defines the criteria for assessing the intensity and quantity of the defects and the size of the defects associated with the paint coatings defined in the following parts. Uniform criteria were adopted to assess the intensity and size of the defects on a numerical scale of 0 to 5, where 0 signifies the absence of changes and 5 defects so severe that further discrimination is not reasonable. The intermediate values give optimum discrimination over the whole range of the scale. Where assessment of the size of the defects is required or is relevant, the values are the same, with 0 corresponding to invisible defects when magnified 10 times and 5 to sizes over 5mm. In this case the values are preceded by the letter "S".

As an example, where a surface shows slight blistering (few but significant defects) visible to the naked eye, it should be assessed as follows: Blistering grade 2 (S2).

2.2 ISO 4628-2 Assessment of blistering grade

The assessment of the blistering grade is made according to the density of the blisters and their size.

Blistering assessment:

<table>
<thead>
<tr>
<th>Density</th>
<th>ISO</th>
<th>ASTM</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>None</td>
<td>1 x10 magnification</td>
</tr>
<tr>
<td>1</td>
<td>Scarce</td>
<td>Few</td>
<td>visible</td>
</tr>
<tr>
<td>2</td>
<td>Medium</td>
<td>Medium-High</td>
<td>up to 0.5mm 0.5-5mm</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>&gt; 5 mm</td>
</tr>
</tbody>
</table>

Maintenance considerations:

- In practice the area to be repaired will be that actually affected multiplied by 10.
- If the blistering affects an area of less than 2.5%, a localised repair can be carried out. Above 2.5% the repair of the whole area is recommended (complete replacement of the paint system).
2.3 ISO 4628-3 Assessment of degree of rusting

This part presents a series of pictorial standards which must be compared with the painted surfaces in order to determine the degree of rusting/corrosion. There are also tables showing the percentage area of visible rusting of the surfaces. Corrosion grades are designated by “Ri”. In the table below the areas for each grade of corrosion are shown.

Assessment of degree of rusting

<table>
<thead>
<tr>
<th>ISO</th>
<th>European Scale</th>
<th>ASTM</th>
<th>% rusted area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ri0</td>
<td>Re0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Ri1</td>
<td>Re1</td>
<td>9</td>
<td>0.05</td>
</tr>
<tr>
<td>Ri2</td>
<td>Re2</td>
<td>7</td>
<td>0.5</td>
</tr>
<tr>
<td>Ri3</td>
<td>Re3</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Ri4</td>
<td>Re4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Ri5</td>
<td>Re6</td>
<td>1 a 2</td>
<td>40/50</td>
</tr>
</tbody>
</table>

ISO 12944-5 states that Grade Ri3 represents the end of the durability of the paint system, since the first maintenance painting must now be carried out.

In conjunction with the grade of rusting/corrosion, the size of the rusted patches can be assessed in accordance with part 1 of the standard.

As an example, in the case of a painted surface which shows rusting similar to the photographic example corresponding to Ri3 (corroded area of approx. 1%) and which has rust patches of a size clearly visible to the naked eye (up to 0.5mm), it will have to be classified as “Ri 3 (S3)”. 

This information is merely a summary of the standard. For detailed information you must obtain the standard in addition to the IQ document. The photographs of the rust and surface preparation grades cannot be used as representative photographic examples.
Figure 3: Photographic examples corresponding to ISO 4628-3, to assess the degree of rusting of a painted surface.

Maintenance considerations:

- The area to be repaired will be that actually affected by rusting multiplied by 10 if it was widespread and multiplied by 2 if it was localised.
- If the corrosion represents grade Ri4 or less a localised repair can be carried out. Above Ri4 repair of the whole area is recommended.

CIN Protective Coatings recommends careful, thorough reading of the standard.
To obtain copies of the standards, contact:

International Organization for Standardization
ISO Central Secretariat
1, ch. de la Voie-Creuse
CP 56
CH-1211 Geneva 20
Switzerland

This information is merely a summary of the standard. For detailed information you must obtain the standard in addition to the IPO document. The photographs of the rust and surface preparation grades cannot be used as representative photographic examples.