Public License Document

Network access allowed
Einstellen in Netzwerke erlaubt

Copying and distribution allowed
Kopie und Weitergabe erlaubt

All other rights reserved.
Alle weiteren Rechte vorbehalten.
VGB/BAW Standard
Corrosion Protection for Offshore Wind Structures
Part 3: Application of Coating Systems
(3rd edition, 2018)
VGB-S-021-03-2018-04-EN

Publisher:
VGB PowerTech e.V.

Publishing house:
VGB PowerTech Service GmbH
Verlag technisch-wissenschaftlicher Schriften
Deilbachtal 173, 45257 Essen, Germany

Phone: +49 201 8128-200
Fax: +49 201 8128-302
E-mail: mark@vgb.org
ISBN 978-3-96284-057-0 (eBook)

All rights reserved, VGB PowerTech.
www.vgb.org
Preface

The growing number of wind turbines in Europe and the world raise new challenges to operators. To reduce the cost of installation and operation and to increase operating reliability, a coordinated and joint analysis of operating experience is an absolute necessity. Apart from exchanging information and experience, the participating companies mainly strive to promote standardisation (best practice). To this end, VGB PowerTech e.V. and Bundesanstalt für Wasserbau (BAW – Federal Waterways Engineering and Research Institute) have decided jointly to draw up a VGB/BAW Standard on corrosion protection for offshore structures (e.g. offshore stations).

The aim of this standard is to ensure that the considerable investments in offshore structures are safeguarded by appropriate corrosion protection systems. In this context, coating systems, for instance, are to protect the steel structures of offshore units from corrosion damage, during their entire service life – which is normally at least 25 years – and without requiring any expensive repair work. Robust systems are therefore required which, while involving calculable manufacturing costs (CAPEX), can keep the operating costs (OPEX) at a predictable and low level in the long term. Repair work at sea is to be avoided, as the cost of such offshore repair work can exceed the cost of onshore repairs by a factor of as much as 100.

VGB/BAW Standard VGB-S-021-03-2017-06-EN, published in June 2017, is replaced by the VGB/BAW Standard published in April 2018:


Like the previous standard, this modified Part 3 “Application of Coating Systems” defines the application of coating systems.

Part 1 explains various corrosion protection options, provides information about planning, the design of steel surfaces, as well as about the stress zones within the scope covered by the standard. Part 2 describes the requirements made of corrosion protection systems, and Part 4 the design, operation and monitoring of galvanic and impressed-current protection systems. Parts 5 and 6 are currently in preparation and will be concerned with the topics of coating system repair and in-service inspection and monitoring.

This VGB/BAW Standard is made available for use free of charge. It has been written to the best of our knowledge, but cannot fully reflect the state of the art for every conceivable case. Any liability, also for the factual presentation of the contents, is excluded. Also, the users themselves are responsible for clarifying the situation regarding patents and other property rights. The VGB/BAW Standard is not in itself binding. Its application must be explicitly agreed between the contracting parties.

Proposed changes can be sent to the email addresses vgb.standard@vgb.org and info@baw.de. To enable unambiguous allocation of the contents, the subject line should contain a brief designation of the document concerned.
The following institutions and associations submitted comments on topics addressed by this standard, which were adopted in the process of editing this standard:

- Bundesamt für Seeschifffahrt und Hydrographie (BSH – German Maritime and Hydrographic Agency), authority responsible for approving offshore structures in Germany within the exclusive economic zone
- Bundesverband Korrosionsschutz (BVK – Federal Association for Corrosion Protection)
- Verband der deutschen Lack- und Druckfarbenindustrie (VDL – German Paint and Printing Ink Association)
- Arbeitsgemeinschaft Offshore-Windenergie (AGOW – Offshore Wind Power Consortium)
- Fachausschuss für Korrosionsfragen (Committee for Corrosion Issues) of Hafentechnische Gesellschaft (HTG-FAKOR)
- DNV GL
- WAB Windenergieagentur (WAB)

and other interested parties.

In cases of doubt, the current German version shall apply.

Essen, April 2018 Karlsruhe, April 2018

VGB PowerTech e.V. Bundesanstalt für Wasserbau (BAW)
Deilbachtal 173 Kussmaulstraße 17
45257 Essen, Germany 76187 Karlsruhe, Germany

A grey bar at the side indicates changes compared to the 2nd edition 2017.
Revised pages in this document: 7, 8
Part 3 – Application of Coating Systems

Contents

1  General ..................................................................................................................5
2  Scope ..................................................................................................................7
3  Surface preparation .............................................................................................8
4  Inspection of prepared surface ............................................................................10
   4.1  Visual check for surface cleanliness ..............................................................10
   4.2  Inspection of design .....................................................................................10
   4.3  Inspection of preparation grade ....................................................................10
   4.4  Roughness inspection ...................................................................................10
   4.5  Surface cleanliness inspection .....................................................................10
   4.6  Examination for presence of water-soluble contaminants ...........................10
   4.7  Examination for presence of oils, greases and waxes .................................11
5  Application of coating .........................................................................................12
6  Testing of applied coating ....................................................................................14
   6.1  Visual inspection of surface quality ...............................................................14
   6.2  Measuring of film thickness .........................................................................14
   6.3  Testing for pores and cracks using high voltage (density test) .......................14
   6.4  Testing of adhesive strength (test panels for use during construction) .........15
7  Tested coating systems .........................................................................................16
8  Control surfaces ...................................................................................................16
9  Factory repairs .....................................................................................................17
10 Transport and erection of coated components .....................................................17
11 Repair of transport and erection damage before shipping ....................................17
12 Fasteners .............................................................................................................17
13 Self-monitoring by the contractor .....................................................................17
14 Standards and codes of practice ........................................................................21
15 Literature .............................................................................................................24
16 Annexes ..............................................................................................................25
1 General

The following must be coordinated during the contract award phase between the principal/owner (AG), the contractor (AN) and, where necessary, the coating system manufacturer:

- the coating system to be used (product and manufacturer)
- deviations from the specified film thickness
- the colours that will be used
- number, size and positions (location) of control surfaces
- production of test panels for use during construction
- type and scope of support/advice on coating work to be provided by an application engineer/supervisor of the coating system manufacturer

The scope of testing agreed between principal/owner and contractor must be laid down in a test and examination sequence plan (TESP).

During processing of coating systems, the technical data sheets, processing instructions and safety data sheets of the coating system manufacturers must be observed.

When carrying out corrosion protection work, the contractor may use only supervisory personnel (site supervisors, work crew foremen) who are in possession of a valid certificate (KOR-Schein) complying with ZTV-ING. If production takes place outside Germany, proof of comparable qualifications shall be provided. The site supervisor or foreman must constantly be present at the work site during performance of the work. In addition, for coating work only personnel having suitable qualifications or long years of experience in corrosion protection may be used (proof as per DIN EN ISO 12944-7).

Unprotected steel corrodes in the atmosphere, in water and in soil, possibly giving rise to damage. To avoid such corrosion damage, steel structures are protected so that they can withstand corrosion stresses during the required service life, usually at least 25 years.

The offshore structures are exposed to strong corrosive influences over a long period, while the conditions for maintenance and repair are poor. Along with corrosion protection systems that must meet the highest demands, the idea of a corrosion protection strategy must be taken into consideration. This means, among other things, that the specific stresses in the various areas of offshore structures, but also the cooperation of several methods of protection, e.g. coatings, duplex systems (passive corrosion protection), cathodic protection (active corrosion protection) and corrosion allowance (see DIN 50929-3 Supplement 1) in submerged areas, must also be taken into consideration.
This standard is concerned with offshore structures made of steel. In its various parts it takes into account all essential factors having significance for appropriate corrosion protection.

Project owners, ordering parties/principals, planners, advisors, firms carrying out corrosion protection measures, supervisory personnel for corrosion protection work and manufacturers of coating systems require state-of-the-art information on corrosion protection through corrosion protection systems, in condensed form, to protect steel structures effectively against corrosion. Such information must be as complete as possible and unambiguous and easy to understand as well so that complications and misunderstandings are avoided between the parties involved in carrying out the protective measures.

In regard to the minimum requirements for corrosion protection concepts, reference is made to the BSH Standard “Mindestanforderungen an die konstruktive Ausführung von Offshore-Bauwerken in der ausschließlichen Wirtschaftszone (AWZ)” (Minimum requirements for the design of offshore structures within the exclusive economic zone) as amended from time to time.

This standard defines additional requirements supplementing the standards and codes of practice cited in Chapter 14 hereinbelow.

In addition to this standard, the minimum requirements, rules and regulations applicable on the federal state level to the locations of wind turbines, wind farm components and other offshore wind structures must also be considered for the design of the corrosion protection. For the area of the German exclusive economic zone, the minimum requirements and regulations stipulated by the Bundesamt für Seeschifffahrt und Hydrographie (BSH) are applicable.
2 Scope

This standard “Corrosion Protection for Offshore Wind Structures – Part 3: Application of Coating Systems”, specifies requirements for the initial coatings of offshore structures exposed to stress by water and atmosphere as defined in Part 1 “General”, Chapter 2 Scope.
3 Surface preparation

The surfaces of components are prepared by means of blast cleaning as per DIN EN ISO 12944-4.

Prior to blast cleaning, all weld residues such as spatters and slags and foreign contaminants such as greases, oils and salts (e.g. chlorides) must be removed from the surfaces by suitable methods; where appropriate, a salt contamination test is to be performed prior to blast cleaning. The surfaces must be dry. In addition, the blasting abrasive must be dry and free of foreign contaminants.

Temporary coatings must be fully removed by blast cleaning before the coating system is applied.

All steel parts including the weld seams are prepared by blast cleaning at least with the preparation grade B Sa 2½ as per DIN EN ISO 12944-4 immediately before applying the first coating.

Blasting work shall be executed in closed, air-conditioned rooms. The climatic conditions must be continuously maintained from the start of blasting work until the start of the application of the first coating film. If necessary, a suitable housing is to be erected, among others to prevent pollution of the surroundings. This also must be taken into account for any transport actions.

During blast cleaning work the following climatic conditions shall be observed:

Permanent factory hall and temporary housing/hall:

- Relative humidity \( \leq 65\% \) *
- Dewpoint distance \( \geq 5\,\text{K} \) (Verification by continuous measurement of ambient temperature and humidity, and object temperature must be checked by individual measurements, at least every 3 hours)

* A relative humidity of \( \leq 40\% \) shall be observed if the surface will not be coated within 12 hours from blast cleaning.

If the ambient and object temperatures are higher (> 30 °C), the further course of action must be agreed with the coating system manufacturer. Care must be taken to route the conditioned air stream so that the entire working area meets the aforesaid requirements.

The air used for blasting must be dry and free of oil.

The roughness of the prepared, blast-cleaned surface influences the adhesive strength of the coating systems. Therefore, for blast cleaned surfaces a medium roughness grade “medium G” as per DIN EN ISO 8503-1 is required. For this purpose only angular abrasive (grit) is to be used. Should higher requirements be made.
of the roughness grade in the technical data sheet of the coating system being used, they must be taken into account.

After blasting the surface must be cleaned and protected from further contamination until the coating is applied. If the required roughness is not attained, a further blast cleaning operation is to be carried out; use of a disposable blasting abrasive is recommended for this purpose.

During blasting work, no deformation of or damage to the workpiece may occur. Sealing surfaces and functional surfaces which will not be coated are to be cleaned and masked or covered prior to blasting.

Where it is not possible to avoid transporting a blast-cleaned component after blast cleaning to the place where the coating work will be carried out, the following conditions must be observed:

- no precipitation,
- humidity < 80 %,
- the duration of stay of the component outside of the housing is to be minimized,
- transports are to be documented (ambient conditions and course of transport).
4 Inspection of prepared surface

As part of its internal controls, the corrosion protection company performing the work shall make the following inspections (4.1 to 4.7).

4.1 Visual check for surface cleanliness
No contamination may be in evidence on the prepared surface.

4.2 Inspection of design
The coating-compatible design of the surface is to be examined in accordance with DIN EN ISO 8501-3 – Preparation grade P3 (see 1.4) and DIN EN ISO 12944-3. For edges, as alternative to DIN EN ISO 8501-3 triple chamfering is permissible; also refer to DIN EN 1090-2.

4.3 Inspection of preparation grade
The preparation grade is determined according to DIN EN ISO 12944-4; the inspection of the preparation grade is to be carried out at the place where the coating work is carried out. The requirement is at least B Sa 2½.

4.4 Roughness inspection
The roughness inspection is carried out by means of surface profile comparators in accordance with DIN EN ISO 8503-1 (grit). The inspection is performed as per DIN EN ISO 8503-2.

4.5 Surface cleanliness inspection
The surface cleanliness is to be checked by tape test according to DIN Fachbericht 28. The dust quantity 2 and the particle size class 3 as per DIN EN ISO 8502-3 must not be exceeded. If the required degree of cleanliness is not attained, a further cleaning operation must be carried out.

4.6 Examination for presence of water-soluble contaminants
The blast cleaned surface must be free of water-soluble contaminants.
To provide proof of this, immediately before coating a
– wipe test as per DIN Fachbericht 28 or a
– Bresle test as per DIN EN ISO 8502 Part 6 and Part 9 (requires principal's consent)
is to be carried out. A surface concentration limit of 50 mg/m² anions (equal to 5 µg/cm²) or 80 mg/m² salt (equal to 8 µg/cm²) must not be exceeded. If the coating
system manufacturer demands lesser surface concentrations, they shall be observed. The test area must be re-blasted subsequently. If the specified limits are exceeded, the contaminants must be removed by suitable methods.

4.7 Examination for presence of oils, greases and waxes

The blast cleaned surface must be free of oils, greases and waxes. If the presence of such contamination is suspected or the possibility of such contamination exists, a detection method pursuant to DIN Fachbericht 28 is to be employed. If the specified limits are exceeded, the contaminants must be removed by suitable methods.
5 Application of coating

During application of coatings the following climatic conditions shall be observed:

Permanent factory hall and temporary housing/hall:

- Ambient temperature ≥ +10 °C and ≤ +30 °C
- Object temperature ≥ +10 °C and ≤ +30 °C
- Relative humidity ≤ 65 %* up to the completion of application of the first coating film; thereafter ≤ 80 % *
- Dew point distance ≥ 5 K

* Deviations for 1K-PUR are to be agreed with the principal/owner.

Application of the first coating film takes place immediately after abrasive blasting and the cleaning of the blasted surface of the component. The complete coating system is to be applied without intermediate weathering. If the ambient and object temperatures are higher (> 30 °C), the further course of action must be agreed with the coating system manufacturer.

Coating work shall take place in closed, clean, air-conditioned rooms. If necessary, a suitable housing is to be erected, among other things to prevent polluting the surrounding area.

In the case of two-component coating systems, the complete original containers (mixture ratio base component : hardener component) always are to be mixed. For smaller surfaces small containers are to be used. Weighing out smaller quantities from original containers is not permissible.

As a rule, application to large, smooth surfaces should be by airless spraying. All corners, edges, interstices, screw holes, uneven weld seams, rivets and hard-to-access areas are to be pre-painted (brush).

During application of intermediate and top coats, the re-coating intervals specified by the manufacturer are to be observed.

The specified climate conditions are to be complied with up to the completion and curing of the last coating and until drying stage 6 as per DIN EN ISO 9117-5 has been reached, including possible touch-ups, before the component is removed from the permanent factory hall or temporary housing/hall. Intermediate weathering of the components being coated is not permissible. In consultation with the coating system manufacturer, higher ambient temperatures may be permissible during curing.

During curing, the coating is to be protected from external influences. In addition, the information of the coating system manufacturer about drying times is to be observed with an eye to mechanical and chemical stresses.
For transport, storage and application of coating systems, the instructions of the coating system manufacturer additionally are to be taken into account.

When applying multi-layer coating systems the individual coats must be applied in alternating colours.

The provisions in chapter 6.2 are applicable to the measurement of the film thickness of the individual coat and of the overall coating system.

The coating materials for coating systems are to be procured in accordance with their approval from the same manufacturer.

In addition, the contractor shall produce test panels for use during construction. For the individual zones for each test area. The material of these test panels must correspond to the material to be coated.

For zones 1, 2 and 3, for each test area the following test panels shall be manufactured as specified in Tables 1 and 2.

### Table 1  Test panels for zones 1 and 2

<table>
<thead>
<tr>
<th>Panel (mm)</th>
<th>Zone</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 x 300 x 10</td>
<td>1 and 2</td>
<td>Testing of adhesive strength</td>
</tr>
<tr>
<td>300 x 300 x 10</td>
<td>1 and 2</td>
<td>Retained sample for principal/owner</td>
</tr>
<tr>
<td>300 x 200 x 4</td>
<td>1 and 2</td>
<td>Retained sample for principal/owner (possibly abrasion resistance)</td>
</tr>
</tbody>
</table>

### Table 2  Test panels for zone 3

<table>
<thead>
<tr>
<th>Panel (mm)</th>
<th>Zone</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 x 200 x 4</td>
<td>3</td>
<td>Retained sample for principal/owner</td>
</tr>
</tbody>
</table>
6  Testing of applied coating

As part of its internal controls, the corrosion protection company performing the work shall make the inspections and tests outlined in sections 6.1 to 6.4.

The individual inspections and tests shall be carried out in each case after the manufacturer-specified necessary curing time, and not before.

6.1  Visual inspection of surface quality

The visual check of the surface finish is performed on the entire coated surface. Every applied coating layer is checked. Faults such as runs, overspray, dirt entrapment, non-continuous films or insufficient covering layers are not permissible and must be properly eliminated or repaired.

In addition, the surface of the coating must be of uniform colour and gloss and must not exhibit inclusions, wrinkles or runs.

6.2  Measuring of film thickness

The measuring of individual and total film thicknesses is performed based on ISO 19840.

If measured electronically, calibration takes place exclusively on a smooth surface.

The film thickness is measured evenly on the entire coated surface. The minimum is:

- 4 measuring points/m²,
- on small surfaces (≤ 6 m²) at least 25 measuring points.

The indicated film thicknesses are defined as nominal dry film thickness. Three times the nominal dry film thickness is permissible as maximum film thickness. In divergence from this stipulation, double the nominal dry film thickness is the permissible maximum for zinc dust primer films. If a smaller maximum film thickness is required by the coating system manufacturer, the maximum film thickness specified by the coating system manufacturer shall be observed.

Areas with insufficient film thicknesses are not permissible and must be properly reworked.

Unless stipulated otherwise, the specifications of the coating system manufacturer govern the maximum individual coating thickness that may be applied.

6.3  Testing for pores and cracks using high voltage (density test)

Testing of the density of the applied coating must be performed in stress zones 1 and 2. The coating must be completely (100 %) dense. Pores are not permissible.
Density testing for zone 1 may be dispensed with in consultation with the owner/principal if a cathodic protection (CP) system is provided.

Wherever possible, density testing for zone 2 should be performed prior to application of the colouring top coat.

Density testing is carried out on all coating systems which are suited for such testing.

Testing of the density of the coating is carried out in accordance with DIN 55670 on the entire coated surface applying high voltage after the required curing time. The test voltage is selected based on the specifications of the coating system manufacturer. If nothing is specified by the coating system manufacturer, the following test voltage is used:

- 0.5 kV/100 µm film thickness

relative to the mean value of the measured film thicknesses of a test area.

6.4 Testing of adhesive strength (test panels for use during construction)

Testing of adhesive strength in stress zones 1 and 2 is performed according to DIN EN ISO 4624 and DIN EN ISO 16276 Part 1 (Pull-off test) and Part 2 (X-cut) for each test area on a test panel for use during construction; see chapter 5.

Pull-off test requirements

- Number of indenters per test panel: 5

Minimum requirement:

- \( \geq 8 \) MPa (N/mm\(^2\)) in zone 1
- \( \geq 5 \) MPa (N/mm\(^2\)) in zone 2

Failure patterns showing fractures between coating and steel (A/B fractures) are not permissible. For mixed fractures a maximum 10 % A/B fraction is permissible.

X-cut requirements

Minimum requirement:

- \( \leq Kt \ 2 \).
7 Tested coating systems

Only coating systems tested successfully in accordance with Part 2 of VGB/BAW Standard VGB-S-021-02-2018-04-EN may be used.

Original containers exclusively shall be used.

Required container markings:
- coating system manufacturer
- coating material
- colour
- batch number
- mixture ratio for multi-component material
- filling weight (net)
- date of manufacture and/or filling
- storage life

8 Control surfaces

As a matter of principle, control surfaces are to be created by the contractor (cost-neutral) based on the specifications of and in agreement with the principal/owner as per DIN EN ISO 12944-7 (possibly in divergent number and size) and documented by control surface reports and markings in the drawings. A control surface always corresponds at least to a representative component from a coating system area. This is valid for all application sites of the main suppliers and their subsuppliers.

The location of control surfaces is to be selected so that they are accessible in all operating conditions. The principal/owner shall be notified in writing of the creation (realisation) of control surfaces.

The participation of the following parties in the creation (realisation) of control surfaces for purposes of this standard is mandatory:
- the contractor;
- the applicator;
- coating system manufacturer:

The participation of the principal/owner is optional.
9 Factory repairs

Necessary repairs at the factory shall be made so that a specification-compliant coating as per this VGB/BAW Standard is ensured and a uniform colour impression is produced. Details are to be agreed with all parties involved.

10 Transport and erection of coated components

Storage, transport and erection of coated steel components shall take place in such a way that damage is avoided. This includes in particular the use of textile belts, wooden chocks with PE foil, and the avoidance of abrasive stresses and mechanical impacts.

11 Repair of transport and erection damage before shipping

Transport and erection damage before shipping are to be repaired in accordance with the stipulations in chapter 9. In this context, it is recommended that corrosion protection be checked prior to shipping.

Note:
Repair of transport and erection damage after shipping (offshore) is to be performed as per VGB/BAW Standard VGB-S-21 Part 5, “Repair of Coating Systems” (in preparation).

12 Fasteners

The corrosion protection concept for all fasteners exposed to wind and weather, e.g. modelled after the repair concept, is to be described and explained separately.

13 Self-monitoring by the contractor

Before beginning corrosion protection work, the contractor must put together a work folder containing at least the following:

- organisation chart
- implementation concept
- implementation site
- implementation period
- possibly contracted vicarious agents (subcontractors)
- coating materials and coating systems finding use, including manufacturer, if not stipulated
test certificates and approvals  
technical data sheets  
processing instructions  
safety data sheets  
test and examination sequence plan (see Annex 1 and 2: sample reports)

Unless stipulated otherwise, the work folder shall be presented to the principal/owner for approval no later than 4 weeks before the beginning of work.

The execution of coating work may begin only after the principal/owner has approved the work folder.

The approved work folder must be available at the implementation site (workshop, site office) for inspection at any time.

The principal/owner, its authorised inspectors and the coating system manufacturers shall be enabled to conduct checks of the corrosion protection work in the relevant fabrication sites after announcing this intention to the contractor.

As part of its internal controls, for on-site execution of the corrosion protection work the contractor shall employ a certified coating inspector of level C as per DIN CERTCO or comparable (e.g. FROSIO Level III, NACE Level 3, etc.).

The coating inspector employed by the contractor is obligated to monitor and document the proper and professional performance of the corrosion protection work on a continuous basis.

This includes in particular the following steps:
  
  - surface preparation (derusting, cleaning),
  
  - measuring of climate data,
  
  - measuring of coating thicknesses (wet and dry film thicknesses) and
  
  - testing for pores and cracks using high voltage (density test).

It is recommended that the contractor ensures that a representative retention sample (wet sample, including coating material batch number) is taken by the applicator and retained for the entire shelf life period of the material, storing it in compliance with the manufacturer's instructions.

The documentation is to be drawn up by the contractor parallel to fabrication and presented during inspections to the principal/owner or the principal's authorised inspectors.

After completion of the work, the contractor shall compile all collected data in a copyable documentation and hand it over to the principal/owner both in paper form and on a data medium.
This documentation must contain at least the following:

- object/component
- applicator (company/employee)
- daily progress of work
- description of the equipment used
- blasting medium (product, grain size, etc.)
- surface preparation (design of surface, preparation grade, roughness and cleanliness)
- coating system manufacturer
- coating material
- batch no. (for two-component coating systems: base and hardener components)
- storage life (shelf life period)
- factory production control for coating system/wet sample:
  - acceptance test certificate 3.1 as per DIN EN 10204 with the following details
    - viscosity of the individual components (e.g. acc. to Brookfield)
    - density
    - pigment and filler content
    - binder content
    - solvent content
    - pot life
- individual components
- coating system
- application technique
- application data of the individual coating layers (incl. re-coating intervals)
- wet and dry film thicknesses of the individual coats and the entire coating system
- climate data (continuous and discontinuous recording)
- visual inspection and density check
- adhesion strength (on test panel for use during construction)
In addition, by agreement with the principal/owner the certificate may contain the following:

- identity check of coating system on a wet sample and/or on cured samples (FTIR, TG, HS-GC)
- determination of abrasion resistance (on test panels for use during construction)

If single steps of the operations are subcontracted, they are to be documented accordingly.

Unless stipulated otherwise, the contractor shall hand over the documentation and technical records within 14 days of completion of the coating work.

The principal/owner reserves the right to review the documentation.
14 Standards and codes of practice

This standard defines additional requirements supplementing the following series of technical rules, some of which are cited in this standard:

**Standards:**

**DIN 16945** Testing of resins, hardeners and accelerators, and catalyzed resins

**DIN 55670** Paints and varnishes – Method for testing paint coatings for pores and cracks using high-voltage

**DIN EN 10204** Metallic products – Types of inspection documents

**DIN EN 14879-1** Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media – Part 1: Terminology, design and preparation of substrate

**DIN EN ISO 1461** Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods

**DIN EN ISO 2808** Paints and varnishes – Determination of film thickness

**DIN EN ISO 2811-1** Paints and varnishes – Determination of density – Part 1: Pycnometer method

**DIN EN ISO 4624** Paints and varnishes – Pull-off test for adhesion

**DIN EN ISO 8501-3** Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 3: Preparation grades of welds, edges and other areas with surface imperfections

**DIN EN ISO 8502-3** Preparation of steel substrates before application of paint and related products; tests for the assessment of surface cleanliness; part 3: assessment of dust on steel surfaces prepared for painting (pressure-sensitive tape method)


**DIN EN ISO 8503-1** Preparation of steel substrates before application of paints and related products – Surface roughness characteristics of blast-cleaned steel substrates – Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces
DIN EN ISO 9117-5 Paints and varnishes – Drying tests – Part 5: Modified Bandow-Wolff test

DIN EN ISO 11909 Binders for paints and varnishes – Polyisocyanate resins – General methods of test

DIN EN ISO 12944-3 Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 3: Design considerations

DIN EN ISO 12944-4 Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 4: Types of surface and surface preparation

DIN EN ISO 12944-7 Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Part 7: Execution and supervision of paint work

DIN EN ISO 14713-1 Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 1: General principles of design and corrosion resistance

DIN EN ISO 14713-2 Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures – Part 2: Hot dip galvanizing

DIN EN ISO 16276 Corrosion protection of steel structures by protective paint systems – Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating

ISO 19840 Paints and varnishes – Corrosion protection of steel structures by protective paint systems – Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces
Codes of practice (in the current version):

BSH Standard Mindestanforderungen an die konstruktive Ausführung von Offshore-Bauwerken in der ausschließlichen Wirtschaftszone (AWZ)

DIN Fachbericht 28 Korrosionsschutz von Stahlbauten durch Beschichtungen Prüfung von Oberflächen auf visuell feststellbare Verunreinigungen vor dem Beschichten

DASt-Richtlinie 022 Feuerverzinken von tragenden Stahlbauteilen


15 Literature

RWE-Spezifikation – Korrosionsschutz Stahlwasserbau, Ausgabe Februar 2013 – V2 (on request).

RWE-Spezifikation – Korrosionsschutz für fossil gefeuerte Kraftwerke, Atmosphärischer Korrosionsschutz, Ausgabe September 2014 – V0 (on request).
### Annexes

#### Annex 1: Specification – Corrosion protection for hydraulic steelwork – Sample TESP, page 1 of 3

This test and examination sequence plan (TESP) is an example showing the minimum requirements. For each measure, the contractor/coater must prepare a project-related test and examination sequence plan. The contents and the test steps must be defined and coordinated with the principal/owner in relation to the project.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ZTV-ING – Part 4 - Section 3 DIN EN ISO 12944-7</td>
<td>Proof of qualification of supervisory personnel and personnel</td>
<td>Z</td>
<td>ABC</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Test certificates coating systems incl. technical data sheets, processing instructions and safety data sheets</td>
<td></td>
<td>PZ</td>
<td>XYZ</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Climate data measurement during blast cleaning and coating work</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Ambient temperature (°C) (only coating works)</td>
<td></td>
<td>Pr. 1</td>
<td>X</td>
<td>≥ 10 °C ≤ 30 °C</td>
</tr>
<tr>
<td>3.2</td>
<td>Object temperature (°C) (only coating works)</td>
<td></td>
<td>Pr. 1</td>
<td>X</td>
<td>≥ 10 °C ≤ 30 °C</td>
</tr>
<tr>
<td>3.3</td>
<td>Relative humidity (%)</td>
<td></td>
<td>Pr. 1</td>
<td>X</td>
<td>≤ 65 % if coating work is not carried out within 12 hours from blast cleaning then ≤ 40%</td>
</tr>
<tr>
<td>3.4</td>
<td>Dewpoint distance (K)</td>
<td></td>
<td>Pr. 1</td>
<td>X</td>
<td>≥ 5 K</td>
</tr>
<tr>
<td>4</td>
<td>Pre-blasting inspection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>DIN EN ISO 8501-3 DIN EN ISO 12944-3</td>
<td>Check for coating-compliant design of steel surface</td>
<td>Pr. 2</td>
<td>X</td>
<td>DIN EN ISO 8501-3: preparation grade P3</td>
</tr>
<tr>
<td>4.2</td>
<td>DIN Fachbericht 28 DIN EN ISO 8502-6</td>
<td>Visual inspection of steel surface for contaminants Where appropriate, detection of water-soluble contaminants and/or detection of oils, greases and waxes</td>
<td>Pr. 2</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Post-blasting inspection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Visual check for surface cleanliness</td>
<td></td>
<td>Pr. 3</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>DIN EN ISO 8501-3 DIN EN ISO 12944-3</td>
<td>Check for coating-compliant design of steel surface</td>
<td>Pr. 3</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

#### TESP approval

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
</tbody>
</table>
# Test and examination sequence plan (TESP)

## Test No. | Basis of test/standard | Description/test step | Report | Testing by | Remark/Requirement
---|---|---|---|---|---
5.3 | DIN EN ISO 12944-4 | Preparation grade check | Pr. 3 X X H | B Sa 2½/B Sa 3 |
5.4 | DIN EN ISO 8503-1 | Roughness check | Pr. 3 X X H | “medium (G)” grit |
5.5 | DIN Fachbericht 28 DIN EN ISO 8502-3 | Check of surface cleanliness Pressure-sensitive tape test – dust quantity | Pr. 3 X X H | DIN EN ISO 8502-3: max. dust quantity 2 and particle size class 2 |
5.6 | DIN Fachbericht 28 DIN EN ISO 8502-6 | Water-soluble contaminant check Bresle test or wipe test | Pr. 3 X X H | max. surface concentration: 50 mg/m² anions (or 5 µg/cm²) |
5.7 | DIN Fachbericht 28 | Where appropriate oil, grease and wax check | Pr. 3 X X H | |
6 | | Testing during coating | | |
6.1 | | Documentation of processing: coating systems incl. batch number, number of coating layers and recoating intervals etc. | Pr. 4 X S S | |
7 | | Testing after coating | | |
7.1 | | Visual inspection | Pr. 5 X X H | |
7.2 | ISO 19840 | Coating thickness measurement Minimum: 4 measuring points/m² For small surfaces at least 25 measuring points | Pr. 5 X X H | |
7.3 | DIN 55670 | Testing for pores and cracks using high voltage (density test) Test voltage specified by coating system manufacturer \(\Rightarrow\) no specification: 0.5 kV/100 µm film thickness | Pr. 5 X X H | |

## TESP approval

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>Principal</td>
<td>Mr./Ms. Unknown</td>
<td>UUU</td>
</tr>
</tbody>
</table>
Co.: ABC Corrosion Protect

Test and examination sequence plan (TESP)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>---</td>
<td>Testing of test panels for use during construction 2/test area (1x test panel – 1x retained sample for principal)</td>
<td>Pr. 6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8.1</td>
<td>---</td>
<td>Visual inspection</td>
<td>Pr. 6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8.2</td>
<td>ISO 19840</td>
<td>Coating thickness measurement – 25 measuring points</td>
<td>Pr. 6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8.3</td>
<td>DIN 55670</td>
<td>Testing for pores and cracks using high voltage (density test) Test voltage specified by coating system manufacturer  no specification: 0.5 kV/100 µm film thickness</td>
<td>Pr. 6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>8.4</td>
<td>DIN EN ISO 4624</td>
<td>Testing for adhesive strength (5 indenters/test panel) incl. failure pattern</td>
<td>Pr. 6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>---</td>
<td>Review and approval of documentation</td>
<td>Pr. 7</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Z = certificate  X = test  PZ = test certificate  S = random check (report to principal)  Pr. 1 – Pr. 7 = reports  H = hold point (report to principal – further steps possible only after approval)

TESP approval

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>Principal</td>
<td>Mr./Ms. Unknown</td>
<td>UUU</td>
</tr>
</tbody>
</table>
Annex 2: Sample reports

These sample reports show the minimum requirements. For each measure, the contractor/coater must draw up project-related reports. The contents and structure must be defined and coordinated with the principal in relation to the project.

<table>
<thead>
<tr>
<th>Company: ABC Corrosion Protect</th>
<th>Climate data measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal: XYZ Mechanical Engineers</td>
<td>Report Pr. 1</td>
</tr>
<tr>
<td>End customer: principal</td>
<td></td>
</tr>
<tr>
<td>Wind farm/site: sea</td>
<td></td>
</tr>
<tr>
<td>Component/structure: foundation XY</td>
<td>Page 1 of 1</td>
</tr>
</tbody>
</table>

Test area: component 123

<table>
<thead>
<tr>
<th>Date/time/tester</th>
<th>Ambient temp. (UT) – [°C] (only coating works)</th>
<th>Object temperature (OT) – [°C] (only coating works)</th>
<th>Rel. humidity (LF) – [%]</th>
<th>Dew point distance (ΔT) – [K]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remark: where necessary, additional annex XX → continuous recording

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>Principal</td>
<td>Mr./Ms. Unknown</td>
<td>UUU</td>
</tr>
</tbody>
</table>

28
<table>
<thead>
<tr>
<th>Company: ABC Corrosion Protect</th>
<th>Pre-blasting inspection – Steel acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal: XYZ Mechanical Engineers</td>
<td>Report Pr. 2</td>
</tr>
<tr>
<td>End customer: principal</td>
<td></td>
</tr>
<tr>
<td>Wind farm/site: sea</td>
<td></td>
</tr>
<tr>
<td>Component/structure: foundation XY</td>
<td>Page 1 of 1</td>
</tr>
</tbody>
</table>

Test area: component 123

1 – Visual inspection of steel surface for contaminants

Result:

*Example:* Surface heavily fouled with old coating

2 – Check for coating-compliant design of steel surface (DIN EN ISO 8501-3, DIN EN ISO 12944-3)

| Requirement DIN EN ISO 8501-3: | Satisfied: YES / NO |
| Requirement DIN EN ISO 12944-3: | Satisfied: YES / NO |

Deficiencies (where appropriate, photo documentation):

*Example:* Edges are sharp, weld spatter

3 – Detection of water-soluble contaminants where appropriate (DIN Fachbericht 28, DIN EN ISO 8502-6)

Carried out: YES / NO

Result:

4 – Detection of oil, grease and wax where appropriate (DIN Fachbericht 28)

Carried out: YES / NO

Result:

Remark:

**Approval for blast cleaning:** YES / NO

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>Principal</td>
<td>Mr./Ms. Unknown</td>
<td>UUU</td>
</tr>
<tr>
<td>Company:</td>
<td>ABC Corrosion Protect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principal:</td>
<td>XYZ Mechanical Engineers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>End customer:</td>
<td>principal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind farm/site:</td>
<td>sea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Component/structure:</td>
<td>foundation XY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test area: component 123

1 – Visual inspection of steel surface for contaminants
Result:

2 – Check for coating-compliant design of steel surface (DIN EN ISO 8501-3, DIN EN ISO 12944-3)
Requirement DIN EN ISO 8501-3: Satisfied: YES / NO
Requirement DIN EN ISO 12944-3: Satisfied: YES / NO
Deficiencies (where necessary, photo documentation):

3 – Preparation grade check (DIN EN ISO 12944-4)
Requirement: B Sa 2½/B Sa 3 Result:

4 – Roughness check (DIN EN ISO 8503-1)
Measuring instrument used: Surface profile comparator 123, Measurement Co. – Serial No. 456
Requirement: “medium (G)” (grit) Result:

5 – Check of surface cleanliness – Pressure-sensitive tape test – dust quantity (DIN Fachbericht 28, DIN EN ISO 8502-3)
Requirement (DIN EN ISO 8502-3): max. dust quantity 2 and particle size class 2
Result: where necessary, attachment XX

6 – Check for water-soluble contaminants where appropriate (DIN Fachbericht 28, DIN EN ISO 8502-6)
Wipe test (DIN Fachbericht 28) YES / NO
Bresle test (DIN EN ISO 8502-6) YES / NO
Requirement: surface concentration ≤ 50 mg/m² anions (equivalent to 5 µg/cm²)
Result: where necessary, attachment XX

7 – Check for oil, grease and wax where necessary (DIN Fachbericht 28)
Carried out: YES / NO
Result: where necessary, attachment XX

Remark:

Approval for coating: YES / NO

<table>
<thead>
<tr>
<th>Date/time</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY/ hh:mm</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY/ hh:mm</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
<tr>
<td>DD.MM.YYYY/ hh:mm</td>
<td>Principal</td>
<td>Mr./Ms. Unknown</td>
<td>UUU</td>
</tr>
</tbody>
</table>
Test area: component 123

1. Coating layer (possibly primer coat)
   - Coating system:
   - Container size – base component (A)/hardener component (B):
   - Colour:
   - Batch number base component (A):
   - Batch number hardener component (B):
   - Temperature (°C) base component (A):
   - Temperature (°C) hardener component (B):
   - Date/time (start):
   - Date/time (finish):
   - Wet film thickness (µm):
   - Where applicable, dry film thickness (µm):

2. Coating layer
   - Coating system:
   - Container size – base component (A)/hardener component (B):
   - Colour:
   - Batch number base component (A):
   - Batch number hardener component (B):
   - Temperature (°C) base component (A):
   - Temperature (°C) hardener component (B):
   - Date/time (start):
   - Date/time (finish):
   - Wet film thickness (µm):
   - Where applicable, dry film thickness (µm):

3. Coating layer
   - Coating system:
   - Container size – base component (A)/hardener component (B):
   - Colour:
   - Batch number base component (A):
   - Batch number hardener component (B):
   - Temperature (°C) base component (A):
   - Temperature (°C) hardener component (B):
   - Date/time (start):
   - Date/time (finish):
   - Wet film thickness (µm):
   - Dry film thickness (µm):

Remark: For larger components requiring several batches of coating system → mixing report

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>Principal</td>
<td>Mr./Ms. Unknown</td>
<td>UUU</td>
</tr>
</tbody>
</table>
Company: ABC Corrosion Protect

Testing of applied coating

Principal: XYZ Mechanical Engineers
End customer: principal
Wind farm/site: sea
Component/structure: foundation XY

Test area: component 123

Coating:

1 – Visual inspection
Result:

Examples: Runs, orange peel, faults, inclusions

2 – Coating thickness measurement [µm] (ISO 19840) – Nominal value: XX µm
Measuring instrument used: Coating thickness 123, Measurement Co. – Serial No. 456
Number of measurements:
Minimum value:
Maximum value:
Mean value:
Where necessary, attachment XX

3 – Testing for pores and cracks using high voltage (DIN 55670) – Test voltage: XX kV
Measuring instrument used: Pores 123, Measurement Co. – Serial No. 456
Result:

Remark: Where necessary, photo documentation and drawings incl. surface area data

Date Company Name Signature
DD.MM.YYYY ABC Corrosion Protect Mr./Ms. Sample MMM
DD.MM.YYYY XYZ Mechanical Engineers Mr./Ms. Example BBB
DD.MM.YYYY Principal Mr./Ms. Unknown UUU
### Company: ABC Corrosion Protect

<table>
<thead>
<tr>
<th>Coating</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Test panel – Test area: component 123</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Coating</th>
</tr>
</thead>
</table>

| 1 – Visual inspection |  
Result: |  

| 2 – Coating thickness measurement [µm] (ISO 19840) – 25 measuring points – Nominal value: XX µm |  
Measuring instrument used: Coating thickness 123, Measurement Co. – Serial No. 456 |  
Minimum measurement: |  
Maximum measurement: |  
Mean value: |  

| 3 – Testing for pores and cracks using high voltage (DIN 55670) – Test voltage: XX kV |  
Measuring instrument used: Pores 123, Measurement Co. – Serial No. 456 |  
Result: |  

| 4 – Adhesive strength test (DIN EN ISO 4624) – Nominal value: XX N/mm² |  
Measuring instrument used: Force 123, Measurement Co. – Serial No. 456 |  
Indenter | Adhesive strength [N/mm²] | Failure pattern |  
--- | --- | --- |  
1 |  |  
2 |  |  
3 |  |  
4 |  |  
5 |  |  
Mean value for adhesive strength [N/mm²]: |  

| 5 – Hardness test – Where appropriate, Shore D/Barcol (X measuring points) – Nominal value: XX |  
Measuring instrument used: Hardness 123, Measurement Co. – Serial No. 456 |  
Minimum measurement: |  
Maximum measurement: |  
Mean value: |  
Remark: Where necessary, photo documentation of failure patterns |  

| Date | Company | Name | Signature |  
--- | --- | --- | --- |  
DD.MM.YYYY | ABC Corrosion Protect | Mr./Ms. Sample | MMM |  
DD.MM.YYYY | XYZ Mechanical Engineers | Mr./Ms. Example | BBB |  
DD.MM.YYYY | Principal | Mr./Ms. Unknown | UUU |
Company: ABC Corrosion Protect

Review and approval of documentation

| Principal: XYZ Mechanical Engineers | Report Pr. 7 |
| End customer: principal | |
| Wind farm/site: sea | |
| Component/structure: foundation XY | Page 1 of 1 |

Coating:

Contents of documentation

- Test reports Pr. 1 to Pr. 6
Satisfies the requirements stated in
- Contract
- Specifications
- Test and examination sequence plan

Remark:

<table>
<thead>
<tr>
<th>Date</th>
<th>Company</th>
<th>Name</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD.MM.YYYY</td>
<td>ABC Corrosion Protect</td>
<td>Mr./Ms. Sample</td>
<td>MMM</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>XYZ Mechanical Engineers</td>
<td>Mr./Ms. Example</td>
<td>BBB</td>
</tr>
<tr>
<td>DD.MM.YYYY</td>
<td>Principal</td>
<td>Mr./Ms. Unknown</td>
<td>UUU</td>
</tr>
</tbody>
</table>