Maintenance of protective coating systems

Expected durability according to ISO 12944, Norsok M501 etc.

Introduction

The expected durability or life to first major maintenance (e.g. according to ISO 12944) of protective coating systems on steel is based on the assumption that the scheme correctly specified and applied. While wood protection has to be reapplied regularly this is not the case for corrosion protection coatings systems for steel. If the system is specified and applied correctly no general maintenance is necessary for many years on areas with intact coating. Should the coating however become damaged (e.g. due to impact, exposure to chemicals, heat – e.g. from welding, deformation of steel, film imperfections etc.) it may be relevant to perform local repair to minimise spreading of the damage.

The durability ranges referred to in this document are taken from ISO 12944-1:2017, which states: “Durability is a technical consideration that can help the owner set up a maintenance program.” (For further information regarding durability ranges see reference 2.)

Some breakdown may occur within the durability range period and will typically be located on edges or other potential weak spots. As long as this does not result in significant loss of steel it is often not critical. The rational point to do maintenance according to ISO 12944-1:2017 is when break down reached Ri3 on 10% of an area. This is to prevent significant loss of steel and damage to the structure. Earlier maintenance than this point is likely to increase maintenance cost without providing real extension of durability. However some maintenance may be considered earlier to prevent spread of local break down and postpone the point where general maintenance becomes necessary.

Scope

This guideline is relevant to most of Hempel’s protective coating systems for corrosion protection of steel in both visible and hidden areas. These are typically barrier coating systems based on epoxy coatings. The system may include zinc-rich primers (epoxy or silicate) as primer as well as UV resistant topcoat.

Coatings systems serving other purposed (aesthetic, antifouling etc) are not in scope.

Initial Condition

Prior to handover an inspection is recommended to ensure:

- The application work has been carried out in accordance with the coating specification, product data sheets, and Hempel’s additional other instructions as may be relevant for the project.
- Any remedial work to repair coating damage has been carried out in accordance with point above.
- The condition of the applied coatings is satisfactory.
- Overall it is crucial to have strict inspection and quality control by qualified inspectors of the complete process from cleaning of the steel, over surface preparation and application to curing. No simple post application test can verify the whole process or the performance of the applied system. See also Hempel Technical Guidelines for “Quality Control & Inspection” available here : https://www.hempel.com/knowledge-center/technical-guidelines

Cleaning, Inspection and Maintenance Regime:

Cleaning
Prior to inspection the coated surface may need to be cleaned. The method by which this is carried out will depend on a number of factors many of which relate to practical issues at the specific location. Hempel can provide advice on specific projects when details of the environment and practical constraints are known. A typical cleaning method would be to pressure wash the structure using clean water but this may not be suitable in all instances.

Inspection Plans
The optimum inspection and maintenance regime will depend upon numerous factors beyond Hempel's control:

- How critical the area is for the safe operation of the structure
- The intended durability range.
- The environment, including possible change of environmental conditions and whether a microclimate exists which could result in a higher corrosivity category than the general environment.
- The likelihood of damage occurring as a result of external influences, e.g. mechanical damage, sand erosion, exposure to chemicals, heat, bird droppings. UV degradation, etc.
- The importance placed on the visual appearance of the structure.

In the end it is up to the owner/operator of a structure to balance the above for any given structure and define what inspection and maintenance regime to implement.

Standard areas - structural steel etc.
It is recommended that an inspection is performed after 6 - 12 months service to capture any defects missed at the handover. The table below gives a suggestion for later routine inspection of building steel.

Table 1: *Suggested time to first inspection and subsequent inspection intervals. In general Hempel recommends to avoid the specification marked in red*

	Durability Range			
Corrosivity Category	Low Up to 7 years	Medium 7 - 15 years	High: 15-25 years	Very High > 25 years
C1 - C2 low	2/2	5/3	10/3	15/3
C3 medium	2/2	4/2	10/3	15/3
C4 high	2/1	4/2	8/3	12/3
C5 very high	1/1	3/1	5/3	10/3

Towards the end of the durability range or if signs of degradation is observed it may be advisable to increase the inspection frequency

Critical areas
The above suggestion may not be frequent enough on critical areas. This includes e.g.

- Areas where aggressive exposure may reduce durability
- Areas with critical performance where failure may result in personal injury etc.

References

1. The environmental classifications are defined in ISO 12944-2:2017 Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 2: Classification of environments.
2. The durability ranges referred to are set out in ISO 12944-1:2017 Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 1: General introduction.
3. Suitable coating systems for the environment and durability are defined in ISO 12944-5:2018 with optional test requirements in part 6.
4. Corrosion levels are defined in BS EN ISO 4628-3: Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 3: Assessment of degree of rusting.

This document is intended for professional use and provides generic advice in respect of the subject matter only. It is not intended to be used as a comprehensive guide. The buyer/applicator should always read the relevant Product Data Sheet ("**PDS**") and Safety Data Sheet ("**SDS**") relating to the Products ordered which are available for download on www.hempel.com. If in doubt, please contact your local Hempel representative for further advice. To the extent relevant, the disclaimer set out in the relevant PDS(s) applies to this document.