Technical Specifications

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1 General Information

1.1 Scope

QUALISTEELCOAT is an international quality label for the coating of steel with organic coatings.

Being the most frequently used construction material in the architectural and industrial field, steel must be protected against corrosion. If corrosion protection is achieved by organic coatings, then this falls in the field of application of QUALISTEELCOAT.

The requirements of QUALISTEELCOAT go beyond corrosion protection and include requirements for mechanical characteristics, weathering resistance and decorative appearance.

In this specification QUALISTEELCOAT defines the quality level and the requirements a coating company must achieve internally to be able to offer their products on the market as a company licensed by QUALISTEELCOAT.

It includes the definition of quality requirements on coating companies, coating systems and the approval of coating material, as well as the regular external quality control of coating companies holding a QUALISTEELCOAT quality label.

Only coating systems which are in line with this specification shall be used. The coating company shall only use coating material for which the material's supplier has acquired an approval by QUALISTEELCOAT.

The corresponding license document indicates for which coating systems and corrosivity categories a coating company holding a QUALISTEELCOAT license is qualified.

1.2 QUALISTEELCOAT corrosivity class

The ISO Standard 12944 family - Paints and varnishes - Corrosion protection of steel structures by protective paint systems - is international acknowledged as technical standard for the protection of steel with liquid coatings. Therefore, QUALISTEELCOAT is using the atmospheric corrosivity classes C1 to C5 as described in ISO 9223.

The ISO 12944 standard however, is limited to coating substances which dry or harden under ambient conditions – thus liquid coating without forced drying. ISO 12944 explicitly excludes powder coatings, stoving enamels, thermosetting coating material as well as other coating systems from the scope of application. But as the corrosivity categories of ISO 12944 part 2 are widely recognized and referred to in many other specifications, QUALISTEELCOAT uses them as basis for all types of organic coating systems.

ISO 12944-2 defines 5 general atmospheric corrosivity categories ranging from C1 to C5. These categories combined with the expected lifetime High (H) are the basis for the classification of the QUALISTEELCOAT coating system and the licences for QUALISTEELCOAT coaters. The following table shows the corrosivity categories per ISO 12944-2 (2018)

Corrosivity category	Examples for typical ambient conditions in a moderate climate	
	exterior	**Interior**
C1 **very low**		heated buildings with clean atmospheres, e.g. offices, shops, schools, hotels.
C2 **low**	atmosphere with low level of pollution; mostly rural areas	unheated buildings where condensation may occur, e.g. depots, sports halls.
C3 **medium**	urban and industrial atmospheres, moderate sulphur dioxide pollution; coastal areas with low salinity	production rooms with high humidity and some air pollution, e.g. food processing plants, laundries, breweries, dairies
C4 **high**	industrial areas and coastal areas with moderate salinity	chemical plants, swimming pools, coastal ship- and boatyards
C5 **very high**	industrial areas with high humidity and aggressive atmosphere and coastal areas with high salinity	buildings and areas with almost permanent condensation and with high pollution

Beside the atmospheric corrosivity category ISO 12944 part 1 defines a lifetime that fixes the time until the steel parts must undergo a first major maintenance painting. This standard durability is expressed in 4 ranges:

low (L)	2 to 7 years
medium (M)	7 to 15 years
high (H)	15 to 25 years
very high (VH)	more than 25 years

The technical requirements on corrosivity categories of QUALISTEELCOAT in this specification always refer to the expected lifetime “high” (15-25 years).

Only the requirements of this category in the corrosivity categories C1 - C5 are taken as a basis for the approval of the coating material and the awarding of licenses to coating companies.

The QUALISTEELCOAT corrosivity class is defined by the corrosivity Category in combination with the expected lifetime high (H).

However, this term of protection is no warranty period. The warranty period is fixed per statutory provisions as well as agreements between the parties.

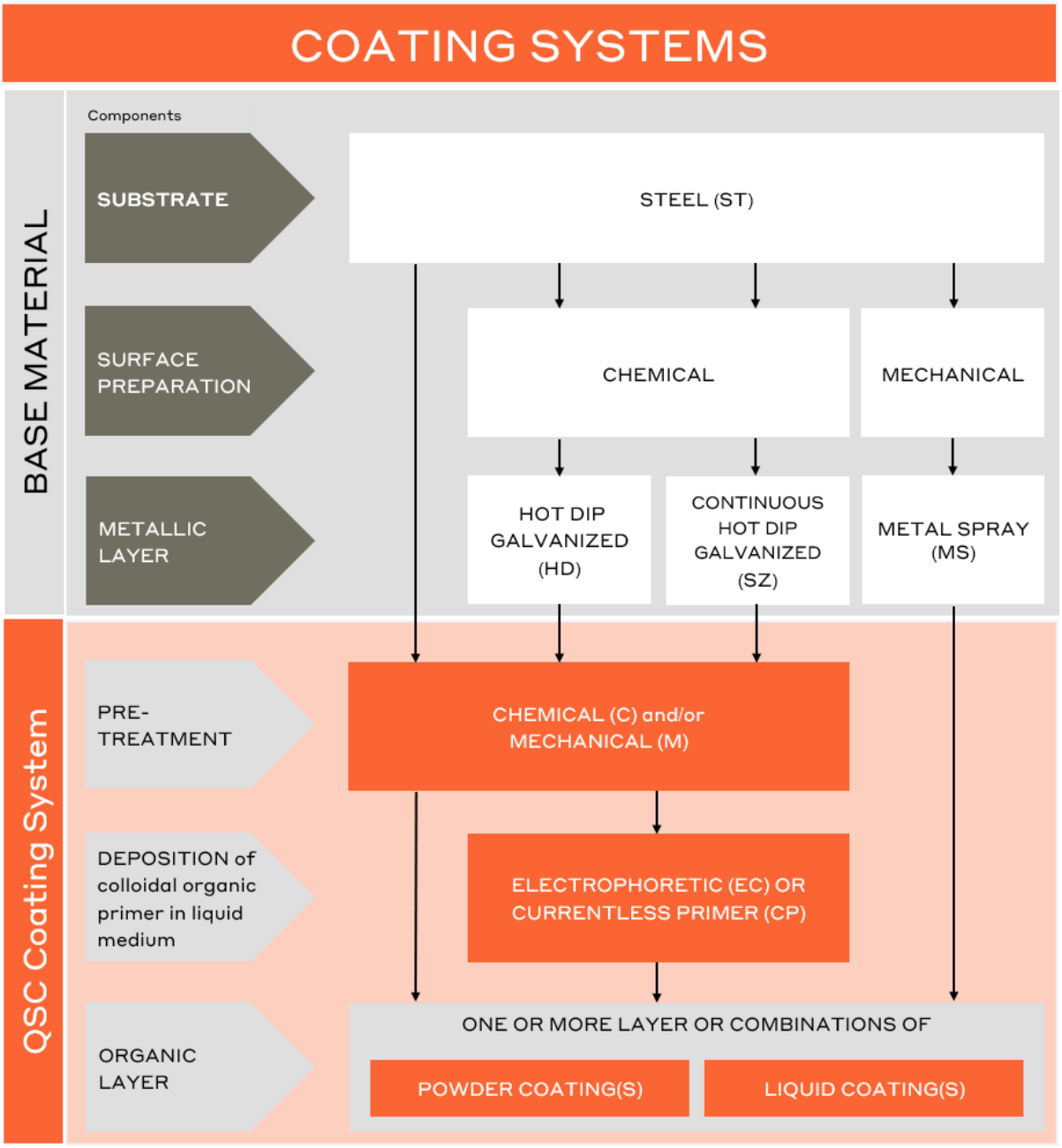
1.3 QUALISTEELCOAT coating System

A QUALISTEELCOAT coating system (QCS) is defined by the base material, the pre-treatment method, the eventual use of a deposition of colloidal organic particles in a liquid medium named as EC (electrophoretic primer) or CP (currentless primer) and the type of the organic coating.

The license attributed to a coater or an approval for a coating system is always related to a QUALISTEELCOAT coating system.

All coating materials used for the QUALISTEELCOAT coating systems must be QUALISTEELCOAT approved by their suppliers and licenced QUALISTEELCOAT coaters can use them to produce the QUALISTEELCOAT coating systems that are indicated on their licence.

QUALISTEELCOAT coating systems are grouped by the type of base material, the type of pre-treatment, the eventual presence and type of deposited primer (EC or CP) and the type of organic coatings. Powder coatings and liquid coatings have special requirements as defined in this specification.



All QUALISTEELCOAT coating systems are based on this specification. For each group of coating systems (liquid or powder coating) the special requirements describing the type of coating systems including the maximal QUALISTEELCOAT corrosivity category that can be achieved with the system. For Example: a powder coating system with only one-layer coating on steel can theoretically pass in the laboratory the test requirements for the neutral salt spray test for C3 high. But in the scope of QUALISTEELCOAT it is restricted to a maximum QUALISTEELCOAT corrosivity class of C2.

For each type of coating system, the quality assurance of the coater and the requirements for the approvals of coating systems are clearly defined.

In case of a combination of different types of coating systems (i.e. a combination of electrophoretic or current less deposited primer and liquid

coating or powder coating) the type of the QUALISTEELCOAT coating system is defined by the top-layer.

Requests for the approval of coating systems not yet defined by QUALISTEELCOAT are possible by written request to the QUALISTEELCOAT secretariat. It will be decided by the technical committee if an approval for such a system is possible.

1.3.1 Liquid coating systems

ISO 12944-5 defines examples for coating systems which are based on liquid coatings. QUALISTEELCOAT assumes the example systems which are established on the market, as specification for the approval of liquid coating systems. QUALISTEELCOAT approvals are based on the requirements of ISO 12944-5.

The electrophoretic and currentless deposited primers are in Qualisteelcoat not considered as a liquid coating nor as a base material but as an additional step before the application of a liquid or powder coating.

1.3.2 Powder coating systems

The specifications and recommendations of ISO 12944-5 do not apply to powder, electrophoretic or currentless deposited primers. Therefore, QUALISTEELCOAT developed the following table as basis for the approval of powder coating systems[1] containing specifications for the approval of QUALISTEELCOAT coating systems based on these organic coating systems. The table contains indications about the potential corrosivity category for which the system can be approved. Systems can also be approved for lower corrosivity categories, but not for higher ones than mentioned in the table, even if this would be theoretically possible per the results of the laboratory tests.

The following table indicates the powder coating systems that are possible for approvals as QUALISTEELCOAT coating systems including the QUALISTEELCOAT corrosivity classes they are allowed for.

[1] These specifications are only valid for thermosetting powder coating systems not for thermoplastic. QUALISTEELCOAT has the intention to cover these in a later edition.

Base material	Pre-treatment	Deposition	Number of powder coating layers	Coating System	Corrosivity Class				
					C1	C2	C3	C4	C5
Steel	M and/or C	-	1	ST1	✓	✓	X	X	X
			2	ST2	✓	✓	✓	✓	X
			3	ST3	✓	✓	✓	✓	X
	C	EC	1	STEC2	✓	✓	✓	✓	✓
			2	STEC3	✓	✓	✓	✓	✓
	M and/or C (only cleaning)	CP	1	STCP2	✓	✓	X	X	X
			2	STCP3	✓	✓	✓	X	X
	C	CP	1	STCP2	✓	✓	✓	✓	✓
			2	STCP3	✓	✓	✓	✓	✓
Continuously galvanized steel	M and/or C	-	1	SZ1	✓	✓	✓	X	X
			2	SZ2	✓	✓	✓	✓	X
			3	SZ3	✓	✓	✓	✓	✓
	C	EC	1	SZEC2	✓	✓	✓	✓	✓
Hot-dip galvanized steel (batch galvanizing)	M and/or C	-	1	HD1	✓	✓	✓	✓	X
			2	HD2	✓	✓	✓	✓	✓
			3	HD3	✓	✓	✓	✓	✓
	C	EC	1	HDEC2	✓	✓	✓	✓	✓
Steel coated by thermal spraying	n.a.	-	1	MS1	✓	✓	✓	✓	X
			2	MS2	✓	✓	✓	✓	✓
			3	MS3	✓	✓	✓	✓	✓

M : mechanical pre-treatment
C: chemical pre-treatment with approved conversion layer
n.a.: not applicable
EC: electrophoretic deposited primer
CP: currentless deposited primer

✓: possible for approval
X: not possible for approval

The tables in Annex 3 are an unlimited and detailed list of QUALISTEELCOAT COATING SYSTEMS including the pre-treatment methods and required layer thicknesses.

Note to pre-treatment: The supplier of a QUALISTEELCOAT coating system shall specify which pre-treatment is allowed for his system. However, C3 is the maximum corrosivity category for chemical pre-treatment based on iron phosphate or without forming a conversion layer. (See chapter 2.2.2)

1.3.3 Chemical pre-treatment systems

As there are at present no international standards, which define technical requirements for chemical pre-treatments systems on the base-material steel, QUALISTEELCOAT developed an appropriate approval procedure.

Basis of this approval procedure is the table of coating systems named in chapter 1.3.2. This table includes information about possible corrosivity categories, for which the chemical pre-treatment system may be approved. These systems may also be approved for lower corrosivity categories, yet not for a higher one named in the table, even if this is theoretically possible according to laboratory test results.

1.4 Terminology and Definitions

Approval: A specific material (for coating or chemical pre-treatment) tested in a testing laboratory and fulfilling the requirements of the present specification gets an QUALISTEELCOAT approval.

Base material: The defined base materials in QUALISTEELCOAT coating systems are steel (ST), continuously galvanized steel (SZ), hot-dip galvanized steel (HD) and thermally sprayed part with layers of aluminium alloys on steel (MS).

Cleaning of the surface: The cleaning of the surface is at the beginning of the pre-treatment process. Here, depending on conditions of use, oil, greases, dirt and possible other impurities of surface are removed.

Coating material: Organic coating material approved by QUALISTEELCOAT as part of a QUALISTEELCOAT coating system.

Continuously galvanized steel (SZ): according to EN 10346 continuously hot-dip galvanized steel strip, coated with zinc or its alloy with other metals by immersion in a bath of molten metal. In the Qualisteelcoat specifications only zinc or zinc-aluminum-magnesium with a composition of 3,5% aluminum and 3% magnesium are considered.

Continuous galvanized steel is generally supplied with a temporary surface protection in order to avoid the formation of corrosion during transport or storage. The surface protection can be of different types, as provided by EN 10346 standard, unless otherwise agreed. Qualisteelcoat highly recommends that the coater is informed of the type of surface protection before the order is places. If the temporary corrosion protection layer cannot be removed adequately, a loss of adhesion of the organic coating can occur.

Corrosivity category: Classifications of the principal environments to which steel constructions are exposed as they are detailed in ISO 12944 part 2. Those environments are classified from C1 (very low) to C5 (very high). For more details See chapter 1.2 of this specification.

Durability: the expected lifetime of a protective coating system to the first major maintenance painting. The term of protection “high” (more than 15 years) is always taken as a basis when defining QUALISTEELCOAT coating systems.

Currentless deposited primer (CP): is a term for a process where colloidal particles, suspended in liquid medium, are deposited onto the base material without the support of an electric field. Deposition and the coating formation is forced by an interaction of the base material with the liquid medium of the coating. The deposited particles are forming an organic coating with anti-corrosive properties.

Electrophoretic deposited primer (EC): is a term for a broad range industrial processes of which includes **electrocoating**, **cathodic electrodeposition**, **anodic electrodeposition**, and **electrophoretic coating**, or **electrophoretic painting**. A characteristic feature of this process is that colloidal particles suspended in a liquid medium migrate under the influence of an electric field (electrophoresis) and are deposited onto the base material. The deposited particle forms an organic primer with anti-corrosive properties.

General Licensee: An organization which is authorized by QUALISTEELCOAT to manage the QUALISTEELCOAT quality label in a country or region. Per the statutes this organization has a voice in the legal bodies of QUALISTEELCOAT. To avoid possible conflicts of interest, it is excluded that a testing institute which is commissioned with QUALISTEELCOAT inspections or approvals acts as General Licensee.

Hot-dip galvanized steel (HD): The requirements specified in ISO 1461 as well as further regulatory requirements, if applicable, e.g. DAST guideline 022 (mandatory for construction products supplied in Germany)

Licence: The quality label QUALISTEELCOAT granted to a coater fulfilling the requirements of the present specification.

Licensee: A coater who is authorized to use the QUALISTEELCOAT quality label based on this specification.

Manager of the approval: The chosen General Licensee or by absence of it the QUALISTEELCOAT Secretariat in Zürich, how is managing the QUALISTEELCOAT label.

Metal spray: Thermal spraying of zinc, aluminium, and their alloys, per ISO 2063.

Pre-treatment process: The pre-treatment process is the preparation of the base material prior to the coating, either with a chemical or a mechanical process or with a combination of both.

QUALICOAT: Quality label for liquid and powder organic coatings on aluminium for architectural applications. See www.qualicoat.net

QUALISTEELCOAT coating system: The complete layer composition of organic layers on the base material including the mechanical and/or chemical pre-treatment is defined as QUALISTEELCOAT coating system. See chapter 1.3

QUALISTEELCOAT corrosivity class: The QUALISTEELCOAT corrosivity class C1 high – C5 high is defined by the Corrosivity Category (C1-C5) in combination with the expected lifetime high (H)

Substrate: In line with the QUALISTEELCOAT specification the base material steel is always defined as substrate, which principally can be all types of steel. However, specific requirements may apply: in the case of stainless steel as base material, for example, the requirements on corrosion protection are only applicable to a limited extent.

Surface preparation: The surface preparation is the pre-treatment of the steel substrate prior to the application of the metal layer (i.e. metal spray MS, hot dip galvanized steel HD or continuously galvanized steel SZ), as well as the removal

of imperfections at welds, edges and other areas of the steel substrates prior to the application of the organic coating. Only the latter is covered by the QUALISTEELCOAT specification.

Testing laboratory: An independent laboratory, appointed by the national General Licensee and approved by QUALISTEELCOAT, to carry out all the assessments necessary for the QUALISTEELCOAT quality label, both for coating systems and for coaters. The laboratory must be accredited according to ISO/IEC 17025 general requirements for the Competence of Testing and Calibration laboratories and must be acknowledged by QUALISTEELCOAT.

1.5 Liability Disclaimer

QUALISTEELCOAT stands for a quality label and attributes its label based on inspection or testing reports issued by a qualified laboratory. The results of those reports are based on the quality at the moment of testing. QUALISTEELCOAT cannot be liable for any consequences or damages whatsoever, directly or indirectly imposed to persons or materials, companies, products or organizations, nor can it be held responsible for any material or other damages caused by a holder of the label in the execution of his coating activities, or by any product having a QUALISTEELCOAT label.

2 Requirements to get a licence

2.1 Application for a QUALISTEELCOAT licence

Any coater of steel constructions or steel equipment can apply for a QUALISTEELCOAT licence. A letter of intent expressing the company's engagement to obtain a QUALISTEELCOAT license must be addressed to the General Licensee that is responsible in the country where the company is situated. If there is no General Licensee the letter can be sent to QUALISTEELCOAT - c/o ARCO Association Management AG, P.O. Box 1507, CH-8027 Zürich, Switzerland.

The letter of intent must define the coating system in detail and the corrosion category the coater wishes to apply for.

Every QUALISTEELCOAT licensee must use QUALISTEELCOAT approved coating systems.

A QUALISTEELCOAT licensee can obtain a label for **one or more** QUALISTEELCOAT coating systems. It is indicated on his licence document for which systems he obtained his QUALISTEELCOAT licence and which corrosivity classes can be achieved with these systems.

QUALISTEELCOAT coating systems are not valid for a higher QUALISTEELCOAT corrosivity class as mentioned on the licence. But they are valid for lower corrosivity classes covered with the same coating system.[2]

2.2 First inspection

After receipt of the letter of intent, the General Licensee will start up the procedure and contact the testing laboratory, which will contact the coater for an appointment.

During the first inspection, the coater must use coating objects corresponding to the corrosion category the coater requests the license for.

The inspection will be performed per the official QUALISTEELCOAT checklist in its latest version. The inspector from the testing laboratory will check especially the following points:

2.2.1 QUALISTEELCOAT coating system

The coater shall define his coating system or systems by transmitting for each approval his unique system name, which includes the coating-system-number per QUALISTEELCOAT. This includes the kind of pre-treatment process (chemical, mechanical or both) the manufacturer and the related coating materials.

[2] The COATER may use coating material that is approved for QUALISTEELCOAT corrosivity category C4. But the coaters may with his set-up and pre-treatment only can achieve the lab results for C3. In that case the system will be restricted on the coaters licence on C3.

	Licence holders		
	Chemical pre-treatment	Mechanical pre-treatment	Combination of mechanical and chemical pre-treatment
Approval for coating system with chemical pre-treatment	Accepted	Not accepted	Accepted
Approval for coating system with mechanical pre-treatment	Not accepted	Accepted	Accepted
Approval for coating system with a combination of mechanical and chemical pre-treatment	Not accepted	Not accepted	Accepted

The license holder who carries out a chemical pre-treatment must use an approved coating system with a chemical pre-treatment.

The licensee who carries out mechanical pre-treatment must use an approved coating system with mechanical pre-treatment.

The licensee who carries out a combination of mechanical and chemical pre-treatment must use an approved coating system with a chemical or mechanical pre-treatment or a combination thereof.

The inspector will check that the coater uses coating materials that are part of an approved coating system on the parts or test panels type B1 (see Annex 4) that will be tested.

2.2.2 Pre-treatment methods and restrictions for corrosivity classes

The supplier of a QUALISTEELCOAT coating system (QCS) must specify generally the pre-treatment method that is allowed for the coating system. Beside that any chemical pre- treatment without conversion layer (i.e. degreasing or etching) based only on iron-phosphate is restricted to corrosivity class 3! This also applies for the pre-treatment prior to the electrophoretic or currentless primer.

2.2.3 Electrophoretic and currentless deposited primers

If the coater is applying a QUALISTEELCOAT coating system that includes electrophoretic or currentless deposited primer (STEC, HDEC, SZEC, STCD) the requirements for pre-treatment accordingly to chapter 3.5 must be fulfilled.

If the electrophoretic or currentless deposited primer is applied externally, the coater must install a suitable control for the incoming goods and verify the coatability of the parts. In this case a cleaning process is required before further coating. This process must be defined by the supplier of the electrophoretic or currentless deposited primer.

2.2.4 Laboratory equipment

The required testing equipment must be available and functional, together with the relevant documents. The inspector must verify that the laboratory equipment is functioning as described. This includes the verification of measuring results.

2.2.5 The production process

Both the pre-treatment process and the actual coating process will be monitored.

All the equipment used at the production lines should be properly working. This will be checked.

2.2.6 Assessment of QUALISTEELCOAT coating systems for the coater

The inspector must ensure enough test panels type B1[3] are prepared **for all QUALISTEELCOAT SYSTEMS that the coater wants to apply for**. These test panels type B1 are required for the final assessment and will be tested in a QUALISTEELCOAT-approved laboratory, as outlined in the following table and Annex 5:

Required tests	By the inspector in the plant (*)	In the laboratory	Number of panels to be tested by the laboratory
Dry film thickness	x	x	All test panels per sampling plan (see Annex 5)
Adhesion	x	x	3
Direct impact resistance test	x	x	3
Gloss	x	x	3
Wet adhesion		x	3 Only for ST, STEC and STCP coating systems[4]
Neutral salt spray test (NSS test)		x	6 3 panels for the aimed C-category + 3 for the C-Category below. See text below
Resistance to humidity		x	6 3 panels for the aimed C-category + 3 for the C-Category below. See text below

(*) The inspector is testing the same amount of panels as described for quality control in chapter 3.6.

Where possible, test panels should be produced during the inspection. If there are enough, then these panels can also be used for in-house control. Test panels should be produced as one batch per requested QUALISTEELCOAT SYSTEMS. If test panels for one or more of the requested QUALISTEELCOAT systems cannot be produced during the inspection, the coater may submit the panels to an approved laboratory after the inspection. All test panels related to one coating system shall be produced in the same production batch. In such cases, the panels must be submitted no later than two weeks after the inspection date.

[3] For the details about the test panels see Annex 4

[4] Zinc rich primers: for the time being the coaters could carry out either the pressure cooker or the boiling water test. A negative result would not lead to the cancellation of an approval.

Alternatively, the General Licensee of QUALISTEELCOAT can determine that all test panels from licensees under their responsibility are to be collected and sent together to the testing laboratory at a specified date. It is the General Licensee's responsibility to define the procedure, and to organize and monitor the assessment of the test panels.

A coater can only aim for one corrosion class per requested QUALISTEELCOAT SYSTEM. For the NSS test (Neutral Salt Spray test) and the Resistance to humidity the approved laboratory will also test the corrosion class below the aimed one in case of an unexpected failure. For example, if the aimed corrosion class for a QUALISTEELCOAT SYSTEM is ST2-C4H, then 3 panels of the same batch will also be tested for ST2-C3H.

Actions on failure of one of the laboratory tests can be found in Annex 5.

2.2.7 In-house control and registers

The inspector will check that in-house control has been carried out and that the coating plant maintains the required registers. The results recorded in the registers must be coherent with the results obtained on the test panels. Test panels type B1 must be kept and provided for the inspector for one year, and the registers must be stored for five years.

2.2.8 Training

The training of the In-house Control Employee (ICE) and the Responsible Quality Employee (RQE) is mandatory. A failure to have trained technicians will result in a non-conformity during inspections.

The General Licensee will organise yearly a meeting where the updates of the past year will be explained to the applicator. The RQE must attend the meeting in order to get the proper information and to implement the updates in the company. In case the RQE cannot be present in person, he/she will appoint a replacement and make sure the proper information will be received and the updates will be implemented by the first inspection after the Update meeting by the RQE.

Every company needs at least one trained ICE. After doing and passing an exam, the ICE gets a licence to operate for maximum 5 years. It is not necessary, that the ICE do all the tests by him/herself. Other employees may step into the performance of the ICE (not into the responsibility). However, the ICE has to make sure, the replacement is properly informed and capable to execute the tests as described in the technical specification of QUALISTEELCOAT. The replacement should be registered; the register at least gives information about:

- Name.
- Date of birth.
- Function.
- Replacement for which in-house control test(s).
- Period the replacement will last.
- Date of instruction (instruction is always by the ICE).

If the licenced person leaves employment, and provided the applicator immediately books the replacement individual on the next training course available, this will not be a non-conformity. However, it does not dismiss the company to carry out the tests in a proper way.

Although the technical specification requires a minimum of one ICE, we strongly recommend having adequate back up capacity for in-house control tests.

2.3 Final assessment for granting the licence

The inspection report must be submitted to the General Licensee. If a coater is in a country or region without General Licensee, the report will be sent to QUALISTEELCOAT in Zürich. If the result of the inspection meets the requirements, a licence to use the QUALISTEELCOAT label will be granted.

The coater can apply for any corrosivity category in correspondence with the allowed corrosivity class for the applied QUALISTEELCOAT coating system for which enough panels with positive test result were tested at the testing laboratory.

2.4 Inspection of licensees, routine inspection

After a plant, has been granted a license to use the QUALISTEELCOAT label, it will be inspected once every year. This is called routine inspection. This routine inspection can be announced by the inspector as long the General Licensee does not instruct otherwise.

The routine follows all requirements of the first inspection according to chapter 2.2. The assessment of all QUALISTEELCOAT coating system on the coaters licence accordingly to chapter 2.2.6 must be repeated every year.

The inspection report must be submitted to the General Licensee. If no General Licensee is available, the report will be sent to QUALISTEELCOAT in Zürich. If the result of the routine inspection meets the requirements, authorization to use the quality label will continue and a new licence document will be issued by QUALISTEELCOAT.

If the coater is not satisfied with the corrosivity category he achieved as result of the inspection (e.g. the result is lower than in his existing licence), he can ask for an additional voluntary inspection. This request must be made during 30 calendar days after receiving the test results. If the second inspection does not lift the unsatisfactory requirement, the coater will be informed in a letter explaining the reasons for the momentary refusal, and the licence for the lower corrosivity category is granted. The coater must wait at least three months before making a new licence application for a higher corrosivity category.

2.5 Change of chemistry

When the coater modifies his pre-treatment process chemistry in an important way or introduces a new type of pre-treatment process chemistry, he must notify the General Licensee, and apply for a new QUALISTEELCOAT license.

2.6 Use of the QUALISTEELCOAT logo by the coater

The use of the logo must comply with the Regulations for the use of the QUALISTEELCOAT quality label (see https://qualisteelcoat.net/content/downloads/).

2.7 Company status change

The QUALISTEELCOAT label is not transferable. However, if a company holding a QUALISTEELCOAT licence is subject of a fusion or taken over by another company, then the license is transferred to the new owner. If for whatever reason the company stops its activities as a coater, the QUALISTEELCOAT label granted to the company will lose its validity.

3 Quality assurance by the coater

The inspector from the testing laboratory will evaluate the quality assurance system set up by the coater by assessing the following points:

3.1 In-house control procedures

The coater shall have set up a quality control system including an internal test plan in accordance with the present specification. Both the production methods and the coated products must be monitored and tested.

This specification contains detailed information about the parameters or properties that must be tested, the test frequency, and where in the process will be tested.

The internal test plan also needs an estimation of the duration of the tests, and a statement on any required resources. If a supplier specifies further parameters or tests, they also must be followed.

In addition, the inspector verifies for all QUALISTEELCOAT SYSTEMS of the licensed coater which QUALISTEELCOAT approval numbers have been applied.

3.2 Technical control room

The coater must set up a technical control room or a laboratory facility that is separated from the production facilities. This room must be equipped to assess the quality of the process, the pre-treated and the coated parts.

Technical information and the instruction manuals of every testing device, showing the identification number must be available. All instruments must be in good working condition and functioning.

The technical data sheets (TDS) and the material safety data sheets (MSDS) of all the products must be available to the responsible persons, as well as the applicable standards or precise working instructions describing the test procedures.

3.3 Project details

3.3.1 Control register and quality documentation

The results of the in-house control must be recorded and be easily accessible to the inspector. This control register with numbered pages or a computer record must be maintained by the laboratory supervisor and must include all the measurement results and laboratory tests. The control register must show the nominal values, maximum values not to be exceeded and the measured values. Any corrective measures, when required or implemented, must be noted in the register. The register must be kept for a period of five years.

The register must contain the following information:

- the name of the customer and the order or lot identification
- corrosivity category of the environment in which the product will be used
- gloss, colour or RAL number and visual reference of the colour (colour card or model piece)
- references on the blasting media with dates of their removal or renewal
- references of the used coating: product name and manufacturer; batch numbers; for liquid coatings, both base and the curing agent and eventually the thinner
- the application details of the electrophoretic or currentless deposited primer if present
- the application date of the different coating layers
- thickness of the different layers of the coating system
- list of responsible persons with their name, their function/responsibility and department
- test results of all specified quality control tests and parameters per this specification including the date and time, the set nominal values and corrective measures

3.3.2 Definition of the coating material

Only coating systems which are in line with this specification shall be used. The coating company shall only use coating material for which the material's supplier has acquired an approval by QUALISTEELCOAT. (see also § 2.2.1)

However, in a multi-layer organic coating system "XYZ", the licenced coater can, **following his own experience,** use a topcoat of another supplier, under these conditions:

- The topcoat needs to have a Qualisteelcoat approval in the same coating system "XYZ" as the primer.
- In order to assure the intercoat adhesion, it is the responsibility of the coater to execute an additional adhesion test (5.10) on each and every lot and at least twice per shift on test panels type B2 (for details see Annex 4).

3.4 Requirements for storage

3.4.1 Storage of coating material

The storage of coating materials must comply with the applicable safety requirements. Only the coating used during the application, and in case of liquid coating the additional thinner, may be present in the coating application area.

All coating materials must be stored in a dry room, protected against freezing or too high temperature (see technical data sheet for temperature range), isolated from the production facilities and protected from any contamination.

3.4.2 Storage of parts for coating process

Every lot of parts in the company must be labelled or must be clearly identifiable.

The coated products must be stored in a suitable area. The parts must be packed for transport as soon as possible.

Parts not accepted by quality control must be clearly identified and kept separated from the accepted parts.

Pre-treated parts should preferably be coated immediately after pre-treatment process. They must not be stored for more time than mentioned in the table below, and never in a dusty or harmful atmosphere. At all times zinc corrosion products, must be avoided.

The storage conditions must not allow condensation onto the parts. All workers handling pre-treated parts must wear clean textile gloves to avoid contamination of the surface.

Material	Dry and dust-free atmosphere	Atmosphere with humidity more than 70%
Parts for C1 - C3	≤ 24 hours	≤ 3 hours
Parts for C4 - C5	≤ 8 hours	
Hot-dip galvanized material and thermal sprayed parts after blasting or sweeping	≤ 3 hours	

3.5 Quality control for pre-treatment process

For the pre-treatment process, a coater is equipped with either a mechanical pre-treatment (e.g. blasting booth) or a chemical pre-treatment process. A combination of these is possible.

Detailed information on types of surfaces and surface preparation can be found in ISO 12944-4. Some substrates will however require a supplementary treatment.

The base material can be contaminated with oil and grease, marks with chalk or paint, stickers or other, as dirt or oxidation. Prior to the pre-treatment process and the application of a coating system or with any such surface contamination must be removed by suitable means.

The purpose of the pre-treatment process is to prepare the substrate for the application of the protective coating system, and consists in sandblasting or in a chemical treatment, or both.

Every surface treatment must be done in the plant. Only hot-dip galvanizing, continuous hot-dip galvanizing and the application of an electrophoretic or currentless deposited primer can be subcontracted.

If steel is cut by laser, the cutting edge will be oxidized, unless nitrogen gas or alike is used during the cutting. This oxide must be removed, either mechanically by brushing or sanding or any other suitable method, or by pickling with an acid. In case of various metal combinations, a preliminary testing of such combinations is mandatory.

3.5.1 Quality control for surface preparation and pre-treatment by blasting

The coater must check his production methods and products per the following methods and frequency.

<table>
<tr><th>Required test</th><th>C1 – C2</th><th>C3 – C5</th></tr>
<tr><td>Coatability of parts</td><td colspan="2">Every lot</td></tr>
<tr><td>Blast cleanliness and dust removal</td><td colspan="2">Random testing twice per day</td></tr>
<tr><td>Surface roughness (blasting only steel)</td><td rowspan="2">Not applicable</td><td>Once per shift</td></tr>
<tr><td>Assessment of the zinc layer thickness after blasting or sweeping (only for hot-dip galvanized steel)</td><td>Once per shift</td></tr>
<tr><td>Difference between dew point and surface temperature</td><td colspan="2">Twice per day - morning & late afternoon
every lot of parts suspected of too low temperature</td></tr>
</table>

If the blasting is followed by a conversion treatment, the quality control for chemical pre-treatment process must be fulfilled too.

3.5.2 Laboratory and inspection equipment for mechanical pre-treatment process

All coaters must have a

- dew-point-meter
- thermometer
- Dust-Tape-Kit ISO 8502-3

coaters with category C3-C5 must have in addition a

- roughness measurement device (if applicable)
- thickness measurement gauge for zinc layer thickness (if applicable)

3.5.3 Quality control for chemical pre-treatment process

The coater must check his production methods and products **per the chemical supplier's recommendations** but at least per the following frequency.

Required test	C1 – C2	C3 – C5
Coatability of parts	Every lot	
Concentration of pre-treatment process baths per the supplier's instructions		Once per day
Assessment of pH value of baths per the supplier's instructions	Once per day	Once per shift
Conductivity of rinsing water (last rinse)		Once per shift
Temperature of pre-treatment process baths	Once per day	
Content of Zn and Al with a method according to the supplier´s recommendations		Once per day
Drying temperature		Once per day
Assessment of the zinc layer thickness after pickling (only for hot-dip galvanized steel)		Once per shift
Control of conversion layer	At least once a month	
Surface preparation		Visual

3.5.4 Laboratory and inspection equipment for chemical pre-treatment process

All coaters must have a

- pH-meter
- thermometer

coaters with corrosivity category C3-C5 (if applicable) must have in addition a

- thickness measurement gauge for zinc layer thickness
- chemicals to determine the bath concentrations
- conductivity meter
- temperature test strip for drying oven
- test solutions and equipment to test the chemical conversion coating per the chemicals supplier's instructions
- test solutions for Zn and Al content (only if combined zinc aluminium pickling bath and/or conversion coating bath is used)

3.6 Quality control for finished products

Whenever possible, tests should be carried out on parts from the production. This may require a supplementary number of parts from the customer. When test panels type B1 or B2 are used, these shall match with the production parts and the coating system.

The coater must check his production methods and coated products per the following methods and frequency, based on the type of coating system.

3.6.1 Quality control for powder coating systems

Required test	C1 – C2	C3 – C5
Dry film thickness	Every order per the sampling plan	
Adhesion	Standard: once per shift on 1 test panel type B2 In case of multilayer from different supplier: twice per shift on each lot on test panels type B2	
Direct impact resistance test	Not applicable	Once per shift on 1 test panel type B1.
Gloss	Twice per shift on production parts or test panels type B2	
Determination of dew point	Not applicable	Every lot of parts suspected of too low temperature (base material)
Assessment of stoving conditions (measurement on products representative for the coated parts in thickness, geometry and position in the oven)	Actual oven temperature once per day. once per month a 4-point measurement	Actual oven temperature twice per day. once per week a 4-point measurement
Visual appearance	Every order	
Wet adhesion	Not applicable	Once per shift on 1 test panel type B2[5]

[5] The wet adhesion test is not mandatory for coating systems on zinc and thermal spray metallic layers

3.6.2 Quality control for liquid coating systems

Required test	C1 – C5
Dry film thickness	Every order per the sampling plan
Adhesion	Once per shift on 1 part or test panel
Gloss	Not applicable (only on customer's request)
Determination of dew point	Twice per day
Assessment of forced drying conditions (if applicable)	Twice per day: morning & late afternoon and every lot of parts suspected of too low temperature
Visual appearance	Every order

3.7 Laboratory and inspection equipment for finished products

All coaters must have a

- dry film thickness gauge
- gloss meter 60º
- cross cut tester or pull-off tester for adhesion

The following equipment is necessary if applicable according to the tables in chapter 3.6

- recording instrument for object temperature and curing time with 4 measuring points
- equipment for dew-point measurement
- wet adhesion test equipment
- impact test equipment

4 Approval of chemical pre-treatment systems

To maintain ideal performance of the coating system, which is applied by a coater licensed by QUALISTEELCOAT, the quality of the provided chemical pre-treatment system is tested. This part of the specification describes the testing process and acceptable critical values for the test results.

A coater may only use approved chemical pre-treatment systems for applications under the quality label of QUALISTEELCOAT. If a coater applies a chemical pre-treatment before applying the organic coating, the coater may only use approved chemical pre-treatment systems for applications under the QUALISTEELCOAT quality label.
During the homologation process, the supplier of the chemical pre-treatment system and the candidate license holder can jointly apply for the approval of the chemistry and the granting of the license.

All approved and valid chemical pre-treatment systems are listed on the homepage of QUALISTEELCOAT[6].

The approval is defined by:

- The substrate steel
- The optional presence and the type of a metallic layer (e.g. HD, SZ, MS)
- The optional presence and type of the electrophoretic or currentless deposited primer
- The corrosivity class
- Brand
- Commercial codification of the conversion layer independent of the cleaning and pickling conditions.
- The approval is valid for all coating systems where the combination base material + optional presence and type of the colloidal primer in liquid medium (EC or CP), can achieve the same corrosivity class according to § 1.3.2.

Positive tested coating systems from a licensed coater (according Track 1) or Coating system tested by a Qualisteelcoat laboratory (Track 2)	Chemical supplier can apply for an approval for
ST1	ST1
ST2 or ST3	ST2 + ST3
STEC2 or STEC 3	STEC2 + STEC3
STCP2 or STCP 3 (with conversion layer)	STCP2 + STCP3
SZ1	SZ1
SZ2	SZ2
SZ3	SZ3
SZEC2	SZEC2
HD1	HD1
HD2 or HD3	HD2 + HD3
HDEC2	HDEC2

[6] This is mandatory from 1st January 2025.

The approval applies to the highest corrosivity class achieved by the license holder according to track 1 or according to the corrosivity class achieved according to the test procedure according to track 2, always limited to the maximum permitted corrosivity class according to § 1.3

4.1 Application for approval of a chemical pre-treatment system

Any company may apply for the approval of a chemical pre-treatment system. An approval of QUALISTEELCOAT will be granted to a manufacturer or a company, which partly or completely defines the recipe of a chemical pre-treatment system but delegates its production to a third party. The applicant is called provider.

This company may apply for the approval of a chemical pre-treatment system in two ways, the so called "two track policy".

Track 1: POSITIVE EXPERIENCE

REQUIREMENTS

- ≥ 1 granted licence holder/s
- COATING SYSTEM (ST1, ST2, SZ1, SZ2, SZ3, HD1, HD2, HD3, …)
- Registered follow-up and traceability of pre-treatment line (BOOKLET) proofing the instructions of the providers are followed. This BOOKLET contains
    - the general process instructions of the provider
    - the specific user's manual for the specific licenced coater
    - the register of values and limits.
    - The results of the control of the conversion layer done by the provider according to § 3.5.3.

  The inspector controls the presence of the booklet and up-to-date information of the booklet during the annual inspections at coater.

APPROVAL

- Provider of conversion layer can apply for an approval
- No additional test to be done
- Automatic renewal if number of granted license holders stays ≥ 1
- The corrosivity class is limited to the corrosivity class of the related granted license holder.

In case the ultimate licenced coater loses the licence of the use of a specific conversion layer (approval according to track 1), the provider can request for an approval according to track 2. In order not to lose the approval, the tests need to fulfil the requirements within 6 months.

Track 2: TESTING PROCEDURE according to § 4.2 and § 4.4.

REQUIREMENTS

- The complete coating system, conversion layer included, need to be tested according to § 4.4
- COATING SYSTEM (ST1, ST2, SZ1, SZ2, SZ3, HD1, HD2, HD3, …)
- Registered follow-up and traceability of pre-treatment line (BOOKLET) proofing the instructions of the providers are followed. This BOOKLET contains
    - the general process instructions of the provider
    - the specific user's manual for the specific licenced coater
    - the register of values and limits.
    - The results of the control of the conversion layer done by the provider according to § 3.5.3.

  The inspector controls the presence of the booklet and up-to-date information of the booklet during the annual inspections at coater.

APPROVAL

- Provider of conversion layer can apply for an approval
- The tests need to fulfil the requirements according to § 4.4

A letter of intent expressing the company's engagement to obtain a QUALISTEELCOAT approval must be addressed to the General Licensee of choice or to QUALISTEELCOAT - c/o ARCO Association Management AG, P.O. Box 1507, CH-8027 Zürich, Switzerland. The chosen organisation is here called the manager of the approval.

4.2 First approval of a chemical pre-treatment system

At the first approval of the chemical pre-treatment system the test panels type B1 are pre-treated according to the instructions of the manufacturer either in the test laboratory in attendance of an employee of the manufacturer or at the manufacturer in attendance of an inspector in an immersion or spray pre-treatment. Subsequently the test panels are coated with an already QUALISTEELCOAT-approved coating system according to the instructions of the coating material manufacturer. The RAL-colour 9010, which is part of a Qualisteelcoat approved coating system must be used as topcoat.

The coating process must be carried out immediately after the pre-treatment process.

The provider provides all the necessary information on his pre-treatment system to the testing laboratory, including all details on the successive process-steps. All the corresponding product and safety data sheets must also be provided.

All the tests will be executed on a complete system as defined above. The testing laboratory must allow the coating system to cure properly per the supplier's instructions before starting the tests. All samples must be produced at lowest

specified curing temperatures and shortest corresponding curing times per the technical data sheet of the supplier.

The testing laboratory submits the test results to the manager of the approval.

4.3 Renewal of an approval for a chemical pre-treatment system

The provider provides the testing laboratory with the necessary pre-treatment products for the renewal application. The tests required for the renewal application are the same as for the initial application. The validity of the first approval for a system spans from the date of approval until the end of the second year following on the year of the approval. The renewal is for two years.

The testing laboratory submits the test results to the manager of the approval.

The manager of the approval decides on renewal or withdrawal of the approval. In case of non-compliance, the tests that failed are repeated on samples taken from another batch. If the second series of tests do not lead to satisfactory results, but corresponds to a lower corrosivity category, the approval is decreased to this lower category if the sufficient number of test panels for the category is examined and has passed. The provider of the tested product can submit a new application for an approval for the higher level at any time, in such case the full test range must be repeated.

Any change in the base formula of the chemical pre-treatment product must be notified to the General Licensee respectively to the QUALISTEELCOAT-secretariat. The General Licensee respectively the QUALISTEELCOAT-secretariat decides, whether a new approval is necessary.

4.4 Laboratory tests for the approval of chemical pre-treatment systems

In this chapter tests as well as the sort and number of test panels, which have to be conducted for approval, are listed. Test process, evaluations and requirements are listed in chapter 6 “Testing procedures and requirements”.

Required tests	Test panels	Number of panels to be tested
Dry film thickness	B1	All panels
Adhesion	B1	1
Direct impact resistance test	B1	1
Gloss	B1	1 (average of 10 measurements)
Wet adhesion (resistance to boiling water)	B1	3
Neutral salt spray test	B1	6 (3 for final assessment and 3 for pre-assessment (1 category before))
Resistance to humidity	B1	3

4.5 Use of the QUALISTEELCOAT logo by the supplier of a QUALISTEELCOAT approved chemical pre-treatment product

The use of the logo must comply with the Regulations for the use of the QUALISTEELCOAT quality label (see https://qualisteelcoat.net/content/downloads/).

The chemical pre-treatment product may be marked with the quality label and the approval-number.

5 Approval of coating system

To maintain an optimal performance of the paint systems that are applied by the QUALISTEELCOAT licensed coater, the quality of the coating that is supplied by coating manufacturers is tested. In this part of the specification, the test methods and acceptable test result limits are given.

A coater can only use an approved coating system for those applications where the QUALISTEELCOAT label is involved. All approved and valid coating systems are listed on the QUALISTEELCOAT website.

A QUALISTEELCOAT coating system is defined by:

- the substrate steel
- the optional presence and the type of a metallic layer (e.g. HD, SZ, MS)
- type of surface pre-treatment (chemical/mechanical)
- the optional presence and type of the electrophoretic of currentless deposited primer
- number and type of organic layers
- gloss category of the topcoat, (matt, satin, glossy)
- finish of the topcoat (smooth or textured)
- Class (1 or 2) (cfr. Qualicoat)

For multiple organic layers, the QUALISTEELCOAT approval can be valid for different QUALICOAT approved topcoats of the same brand, including class 1 and class 2 (cfr. Qualicoat). Those QUALICOAT approvals (P-numbers) need to be communicated to the laboratory before granting an approval or renewal.

For monolayer coating systems, the powder coatings with the same recipe, i.e. the same gloss level, UV class and finish, produced in different plants of the same brand, but with a different QUALICOAT P-nr, can have the same QUALISTEELCOAT PE-nr. The applicant for approval should specify this when initiating homologation.

Only QUALICOAT class 1 or 2 are valid for QUALISTEELCOAT systems.

The definition of gloss categories corresponds to QUALICOAT specified in the table below:

Gloss category	Gloss range	Acceptable variation
1 (matt)	0 - 30	+/- 5 units
2 (satin)	31 -70	+/- 7 units
3 (glossy)	71-100	+/- 10 units

5.1 Application for the approval of a coating system

Any company may apply for the approval of a coating system. A QUALISTEELCOAT approval for a coating system will be attributed to a coating manufacturer, or to any company that defines, partially or completely, the formulation of the coating, but relies for the manufacturing on a third party. The applicant is called Supplier.

In case a QUALISTEELCOAT coating system consists of different layers of primer, intermediate coats and topcoats from different manufacturers, the approval must be made by one supplier who takes responsibility for the whole QUALISTEELCOAT coating system. This applies also in case of Combinations with electrophoretic or currentless deposited primers (STEC, HDEC, SZEC, STCP). In all such cases the supplier and type of the different materials must be indicated.

The company addresses a letter of intent expressing its engagement to obtain a QUALISTEELCOAT approval to the General Licensee of choice or to QUALISTEELCOAT - c/o ARCO Association Management AG, P.O. Box 1507, CH-8027 Zürich, Switzerland. The chosen organisation is here called the manager of the approval.

5.2 First approval of a coating system

The testing laboratory will contact the supplier. The necessary quantities of coating products and/or test panels will be handed over to the testing laboratory. If possible, the testing laboratory will prepare the test panels, but for a possible zinc layer or chemical pre-treatment process, it might be necessary to rely on a subcontractor, which is therefore allowed.

The supplier provides all the necessary information on his coating system to the testing laboratory, including details on the successive coating layers to apply and the minimal film thickness of every layer. All the corresponding product data sheets must also be transmitted.

All the tests will be executed on a complete system as defined above, unless otherwise specified. The testing laboratory will allow the coating system to cure properly per the supplier's instructions before starting the tests. All samples must be produced at lowest specified curing temperatures and shortest corresponding curing times per the technical data sheet of the supplier.

The testing laboratory submits the test results to the manager of the approval.

If the test results meet the requirements a QUALISTEELCOAT approval for the coating system will be granted to the supplier.

If the test results do not meet the requirements, the supplier will be informed with a letter by the manager of the approval explaining the reasons for the momentary refusal. The supplier must wait at least three months before making a new application for an approval.

The QUALISTEELCOAT approval for a coating system is valid for the licensed company and for all its production sites where the approved coating is manufactured. However, the coating manufacturer must assure by using the QUALISTEELCOAT approval, that the composition of the produced coating is identical to the approved coating.

5.3 Renewal of an approval for a coating system

The supplier provides the testing laboratory with the necessary coating products and test panels for the renewal application. The tests required for the

renewal application are the same as for the initial application. The validity of the first approval for a coating system spans from the date of approval until the end of the second year following on the year of the approval. The renewal is for two years.

If the topcoat of the QUALISTEELCOAT coating system already has a valid QUALICOAT approval, some of the properties do not have to be re-tested. These tests are marked with (*) in the tables of required tests. The supplier must clearly identify which QUALICOAT P-numbers belong to the tested QUALISTEELCOAT system. This will be mentioned on the approval. He shall make a rotation of the different P-numbers for the renewal tests.

In case a QUALICOAT approval for a topcoat is cancelled the QUALISTEELCOAT approval remains valid until the next renewal where all properties have to be tested.

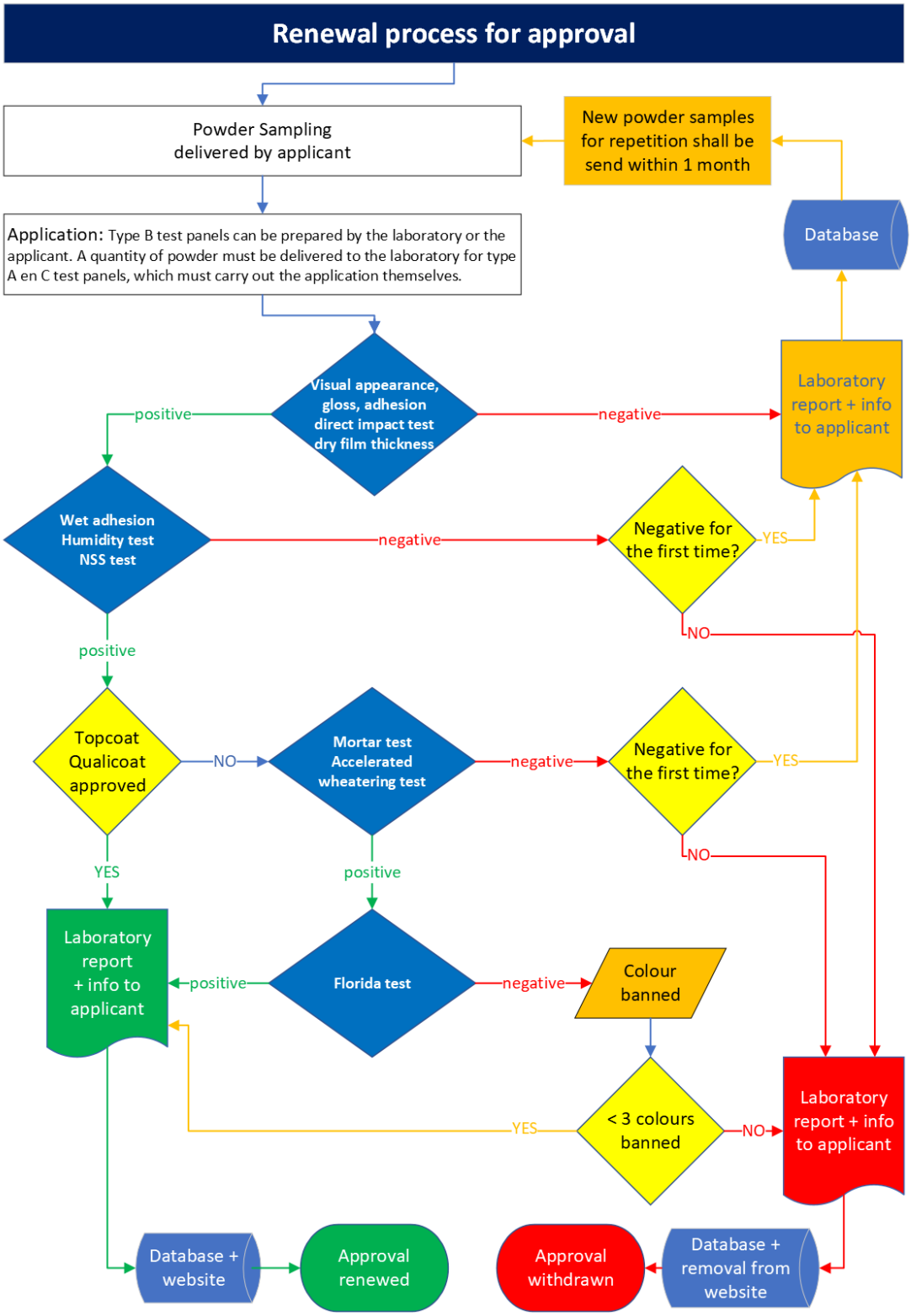
The test report from the QUALISTEELCOAT laboratory must be submitted to the manager of the approval. The manager of the approval decides on renewal or withdrawal of the approval. In case of noncompliance, the tests that failed are repeated on samples taken from another batch. If the second series of tests do not lead to satisfactory results, but corresponds to a lower corrosivity category, the approval is decreased to this lower category if the sufficient number of test panels for the category is examined and has passed. The supplier of the tested product can submit a new application for an approval for the higher level at any time, in such case the full test range must be repeated.

Any change in the base formula (binder, hardener, additives) of the coating product implies, however that it must be considered as a new product, which consequently requires a new QUALISTEELCOAT approval.

Also, test results for artificial weathering and outdoor exposure tests from approved laboratories, collected to obtain other quality labels, may be used as test results for the QUALISTEELCOAT approval, if the conducted tests comply with these specifications and the test report is approved by the testing laboratory.

For the specific approval including topcoat, a specific rule related to Florida results is implemented: As soon as 3 colours are banned for failure in Florida, the QUALISTEELCOAT approval will be withdrawn at the end of the current year.

The following flow-chart shows the process for renewal, as well as what to do in case of failure.



A positive result means the test meets Qualisteelcoat specifications. For NSS, at least 2 of 3 test plates must pass. If one fails, a lower corrosivity class is possible only if prior inspections included enough plates, with at least 2 of 3 passing. Applicants can submit extra plates to allow evaluation for a lower class if needed.

5.4 Laboratory tests for the approval of powder coating system

This chapter lists the tests, the type and number of panels that must be performed for the approval. test procedures, assessments and requirements are listed in chapter 6 testing procedures and requirements.

Required test	Type of test panel	Number of panels to be tested
Dry film thickness	A, B1, C	All panels
Adhesion	B1	1
Direct impact resistance test	A	1
Gloss	A	1 (mean of 10 measurements)
Wet adhesion (resistance to boiling water)	B1	3 (not applicable for coating systems on zinc and thermal spray metallic layers)[7]
Resistance to mortar (*)	B1 or C	3 (not necessary for QUALICOAT approved systems)
Neutral salt spray test	B1	6 (3 for final evaluation and 3 for a pre-evaluation 1 category earlier)
Resistance to humidity	B1	3
Accelerated weathering (*)	A or C	2 (1 for testing, 1 for reference)
Natural weathering (*)	C	4 (3 for testing, 1 for reference)

For details about the test panels, see Annex 4.

(*) These tests are not necessary for topcoats with QUALICOAT approval.

[7] For Zinc rich primers a failure in the wet adhesion test will not lead to a negative approval

5.5 Selected colours for testing

Sequence	Tests[8]	Coating system with a Qualicoat approved topcoat	Coating system without a Qualicoat approved topcoat
Initial tests	Tests without (*)	RAL 9010	RAL 9010
	Test with (*)	*Test result by Qualicoat is accepted*	RAL 9010 + RAL 7016 + RAL 6005
1st renewal	Tests without (*)	RAL 9005 + rotation P-nr	RAL 9005
	Test with (*)	*Test result by Qualicoat is accepted*	2 out of the 3 colours defined by Florida WG Qualicoat for Class1
2nd renewal	Tests without (*)	RAL 7016 + rotation P-nr	RAL 7016
	Test with (*)	*Test result by Qualicoat is accepted*	2 out of the 3 colours defined by Florida WG Qualicoat for Class1
3rd renewal	Tests without (*)	RAL 6005 + rotation P-nr	RAL 6005
	Test with (*)	*Test result by Qualicoat is accepted*	2 out of the 3 colours defined by Florida WG Qualicoat for Class1
Next renewals	Tests without (*)	Rotation RAL 9010 – RAL 9005 – RAL 7016 – RAL 6005	Rotation RAL 9010 – RAL 9005 – RAL 7016 – RAL 6005
	Test with (*)	*Test result by Qualicoat is accepted*	2 out of the 3 colours defined by Florida WG Qualicoat for Class1

5.6 Laboratory tests for the approval of liquid coating systems

This chapter lists the tests, the type and number of panels that must be performed for the approval. Test procedures, assessments and requirements are listed in chapter 6 testing procedures and requirements.

The testing laboratory will prepare test panels type B1.

The preparation of the panels must be in accordance with the QUALISTEELCOAT specification.

[8] This refers to the required tests in chapter 5.5.

- Steel panels of cold rolled steel are prepared to a degree of cleanliness SA 2 ½ or SA 3, per ISO 8501-1. The roughness R_{y5}must be between 50 µm and 100 µm. Blasted panels are de-dusted prior to the application of the primer coating.
- Hot-dip galvanized, or continuous hot-dip galvanized panels of the same dimensions may be bought or prepared by a subcontractor. The former panels are sweep blasted prior to the application of the primer coat; the latter panels may be sweep blasted prior to the application of the primer coat, per the instructions of the coating manufacturer. The panels can eventually also be chemically pre-treated.
- A subcontractor may prepare thermal sprayed panels of the same dimensions.

Required test	Panel	Number of panels to be tested
Dry film thickness	A, B, C	All panels
Adhesion	B	1
Neutral salt spray test	B	6 (3 for final evaluation and 3 for a pre-evaluation 1 category earlier)
Resistance to humidity	B	3
Accelerated weathering (*)	A	2 (1 for testing, 1 for reference)
Natural weathering (*)	C	4 (3 for testing, 1 for reference)

(*) These tests are not necessary for topcoats with QUALICOAT approval or for topcoats for interior use per ISO 12944-2 (see Annex 1).

5.7 Use of the QUALISTEELCOAT logo by the supplier of a QUALISTEELCOAT coating system

The use of the logo must comply with the Regulations for the use of the QUALISTEELCOAT quality label (see https://qualisteelcoat.net/content/downloads/).

Coating systems or products that belong to a QUALISTEELCOAT coating system can be identified by the text on the label: "Part of QSC-system" or "Part of QUALISTEELCOAT coating system".

6 Testing procedures and requirements

6.1 Coatability of parts

The following questions should be considered to evaluate the suitability of an object for the application of a coating system:

- Is the pre-treatment process adapted to the work piece?
- Can the coating system be applied to this substrate?
- Is the paint system suitable for the corrosivity category?
- Is the preparation grade suitable according to the table below?

Doubts about the suitability of the object for the application of the considered coating system must be discussed with the customer. A written agreement must then be available.

Apart from that for load bearing structures according EN 1090-2 (material ≥ 4mm) with an expected corrosivity category from C3H and higher the preparation grade in accordance with ISO 8501-3 preparation grade must fulfil the requirements shown in the table below.

P1- Light preparation

P2 - Thorough preparation

P3 - Very thorough preparation

Corrosivity category	Preparation grade
C1	P1
C2	P2
C3	P2
C4	P2 or P3 as agreed between parties
C5	P2 or P3 as agreed between parties

For a liquid coating system, the edges shall be protected by a stripe coat extending across approximately 25 mm on both sides of the edge and applied to a nominal thickness appropriate to the coating system.

Requirements:

The questions regarding the coatability need to be positively answered and the preparation grade must fulfil the requirements of the table above. The testing of coatability must be reported in the register.

6.2 Determination of surface roughness

The roughness of the substrate after blasting must be assessed. The used parameter is R_{y5} (mean roughness depth). The coater has the choice of the method in accordance with:

- ISO 8503-2 surface profile comparators
- ISO 8503-4 stylus instrument
- ISO 8503-5 replica tape

Requirements for mechanical pre-treatment process:

For liquid coatings R_{y5} must be in the range from 50 - 100µm or otherwise as specified by the coating manufacturer in the technical data sheet.

The mean roughness depth R_{y5} (ISO 21920-2) is the arithmetical mean of single roughness depths of successive sampling lengths.

6.3 Assessment of zinc coating after sweep blasting or pickling

A zinc coating must be made ready to be coated, and dross particles, droplets and sharp points, zinc ashes, zinc flakes, flux residues, and the like must be removed. Additional sweeping may be necessary. This must be done with a fine grade non-metallic abrasive at low pressure at an angle of 30-35° to the surface. Pickling of zinc coating is done in an acid or alkaline bath, or eventually both in different steps.

Requirements:

The remaining zinc layer thickness after sweep blasting and/or pickling must comply with ISO 1461 - Table 3, as shown below in the table. The required thickness is related to the dimension of the steel parts.

Parts and dimensions (mm)	Minimum thickness	Average thickness
Steel > 6 mm	70 µm	85 µm
Steel > 3 mm and ≤ 6 mm	55 µm	70 µm
Steel ≥ 1,5 mm and ≤ 3 mm	45 µm	55 µm
Steel < 1,5 mm	35 µm	45 µm
Cast iron > 6 mm	70 µm	80 µm
Cast iron ≤ 6 mm	60 µm	70 µm

For **Continuously galvanized steel (SZ)** is generally supplied with a temporary surface protection in order to avoid the formation of corrosion during transport or storage. The surface protection can be of different types, as provided by EN 10346 standard, unless otherwise agreed. QUALISTEELCOAT highly recommends that the coater is informed of the type of surface protection before the order is placed. If the temporary corrosion protection layer cannot be removed adequately, a loss of adhesion of the organic coating can occur.

6.4 Inspection of surface cleanliness after blasting

The surface must be very thoroughly blast cleaned (Sa 2 ½) per

ISO 8501-1. Prior to an eventual chemical pre-treatment process and prior to the primer application, the surface must be de-dusted.

The remaining dust quantity and size must be evaluated per ISO 8502-3. Therefore, the dust will be removed with a specific tape and visually evaluated. It is recommended to use a professional ISO 8502-3 Dust-Tape-Kit.

Class	Description of dust particles
0	Particles not visible under 10x magnification
1	Particles visible under 10x magnification but not with normal or corrected vision (usually particles less than 50 µm in diameter)
2	Particles just visible with normal or corrected vision (usually particles between 50 µm and 100 µm in diameter)
3	Particles clearly visible with normal or corrected vision (particles up to 0.5 mm in diameter)
4	Particles between 0.5 mm and 2.5 mm in diameter
5	Particles larger than 2.5 mm in diameter

Requirements:

Dust quantity and dust size must not exceed class 1.

6.5 Determination of the conductivity of dripping water

The final rinse preceding the conversion bath must be done with deionized water. The conductivity must comply with the supplier's instructions.

The measurement with the conductivity meter includes one measurement in the rinsing-bath before rinsing and one measure of the dripping water after final rinse.

Requirements:

If not otherwise prescribed by the chemical supplier, the conductivity of dripping water shall not exceed 30 µS/cm at 25°C.

6.6 Assessment of the conversion coating

The assessment for quality control of conversion coatings varies a lot for each system and different suppliers. The supplier of the chemical products for the conversion layer provides the necessary test methods and frequency of testing.

Requirements:

In compliance with the controls and specifications defined by the supplier of the conversion layer. The licence holder records the test results and the corrective actions of the pre-treatment line in order to meet the required result.

6.7 Assessment of stoving conditions

The temperature in the curing oven (powder coatings) and the object temperature must be measured with a 4-point measuring device. Three detectors must be attached to the parts (in the top, middle and bottom of the oven) and one to measure the air temperature amidst the parts.

The object temperature is measured on uncoated steel pieces that absorb the heat from the oven in a similar way as the parts thar are cured. For this purpose,

test material in steel of the same thickness and shape as the pieces that are to be coasted is used. Please note that tubular material heats up differently than material that can absorb the heat on both sides.

Requirements:

Stoving time and temperature must meet the requirements of the specifications provided by the coating supplier.

The software of the digital data logger for the oven measurements calculates the degree of polymerization based on the minimum conditions specified by the coating supplier. The degree of polymerization must be at least 100 and the maximum requirements may not be exceeded.

6.8 Assessment of forced drying conditions

For forced drying (liquid coatings) the temperature of the substrate in the drying oven must be measured. This may be done by means of a 4-point measuring device, using temperature probes attached to the substrate.

Requirements:

Forced drying time and temperature must meet the specifications of the coating system.

6.9 Determination of dew point

The dew point is the temperature at which water condenses at the same rate at which it evaporates. The measurement must be done with a dew point meter. The measurement is only required if it is expected, that the temperature of the parts for before coating could possibly be below the requirements of 3°C above the dew point temperature. This can happen if parts are stored outside in cold climate conditions or in unheated factories before blasting or before coating and the factory is not using a drying oven after the pre-treatment.

Requirements:

The substrate temperature for any coating application must be at least 3°C above the dew point.

6.10 Adhesion

The adhesion of the coating system onto the substrate can be measured by the following methods:

- cross cut test (ISO 2409)
- pull-off test (ISO 16276-1)

For film thickness of organic layers exceeding 250 µm, only the pull-off test per ISO 16276-1 can be used.

Requirements:

The cross-cut test requires a level 0 or maximum 1. The adhesion at the pull-off test shall be higher 5 MPa.

6.11 Direct impact resistance test

The direct impact resistance is determined per ISO 6272-1 using a 20-mm diameter spherical indenter dropped under standard conditions.

For powder coatings with a thickness d≥60 µm, a mass of one kilo that falls from a height of 25 cm must be used.

Requirements:

coating systems should not show any cracking or any detachment of the coating from the substrate.

6.12 Determination of dry film thickness

The dry film thickness of the individual layers in the system and the total dry film thickness shall be measured with a thickness gauge per ISO 2808.

The measurements must be representative of the inspected area.

Per ISO 19840, the total coated surface can be used to determine the number of necessary measurements. The sampling plan consists of the number of measurements to be taken in an inspection area, and is as follows:

Area/length of the inspected area (m^2 or running meter)	Minimum number of measurements	Maximum number of measurements allowed to be repeated
Up to 1	5	1
Above 1 to 3	10	2
Above 3 to 10	15	3
Above 10 to 30	20	4
Above 30 to 100	30	6
Above 100	Add 10 for every additional 100 m^2 or running meter	20 % of the minimum number of measurements

In case of base material blasted steel the values will be corrected per ISO 19840.

Surface profile in accordance with ISO 8503-1	Correction value
Fine	Measured value – 10 µm
Medium	Measured value – 25 µm
Coarse	Measured value – 40 µm

Requirements:

The arithmetic mean of all individual dry film thicknesses is equal to or greater than the required thickness.

All individual measurements are equal to or above 80 % of the required thickness.

The arithmetic mean shall not exceed the maximum imposed by the coating manufacturer, or in absence of such a value the maximum dry film thickness (individual value) shall be not greater than three times the nominal dry film thickness.

6.13 Visual appearance

Any visual inspection of coated parts should be done at 3 m for an interior setting and 5 m for an exterior setting in diffuse daylight and with a normal unaided vision.

Requirements:

At these distances and in diffuse daylight, the coating must not show any wrinkles, runs, sags, craters, blisters and other surface irregularities. Irregularities that are an image of the steel surface or the hot-dip galvanized zinc, visible through the coating, must be disregarded.

Colour and gloss may be measured if agreed upon between customer and coater.

6.14 Gloss

Gloss is measured per ISO 2813, using incident light at an angle of 60°.

Note: if the significant surface is too small or unsuitable for gloss to be measured with the gloss meter, the gloss should be compared visually with a reference sample, both observed under the same viewing angle.

Requirements:

Low gloss: (0 – 30) ± 5 units

Semi gloss: (31 – 70) ± 7 units

High gloss: (71 – 100) ± 10 units

6.15 Wet adhesion (boiling water or pressure cooker test)

The objective of this test is to determine the resistance of the coating system to cracking and loss of adhesion after accelerated aging by hot water. The coater or testing lab can decide which test is preferably used.

Method 1 with boiling water:

2 hours' immersion in boiling demineralised water (maximum 10 µS/cm at 20°C). Remove the test sample and allow it to cool down to room temperature. After one hour but within two hours, a cross-cut[9] shall be made according to § 6.10.

[9] In 2025, the test results do not lead to a non-conformity.

Apply an adhesive tape to the surface, ensuring that no air is trapped. After one minute, remove the tape at an angle of 45° with a sharp even pull.

Method 2 with a pressure cooker:

Add demineralised water (maximum 10 µS/cm at 20°C) to a pressure cooker with an internal diameter of about 200 mm or more to a depth of 25 mm and place a test panel measuring 50 mm in it. Place the lid in position and heat the pressure cooker until steam escapes from the valve. The weighted needle valve shall be adjusted to produce an internal pressure of 100 +/-10 kPA (1 bar). Continue heating for 1 hour, timing from the moment when steam first escapes from the valve. Cool the pressure cooker, remove the sample and allow it to cool down to room temperature. After one hour but within two hours, a cross-cut[10] shall be made according to § 6.10. Apply an adhesive tape to the surface, ensuring that no air is trapped. After one minute, remove the tape at an angle of 45° with a sharp even pull.

Requirements:

No blistering more than 2 (S2) per ISO 4628-2. There shall not be any defects or detachment. Some slight colour change is acceptable. The cross-cut test requires a level 0 or maximum 1.

6.16 Boiling test for the approval of chemical pre-treatments

Inspection in simmering (small to medium-sized bubbles are breaking through the surface in the complete container), deionized water (max. 10 µS/cm at 20°C).

The specimen is taken out of the water and cooled down to room temperature. After that it is stored for 1 hour at room temperature. The cross-cut shall be made after one hour but within two hours.

Exposure times:

Corrosivity class 1:	15 minutes
Corrosivity class 2:	30 minutes
Corrosivity class 3:	1 hour
Corrosivity class 4:	2 hours
Corrosivity class 5:	3 hours

Requirements:

The degree of blistering according to ISO 4628-2 must not be higher than 2 (S2). No defects nor stripping may occur. A certain change in colour is admissible. The cross-cut test requires a level 0 or maximum 1.

[10] In 2025, the test results do not lead to a non-conformity.

6.17 Resistance to mortar

Per EN 12206-1 mortar is a mixture of sand, lime and water. The mortar must be prepared by mixing 15 g of hydrated lime, 41 g of cement and 244 g of sand with sufficient tap water to make a soft paste. Apply four portions of the mortar, approximately 15 mm in diameter and 6 mm thick, to the test panel. Place the test panel horizontally at 38 ± 3ºC and 95 ± 5% relative humidity for 24 hours. Then remove manually the mortar from the coated surface and remove any residue with a damp cloth. Allow the panel to dry, and examine the coating with normal or corrected vision.

Requirements:

The mortar must be easily removable without leaving any residue. Any mechanical damage to the coating caused by grains of sand must be disregarded. The panel should not show any change in appearance or in colour after the test.

6.18 Neutral salt spray test (NSS)

The objective of this test is to determine the corrosion resistance of the coating system. For the corrosive categories, the test results will give an indication of the durability of the coating system.

All test panels must be scratched in the middle of the panel with a vertical scratch of 1 mm, 100 mm long and made with the Sikkens scratch tool. The depth of the scratch is made through the organic layer till the metallic layer (zinc or steel).

Place the coated test piece in a spray cabinet complying with ISO 9227 – continuous salt spray with the scratch in a vertical position. After testing, remove the sample carefully from the test cabinet, wash the test panels in de-ionized water at a temperature of less than 35ºC, and dry immediately. A cross cut test will be performed on each panel.

Assessment of corrosion and delamination at the scratch is carried out according to ISO 4628-8 (immediate after the washing of the test panels).

For this purpose, it is tried to lift the coating with a sharp tool from the carved line with an angle of 15° to 30°.

c = average corrosion of the substrate from the scratch according to ISO 4628-8 in mm

d = average delamination according to ISO 4628-8 in mm

Number of samples: 3 panels type B1 for each corrosivity-category

Requirements:

Category	Exposure time
C1 high	Not applicable
C2 high	240 h (10 days)
C3 high	480 h (20 days)
C4 high	720 h (30 days)
C5 high	1440 h (60 days)

Assessment	Requirement
Blistering (ISO 4628-2)	0
Rusting (ISO 4628-3)	Ri0
Cracking (ISO 4628-4)	0 (S0)
Flaking (ISO 4628-5)	0 (S0)
Delamination (ISO 4628-8)	d ≤ 3 mm on steel d ≤ 8 mm on zinc substrates
Corrosion (ISO 4628-8)	c ≤ 1.5 mm (For C5 ≤ 2 mm)
Adhesion (ISO 2409)	0 or 1

Rating	Number of samples passed / failed	Consequence for inspection / application
A	3 / 0	Passed
B	2 / 1	Passed
C	1 / 2	Failed
D	0 / 3	Failed

6.19 Resistance to humidity (continuous condensation test)

The determination of the resistance of organic layers to humidity is evaluated per ISO 6270-2 Category CH: condensation atmosphere with constant humidity (also known as continuous condensation test CC). The test is not applicable to corrosivity category C1. The exposure time for the other corrosivity categories is based on ISO 12944-6.

Number of samples: 3 panels type B1 for each corrosivity category

Requirements:

Category	Exposure time (based on ISO 12944-6)	
	Base material steel	Base material zinc
C1 high	Not applicable	Not applicable
C2 high	120 h (5 days)	240 h (10 days)
C3 high	240 h (10 days)	240 h (10 days)
C4 high	480 h (20 days)	480 h (20 days)
C5 high	720 h (30 days)	720 h (30 days)

Assessment	Requirement
blistering (ISO 4628-2)	0
rusting (ISO 4628-3)	Ri0
cracking (ISO 4628-4)	(0) S0
flaking (ISO 4628-5)	(0) S0

Rating	Number of samples passed / failed	Consequence for inspection / application
A	3 / 0	passed
B	2 / 1	passed
C	1 / 2	failed
D	0 / 3	failed

6.20 Accelerated weathering

This test simulates the resistance to discoloration and loss of gloss for an exterior use of coated products and is executed per ISO 16474-2. This test is only required for coating systems in corrosivity categories C3-C5.

After 1000 h exposure, the test specimen is rinsed in demineralized water.

To assess gloss and colour, mean of 10 measurements will be made on the cleaned, weathered sample and on the unexposed reference panel.

Requirements:

Parameter	Measurement method	Acceptance criteria	
Loss of gloss	Gloss measurement at 60° in accordance with ISO 2813	Class 1	Gloss retention must be at least 50%
		Class 2	Gloss retention must be at least 90%
Colour change	ΔE in accordance with ISO 11664-4	In accordance with acceptable ΔE values determined by QUALICOAT	

6.21 Natural weathering

The resistance of a coating system to weathering because of exposure in Florida is evaluated. This test only applies to coating systems intended for outdoor exposure. The test is executed by exposing the coating materials in Florida per EN 13438, A.4.8.2 and following the procedures per ISO 2810.

The test must start in April and the samples must be exposed to the elements facing 5° south for one year.

After exposure, the exposed samples must be cleaned using the following method:

Wash the test panels prior to inspection with water containing 1% neutral detergent, using a sponge and avoiding polishing. Afterwards rinse the panels with water with a maximum electrical conductivity of 10 µS/cm. This process must not scratch the surface.

To assess gloss and colour, three measurements will be made on each of the cleaned, weathered samples and on the unexposed reference panels. These measurements must be made at different points at least 50 mm apart.

Requirements:

Parameter	Measurement method	Acceptance criteria	
Loss of gloss	Gloss measurement at 60° in accordance with ISO 2813	Class 1	Gloss retention must be at least 50% after one year of exposure in Florida
		Class 2	Gloss retention must be at least 75% after one year at least 65% after two years at least 50% after three years
Colour change	ΔE in accordance with ISO 11664-4	In accordance with acceptable ΔE values determined by QUALICOAT	

Annex 1 – List of applicable Standards

Unless otherwise specified, the current version of the standard shall apply.

Standard		Title
EN	10346	Continuously hot-dip coated steel flat products for cold forming – Technical delivery conditions
EN	13438	Paints and varnishes - Powder organic coatings for hot dip galvanised or sherardised steel products for construction purposes (EN 13438)
ISO	1461	Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods (ISO 1461)
ISO	21920-2	Geometrical product specifications (GPS) - Surface texture: Profile - Part 2: Terms, definitions and surface texture parameters
ISO	2409	Paints and varnishes - Cross-cut test (ISO 2409)
ISO	2808	Paints and varnishes - Determination of film thickness (ISO 2808)
ISO	2810	Paints and varnishes - Natural weathering of coatings - Exposure and assessment (ISO 2810)
ISO	2813	Paints and varnishes - Determination of gloss value at 20°, 60° and 85° (ISO 2813)
ISO	3231	Paints and varnishes - Determination of resistance to humid atmospheres containing sulfur dioxide (ISO 3231)
ISO	9227	Corrosion tests in artificial atmospheres - Salt spray tests (ISO 9227)
ISO/IEC	17025	General requirements for the competence of testing and calibration laboratories; Technical Corrigendum 1 (ISO/IEC 17025 Technical Corrigendum 1)
ISO	11664 1	Colorimetry – Part 1: CIE standard colorimetric observers (ISO 11664-1)
ISO	11664 4	Colorimetry - Part 4: CIE 1976 L*a*b* Colour space
ISO	12944-1	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 1: General introduction (ISO 12944-1)
ISO	12944-2	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 2: Classification of environments (ISO 12944-2)
ISO	12944-3	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 3: Design considerations (ISO 12944-3)
ISO	12944-4	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 4: Types of surface and surface preparation (ISO 12944-4)
ISO	12944-5	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 5: Protective paint systems (ISO 12944-5)
ISO	12944-6	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 6: Laboratory performance test methods (ISO 12944-6)
ISO	12944-7	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 7: Execution and supervision of paint work (ISO 12944-7)

Standard		Title
ISO	12944-8	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 8: Development of specifications for new work and maintenance (ISO 12944-8)
ISO	16276-1	Corrosion protection of steel structures by protective paint systems - Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating - Part 1: Pull-off testing (ISO 16276-1)
ISO	2812-1	Paints and varnishes - Determination of resistance to liquids - Part 1: Immersion in liquids other than water (ISO 2812-1)
ISO	4628 -2	Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 2: Assessment of degree of blistering (ISO 4628-2)
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 (ISO 4628-3)
ISO	4628-4	Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 4: Assessment of degree of cracking (ISO 4628-4)
ISO	4628-5	Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 5: Assessment of degree of flaking (ISO 4628-5)
ISO	4628-8	Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 8: Assessment of degree of delamination and corrosion around a scribe or other artificial defect (ISO 4628-8)
ISO	6270-2	Paints and varnishes - Determination of resistance to humidity - Part 2: Procedure for exposing test specimens in condensation-water atmospheres (ISO 6270-2)
ISO	6272-1	Paints and varnishes - Rapid-deformation (impact resistance) tests - Part 1: Falling-weight test, large-area indenter (ISO 6272-1)
ISO	8501-1	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings (ISO 8501-1)
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 (ISO 8501-3)
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) (ISO 8502-3)
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 (ISO 8503-1)
ISO	8503-2	Preparation of steel substrates before application of paints and related products - Surface roughness characteristics of blast-cleaned steel

Standard		Title
		substrates - Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel - Comparator procedure (ISO 8503-2)
ISO	8503-4	Preparation of steel substrates before application of paints and related products - Surface roughness characteristics of blast-cleaned steel substrates - Part 4: Method for the calibration of ISO surface profile comparators and for the determination of surface profile - Stylus instrument procedure (ISO 8503-4)
ISO	8503-5	Preparation of steel substrates before application of paints and related products - Surface roughness characteristics of blast-cleaned steel substrates - Part 5: Replica tape method for the determination of the surface profile (ISO 8503-5)
ISO	16474-1	Paints and varnishes -- Methods of exposure to laboratory light sources -- Part 1: General guidance (ISO 16474-1)
ISO	16474-2	Paints and varnishes -- Methods of exposure to laboratory light sources -- Part 2: Xenon-arc lamps (ISO 16474-2)
ISO	2063	Thermal spraying - Metallic and other inorganic coatings - Zinc, aluminium and their alloys (ISO 2063)
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 (ISO 14713-1)
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 (ISO 19840)
ISO	9001	Quality management systems - Requirements
EN	1090-1	Execution of steel structures and aluminium structures - Part 1: Requirements for conformity assessment of structural components; German version EN 1090-1:2009+A1:2011 (EN 1090-1)
EN	1090-2	Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures; (EN 1090-2)

Annex 2 – Voluntarily Requirements to comply with EN 1090

Voluntary part of the Qualisteelcoat specifications, to meet the EN 1090 requirements.

In fact, for a coater there is not an obligation to give a Declaration of Conformity (DoC). This obligation is for the party that brings the product to the market, and a coater mostly works on order of a construction company or product company.

Due to the fact that EN 1090 adresses the party that brings the product on the market, A coater can do the declaration by himself that his in-house Control and production process fulfils the requirements of EN 1090. However, if a problem occurs, and the coater declared the performance by himself, and the procedures are not right, the customer (construction company) is in deep problems, and will have a significant penalty. If a customer wants to avoid that, either he have to do the audit by himself, or he have to do an audit by an external party. It is obvious, a declaration by a notified body is must stronger than a do it yourself audit, and that is much stronger than a self-declaration of performance by your supplier.

So, for an above mentioned company, it is rather convenient to work with a coater or hot-dip galvanizer that do have a guaranteed working process in line with the EN 1090. So it is an advantage to audit the coater in line with the EN 1090 as an extra option on the Qualisteelcoat specifications.

A2.1 ISO 9001

The EN 1090 is covered by the Qualisteelcoat specifications with the exception of:

1. Personnel chart with educated tests.
2. The description of the order to the coater with the written coating specifications.
3. An incoming goods procedure.
4. A procedure for customers with complains.

In most cases, an ISO 9001 can cover these aspects, however, one should verify this.

Items of the EN 1090 not (completely) covered by the Qualisteelcoat specification if this voluntary part is not executed.

A2.2 EN 1090-1 Section 6.3.2 Personnel

Responsibilities, authorities and cooperation of all employees in managerial, executive or supervising functions, which have an impact on the conformity of the product, must be determined.

>> The company needs to have an organisation chart, descriptions of functions and responsibilities and a record of qualification of personnel.

As an example, the following table can be used.

Name employee	Date of birth	Education level	Test to do	Date instruction	Instruction valid to	Instructor

A2.3 EN 1090-1 Section 6.3.6, EN 1090-2 attachment F, Coating specification

The coating system is defined by:

The expected lifetime (ISO 12944-1) and corrosivity class (ISO 12944-2), to be specified by the customer. The coater has to define a coating system which meets these requirements.

Or;

The coating system is specified by the customer. If applicable special working procedures regarding pre-treatment and/or special coating application are specified.
The coating system to be applied must be indicated in the order specification.
The coater must implement a written supervising and verifying schedule for the verification and recording of the components coated in compliance with the order specification.

>> The coater has to have a procedure for defining a proper coating system according to ISO 12944 in case the customer specifies an expected lifetime and corrosivity class. If the customer does not specify an expected lifetime and corrosivity class, the coater needs a procedure to assure the right system for the right use and/or circumstances. The coater has to check if the preparation grade is specified and executed according EN 1090-2, 10.2 (EN-ISO 8501-3).

All necessary information to execute the corrosion protection according the EN 1090 (preparation, corrosivity class and lifetime or coating system, testing requirements, special instructions regarding masking holes or edges) has to be provided by the customer and all this information must be clearly stated on the order guidance form or fabrication form:

- P-grade
- Pre-treatment
- Coating System
- Layer thickness
- Special requirements

A2.4 EN 1090-2 Section 10.2, 12.6 and Annex F, Incoming goods (products to be coated)

All surfaces to which paints and related products are to be applied shall be prepared to meet the criteria of EN-ISO 8501. The preparation grade according to EN-ISO 8501-3 shall be specified.

If the expected life of the corrosion protection and corrosivity category are specified, the preparation grade shall be in accordance with Table 22. Integratie EN 1090 en Quali-labels 150626 Thermally cut surfaces, edges and welds shall be suitably smooth and able to achieve the specified roughness after subsequent surface preparation (see Annex F).

NOTE Thermally cut surfaces are sometimes too hard for the abrasive material to achieve the suitable surface roughness. The procedure test specified in 6.4.4 may be used to establish surface hardness and determine whether grinding is necessary.

If the structure is to be protected against corrosion, inspection of the structure prior to corrosion protection shall be carried out against the requirements of Clause 10.
All surfaces, welds and edges shall be visually inspected. The acceptance criteria shall meet requirements of EN-ISO 8501.

>> The company has to have a procedure for visual inspection of all surfaces, welding joints and edges (preparation grade ISO 8501-3, EN 13438) to check the coatability of incoming goods. Also, the action if the coatability is not sufficient must be described.

A2.5 EN 1090-1 Section 6.3.8 and annex F, Checking and non-conforming products

Inspection and checking shall be undertaken in accordance with the quality plan. The execution specification shall specify any requirements for additional inspection and testing. Inspection and checking, including routine checking shall be recorded.

The manufacturer shall have written procedures that specify how to deal with non-conforming products. Such events shall be recorded as they occur and these records shall be kept for the period defined in the manufacturer's written procedures.

>> The coater must have procedures how to determine and treat non-conforming products. All cases of non-conformity must be recorded. Non-conforming products must be clearly and visibly marked.

Annex 3 – Exterior coating systems with powder coating

Annex 3 : Coating Systems with Powder Coating for outdoor and indoor use

This table is an unlimited list of coating systems applicable by Qualisteelcoat licensees.
The specification § 1.3. describes the qualification rules for coating systems

Coating System codification	Base material	Pretreatment	Deposition	Powder coat layer					Corrosivity Class			
				Primer	Intermediate Coat	Topcoat (Polyester)	Total coating system		C2	C3	C4	C5
				µm	µm	µm	Number of organic layers (@	µm (@)				
P-ST1-M	ST	Mechanical (SA 2 1/2)				80	1	80	✓	×	×	×
P-ST1-C	ST	Chemical				80	1	80	✓	×	×	×
P-ST2-C	ST	Chemical		60		80	2	140	✓	✓	✓	×
P-ST2-M	ST	Mechanical (SA 2 1/2)		60		80	2	140	✓	✓	✓	×
P-ST2-MC	ST	Mechanical (SA 2 1/2) + Chemical		60		80	2	140	✓	✓	✓	×
P-ST3-C	ST	Chemical		60	60	80	3	200	✓	✓	✓	×
P-ST3-M	ST	Mechanical (SA 2 1/2)		60	60	80	3	200	✓	✓	✓	×
P-SZ1-C	SZ	Chemical				80	1	80	✓	✓	×	×
P-SZ1-M	SZ	Mechanical (sweeping)				80	1	80	✓	✓	×	×
P-SZ2-C	SZ	Chemical		60		80	2	140	✓	✓	✓	×
P-SZ2-M	SZ	Mechanical		60		80	2	140	✓	✓	✓	×
P-SZ3-C	SZ	Chemical		60	60	80	3	200	✓	✓	✓	✓
P-HD1-C	HD	Chemical				80	1	80	✓	✓	✓	×
P-HD1-M	HD	Mechanical (sweeping)				80	1	80	✓	✓	✓	×
P-HD1-MC	HD	Mechanical (sweeping) + Chemical				80	1	80	✓	✓	✓	×
P-HD2-C	HD	Chemical		60		80	2	140	✓	✓	✓	✓
P-HD2-M	HD	Mechanical (sweeping)		60		80	2	140	✓	✓	✓	✓
P-HD2-MC	HD	Mechanical (sweeping) + Chemical		60		80	2	140	✓	✓	✓	✓
P-HD3-C	HD	Chemical		60	60	80	3	200	✓	✓	✓	✓
P-HD3-M	HD	Mechanical		60	60	80	3	200	✓	✓	✓	✓
P-HD3-MC	HD	Mechanical (sweeping) + Chemical		60	60	80	3	200	✓	✓	✓	✓
P-MS1	MS	none				80	1	80	✓	✓	✓	×
P-MS2	MS	none		60		80	2	140	✓	✓	✓	✓
P-STEC2-C	ST	Chemical	EC			80	2	80	✓	✓	✓	✓
P-STEC3-C	ST	Chemical	EC		60	80	3	140	✓	✓	✓	✓
P-SZEC2-C	SZ	Chemical	EC			80	2	80	✓	✓	✓	✓
P-HDEC2-C	HD	Chemical	EC			80	2	80	✓	✓	✓	✓

Codification:

ST	Steel
SZ	Continuous hot dip galvanized steel (coil) the thickness is define in the EN 10346
HD	Hot Dip Galvanized Steel, the zinc thickness is defined in the ISO 1461
MS	Metal Spray, the thickness is defined in the ISO 2063-1 table C1
EC	Electrophoretic primer (e-coat) 15 µm minimum
✓	Recommended
×	Not possible to
EC-pretreatment	Only degreasing except for integrated electrophoretic lines.
@	Number of organic layers and total layer thickness **EC EXCLUDED**
Top coat Polyester	Polyester Qualicoat class 1 or Class 2 can be used indistinctly

Annex 4 – Types of test panels

Type		Composition of panel	Dimension
A		test panels bare steel + zinc phosphate + organic layer	105 x 190 mm 0,75 mm thick
B	**B1**	substrate + complete coating system (eventual surface preparation + eventual metallic layer + eventual pre-treatment + organic layer)	For getting a license or granting an approval: minimum 140 x 70 mm 1-2 mm thick
	B2	substrate + complete coating system (eventual surface preparation + eventual metallic layer + eventual pre-treatment + organic layer)	For testing finished product at the coater the geometry of tested objects must correspond to the parts that are treated
C		test panels EN AW5005 +organic layer	300 x 100 mm 1 mm thick

Annex 5 – Laboratory test procedures

This Annex describes the order of which the laboratory tests after a coater inspection need to be performed in and the actions to be taken when one of them is considered failed.

A5.1 Laboratory tests for coating systems on steel panels

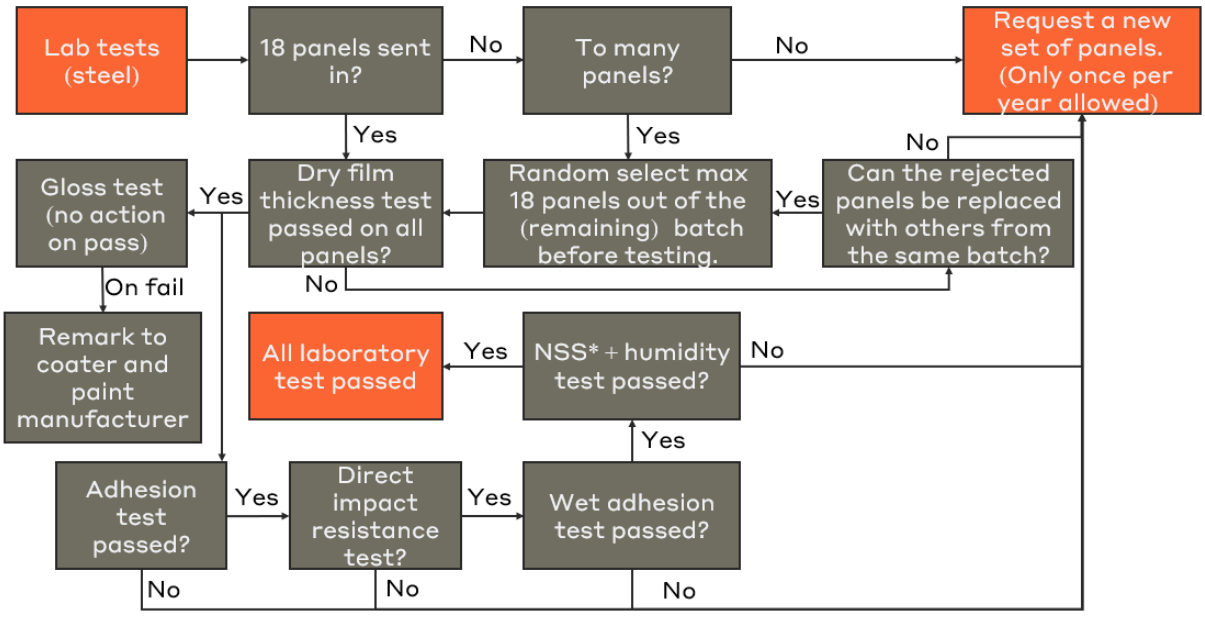
The table below shows the order of testing and the assignment for steel test panels on which a powder or liquid coating system is applied. This only applies for coating systems on steel panels that aim for C3H to C5H.

Order of testing	Required lab tests	Panels	Rating system, acc. to chapter	Action on failure[1]
1	Dry film thickness	All 18 panels	6.12	a2
2	Gloss	Panels #1,2,3	6.14	a3
3	Adhesion (dry)	Panels #1,2,3	A4.4	a4
4	Direct impact resistance test	Panels #1,2,3	A4.5	a4
5	Wet adhesion	Panels #4,5,6	A4.6	a5
6	Neutral salt spray	Panels #7 to 12	6.18[2]	a6
7	Resistance to humidity	Panels #13 to 18	6.19[2]	a6

[1] *See A5.3 for details on the actions*

[2] *This test is considered failed if neither the aimed C-category or the C-category below has passed the test*

For a clear process overview the flowchart below has been provided.



A5.2 Laboratory tests for coating systems on galvanized or thermal sprayed panels

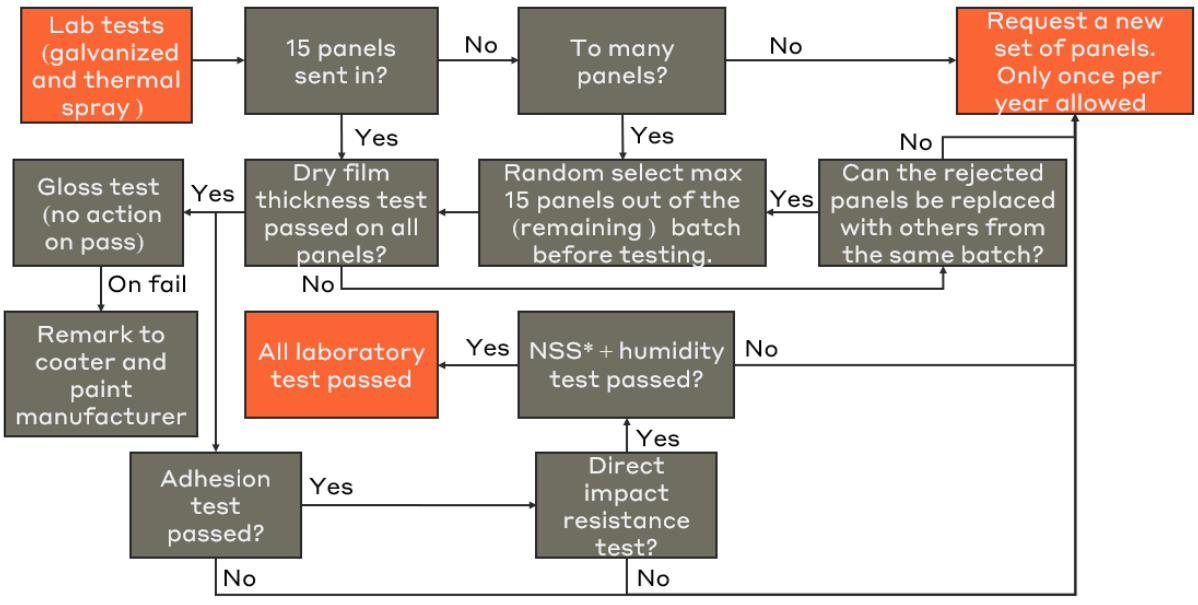
The table below shows the order of testing and the assignment for galvanized or thermal sprayed test panels on which a powder or liquid coating system is applied. This only applies for coating systems on galvanized or thermal sprayed panels that aim for C3H to C5H.

Order of testing	Required lab tests	Panels	Rating system, acc. to chapter	Action on failure[1]
1	Dry film thickness	All 15 panels	6.12	a1
2	Gloss	Panels #1,2,3	6.14	a3
3	Adhesion (dry)	Panels #1,2,3	A4.4	a4
4	Direct impact resistance test	Panels #1,2,3	A4.5	a5
5	Neutral salt spray	Panels #4 to 9	6.18[2]	a6
6	Resistance to humidity	Panels #10 to 15	6.19[2]	a6

[1] *See A5.3 for details on the actions*

[2] *This test is considered failed if neither the aimed C-category or the C-category below has passed the test*

For a clear process overview the flowchart below has been provided.



A5.3 Actions on failure of one of the laboratory tests

Below the table that states the actions to be taken as referred to in the chapters A5.1 and A5.2. If the GL is unknown to the testing laboratory, then the QUALISTEELCOAT secretariat needs to be informed.

Action	Description	Testing laboratory notifies the action owner stated below
a1	Replace the rejected panels with others from the same batch. A total of **15 panels must comply**. If this compliance hasn't been met, then stop all testing and request a new set of panels.	GL (coater)
a2	Replace the rejected panels with others from the same batch. A total of **18 panels must comply**. If this compliance hasn't been met, then stop all testing and request a new set of panels.	GL (coater)
a3	Send remark to coater and paint manufacturer	GL (coater) + GL (paint manufacturer)
a4	**If** 2 out of 3 failed (**rank C**) or 3 out of 3 failed (**rank D**) **stop all testing** and request a new set of panels, else go to the next test in order of testing	GL (coater)
a5	**If** 2 out of 3 failed (**rank C**) or 3 out of 3 failed (**rank D**) **stop all testing** and request a new set of panels, else go to NSS and resistance to humidity test	GL (coater)
a6	**If** 2 out of 3 failed (**rank C**) or 3 out of 3 failed (**rank D**) **stop all testing** and request a new set of panels	GL (coater)

Only **once per year** a new set of panels can be requested, if the second set of panels fails the results of the inspected coating system is considered unsatisfactory.

A5.4 Alternative rating systems for the adhesion test

The test method stated in chapter 6.10 applies to the laboratory test as well. Yet as an additional requirement for the laboratory test the A, B, C, D rating system is being used, see table below.

Rating	Number of samples passed/failed	Consequence for test
A	3 / 0	Passed
B	2 / 1	Passed
C	1 / 2	Failed
D	0 / 3	Failed

A5.5 Alternative rating systems for the direct impact resistance test

The test method stated in chapter 6.11 applies to the laboratory test as well. Yet as an additional requirement for the laboratory test a A, B, C, D rating system is being used, see table in chapter A5.4 above.

A5.6 Alternative rating systems for the wet adhesion test

The test method stated in chapter 6.15 applies to the laboratory test as well. Yet as an additional requirement for the laboratory test a A, B, C, D rating system is being used, see table in chapter A5.4 above.