International
Standard

ISO 7054

Corrosion of metals and alloys — Wiping method for measurements of gases and particles on real structures and equipment

Corrosion des métaux et alliages — Méthodes d'essuyage pour mesurage des gaz et des particules sur structures et équipements en conditions réelles

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys*.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Airborne salts, gases and particles deposited on structures and equipment are corrosion and/or degradation factors for metals, alloys and organic materials. Information on the surfaces of these substances is useful for understanding the corrosion conditions or degradation mechanism, the remaining life of these materials and the corrosivity of the environment. The wiping method outlined in this document is an example of a measurement method used to determine the types and concentrations of depositions on real structures and equipment.

Depositions related to corrosion and degradation are classified as soluble and insoluble materials. Soluble depositions collect moisture and retain a thin layer of water on their surfaces. Prolonged wetness accelerates corrosion and degradation because the thin layer of water contains soluble depositions with a high concentration of electrolytes.

Various methods for collecting airborne gases and particles are widely used to categorize corrosivity. However, for example, the accumulation method described in ISO 9225 requires considerable time (over a year), sampling is conducted every month and a kit consisting of clean gauze and a frame is needed to obtain reliable data. The wiping method described in this document is also widely used in all industries, and is a quick, low-cost method to determine the specifications of materials and coatings, the intervals for maintenance and replacement and the progress of corrosion and degradation. Despite these advantages, procedures for deposition sampling and measurement have not yet been established, and measures to prevent contamination and improve measurement quality are also needed to conduct appropriate corrosion and degradation checks.

The deposition concentration obtained by the wiping method is useful for environmental management because it provides information for prioritising environmental degradation factors. Many instantaneous values are used for the deposition concentration, which is expressed by a mass per unit area without a time component.

Corrosion of metals and alloys — Wiping method for measurements of gases and particles on real structures and equipment

1 Scope

This document specifies a method for evaluating depositions on real structures and equipment by wiping. Depositions become corrosion and/or degradation factors for metals, alloys and organic materials, and can be analysed quantitatively to control the corrosion and degradation of real structures and equipment.

The method specified in this document is suitable for evaluating the type and amounts of depositions on real structures and equipment in all industries. This method identifies the type of depositions and gives instantaneous values of the concentrations of water-soluble and insoluble depositions, which are expressed by mass per area without a time component. These values provide information on environmental factors related to corrosion and degradation. The method can be used to detect water-soluble depositions, including chloride ion, sulfate ion and other ions, and can assist users in understanding the synergistic and antagonistic effects that accelerate corrosion.

This document is applicable to:

- metals and their alloys;
- metallic coatings;
- organic coatings;
- concretes and other structural materials.

The method for determining chloride on clean surfaces, which ensures the cleanness of steel substrates after surface preparation such as grinding, polishing, cleaning and rinsing and before the application of paints, is given in ISO 8502-2, ISO 8502-5, ISO 8502-6 and ISO 8502-9.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8044, *Corrosion of metals and alloys — Basic terms and definitions*

ISO 9225, *Corrosion of metals and alloys — Corrosivity of atmospheres — Measurement of environmental parameters affecting corrosivity of atmospheres*

ISO 11844-1, *Corrosion of metals and alloys — Classification of low corrosivity of indoor atmospheres — Part 1: Determination and estimation of indoor corrosivity*

ISO 11844-2, *Corrosion of metals and alloys — Classification of low corrosivity of indoor atmospheres — Part 2: Determination of corrosion attack in indoor atmospheres*

ISO 11844-3, *Corrosion of metals and alloys — Classification of low corrosivity of indoor atmospheres — Part 3: Measurement of environmental parameters affecting indoor corrosivity*

ISO 7503-1, *Measurement of radioactivity — Measurement and evaluation of surface contamination — Part 1: General principles*

ISO 8502-2, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 2: Laboratory determination of chloride on cleaned surfaces*

ISO 8502-5, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 5: Measurement of chloride on steel surfaces prepared for painting (ion detection tube method)*

ISO 8502-6, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 6: Extraction of water soluble contaminants for analysis (Bresle method)*

ISO 8502-9, *Preparation of steel substrates before application of paints and related products — Tests for the assessment of surface cleanliness — Part 9: Field method for the conductometric determination of water-soluble salts*

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8044, ISO 9225, ISO 11844-1, ISO 11844-2, ISO 11844-3, ISO 7503-1, ISO 8502-2, ISO 8502-5, ISO 8502-6, ISO 8502-9 and ISO 3696 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at https://www.iso.org/obp
- IEC Electropedia: available at https://www.electropedia.org/

4 Introduction of general wiping method

Depositions can be sampled by using the wiping method. The wiping method entails wiping not only the surfaces of metals and alloys, but also organic materials and paint systems of structures and equipment exposed to atmospheric conditions. The concentration of the depositions can also be determined by this method. This document applies to the measurement of gases and particles that affect corrosion and degradation of the surfaces of materials. The concentrations of the soluble and insoluble depositions are expressed by mass per unit area, and the time component is not considered. The risks of corrosion in metals and alloys and the risks of degradation in organic materials can be determined by comparing the concentration of depositions on various parts of the structures and equipment, or at various sites where structures and equipment are located. The wiping method is a powerful, low-cost and easy-to-use method for capturing soluble and insoluble depositions that does not require a fixed time exposures or exchanges of the sampling medium.

The wiping method provides information on the types and concentrations of corrosive chemical depositions. This helps users:

- understand the corrosion of metals and alloys and the degradation of organic materials;
- understand the synergistic and antagonistic effects of environmental degradation agents;
- find better maintenance methods and exchange maintenance cycles for real structures and equipment;
- perform environmental assessments and determine appropriate specifications for construction.

The wiping method can be used widely to measure depositions on various organic and inorganic materials with different surface roughness and water repellency. It is also applicable to various oxides of metals and alloys. The advantages of the wiping method include the following:

a) it applies to hydrophobic materials, hydrophilic materials and heavily-corroded rusty surfaces, which have different deposition efficiencies from polished surfaces of metals and alloys;

b) it provides instantaneous values for the concentration of depositions, which is useful for:

- maintaining structures and equipment;

- maintaining certain components such as bridges, solar cells, electric parts, electronic components, circuit boards, insulators and paint surfaces;
- making decisions on the appropriate times to start and finish the wash cycle;
- conducting an environmental assessment when making quick decisions about constructions and specifications;
- evaluating the penetration of Cl^- into the surfaces of concrete structures and ceramics;
- conducting environmental assessments for quick decisions on construction and specification;
- evaluating Cl^- penetration into concrete structures and ceramics.

5 Preparation

The tools used in the wiping method should be cleaned with boiling water and then rinsed with either distilled, pure or deionized water. The tools include:

a) any one of the following:

- one to three pieces of gauze for one part of wiping with the following dimensions: 100 mm to 500 mm × 100 mm to 500 mm;
- one to three pieces of cotton for one part of wiping with the following mass: 1 g to 10 g;
- one to three pieces of sponge for one part of wiping with the following dimensions: 100 mm to 300 mm × 100 mm to 300 mm × 10 mm to 30 mm.

b) cleaned gloves or tweezers (to handle the gauze, cotton or sponge);

c) cleaned square or rectangle frame for the determination of the wiping area.

The frames are made from plastic, metals and alloys, or using a magnet. Double-sided tape can be used to adhere the frame to the structure and equipment. Masking tape with a width of 5 mm to 20 mm can be used for the determination of the wiping area instead of the frame as shown in Figure 1. The four pieces of masking tape can outline a square or rectangle shape for the wiping area on a rough surface. The frames, which can be made and cleaned in advance, ensure the wiping area remains the same. Alternatively, a marker can be used to draw a square or rectangle to define the wiping area as shown in Figure 1. The square is drawn using a ruler or set square to ensure the wiping area remains the same. The dimensions for wiping shown in Figure 2 are as follows:

- The wiping area is 10 mm to 500 mm by 10 mm to 500 mm.
- The minimum wiping area, S_{min}, is 100 mm^2 as shown in Figure 2 a).
- The maximum wiping area, S_{max}, is 250 000 mm^2 as shown in Figure 2 c).

The deposition on a real steel structure or a piece of equipment is wiped using a clean, wet gauze, cotton or sponge as follows:

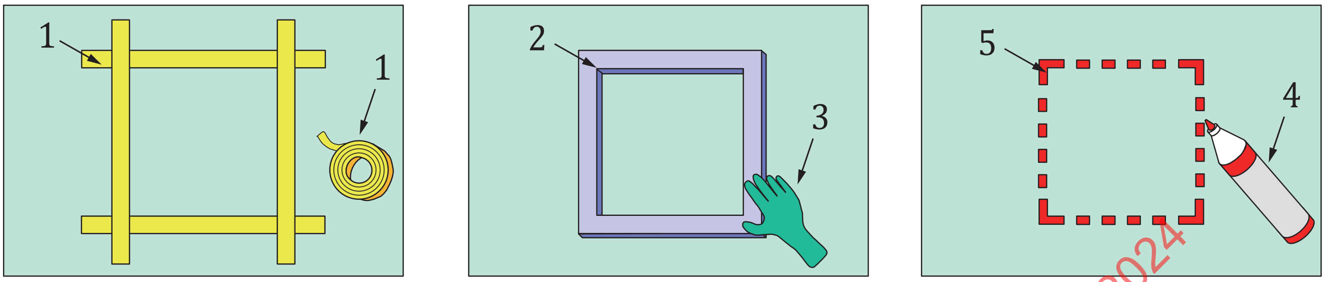
1) 10 ml to 50 ml of distilled, pure or deionized water, such as Grade 2 water (see ISO 3696) with an electrical conductivity of 0,1 mS m^{-1} per wiping area, which is applied to the wet gauze, cotton or sponge before wiping.

2) Plastic storage bags are prepared to hold the wet gauze, cotton or sponge before and after wiping.

3) An example of the determination of wiping areas is shown Figure 3. Three wiping areas are determined at random to evaluate the average or median deposition concentration on a steel structure as shown in Figure 3 a) or on an equipment as shown in Figure 3 b).

4) After wiping, the gauze, cotton or sponge should be put in a plastic storage bag with labels indicating the date, location, position of wiping, wiped area, the weather and surface conditions of the steel structure or the equipment.

5) 100 ml to 500 ml of distilled, pure or deionized water for one wiping area to extract the deposition from the wet gauze, cotton or sponge after wiping.



a) Wiping area defined using masking tape

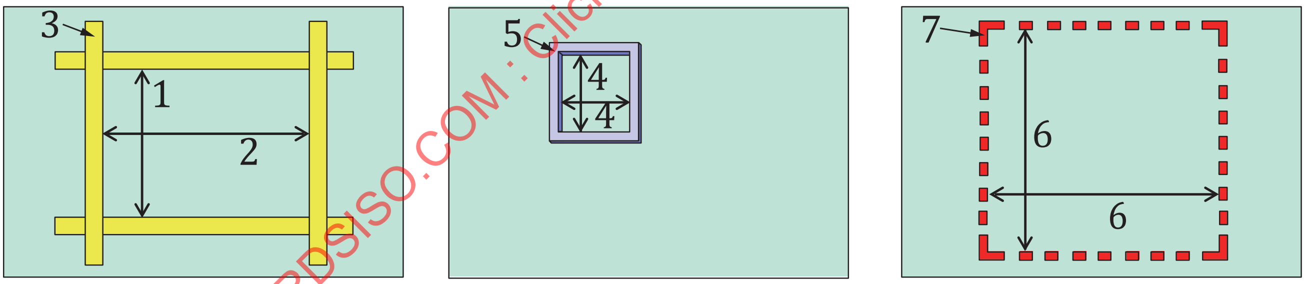
b) Wiping area defined using a magnetic frame, frame affixed with double-sided tape or frame held with hand wearing glove

c) Wiping area defined by line drawn using marker

Key

1 masking tape
2 sheet frame
3 clean glove
4 marker
5 line drawn using marker

Figure 1 — Masking tape, frames and line drawn with marker to define the wiping area



a) Rectangle wiping area defined using masking tape

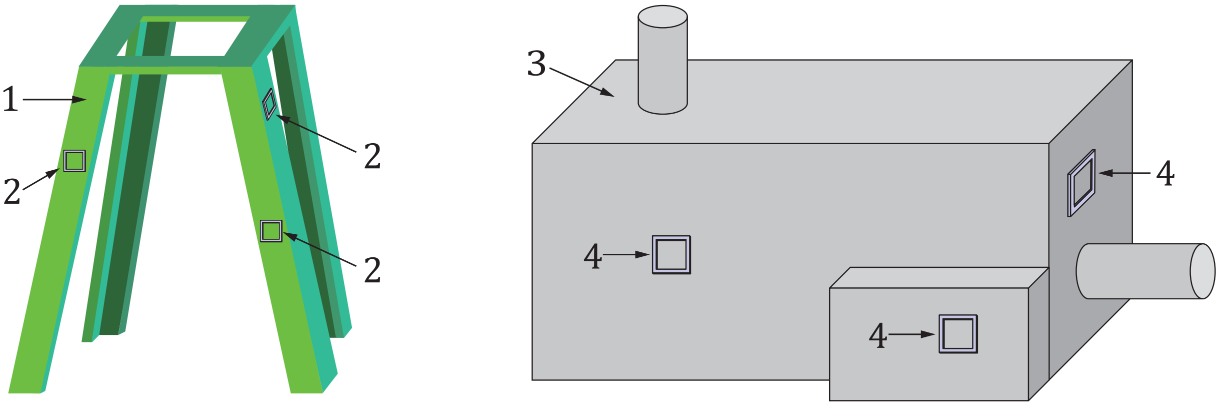
b) Minimum square wiping area defined using a magnetic frame or frame affixed with double-sided tape

c) Maximum square wiping area defined by line drawn using marker

Key

1 vertical length of wiping area, 10–500 mm
2 horizontal length of wiping area, 10–500 mm
3 masking tape
4 equal vertical and horizontal lengths of minimum wiping area, 10 mm
5 sheet frame
6 equal vertical and horizontal lengths of maximum wiping area, 500 mm
7 line drawn using marker

Figure 2 — Dimension of the wiping area



a) Deposition concentration measurement on the steel structure to evaluate the average or median value

b) Deposition concentration measurement on the equipment to evaluate the average or median value

Key

1	angle-type steel member
2	wiping areas on a steel structure: at least three parts selected at random can be wiped to evaluate the average or median deposition concentration on the structure
3	body of equipment
4	wiping areas on a piece of equipment: at least three areas selected at random can be wiped to evaluate the average or median deposition concentration on the equipment

Figure 3 — Example of determination of wiping areas on a real structure and real equipment

6 Wiping procedure

6.1 General

The wiping method is composed of three main steps: wiping, extraction of the deposition and analysis. A flowchart of the wiping method is shown in Figure 4. All tools should be cleaned before wiping to prevent contamination. A specific subject area is wiped to obtain data on the mass of the deposition per unit area. The soluble and insoluble depositions are separated by filtration. After extraction, the soluble depositions in the extract solution are measured by using a detector tube, ion chromatography, salt concentration meter or conductometer for the salt component measurement. The mass and chemical components of the insoluble depositions on the filter after extraction are measured with a scale or by inductively coupled plasma atomic emission spectroscopy (ICP-AES), inductively coupled plasma optical emission spectrometry (ICP-OES) or X-ray fluorescence analysis (XRF).

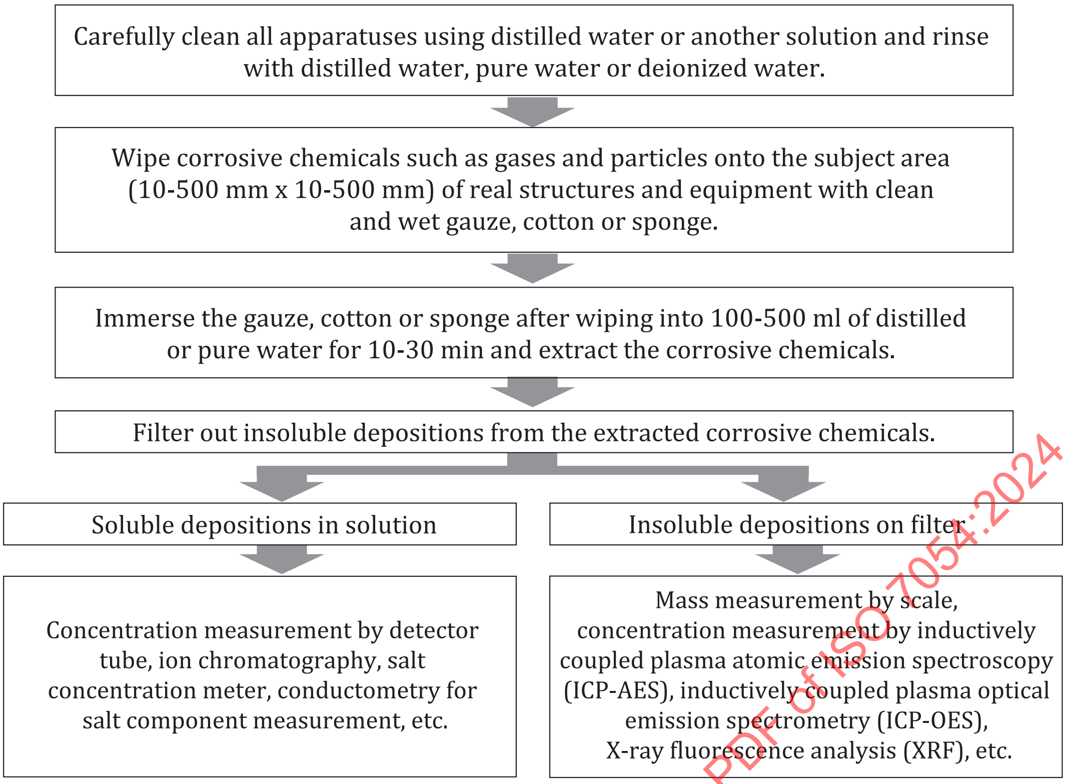
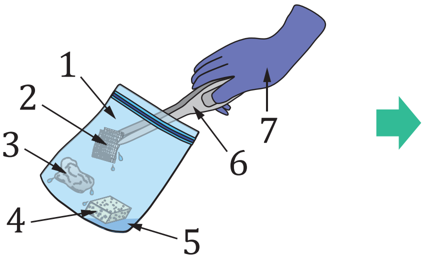


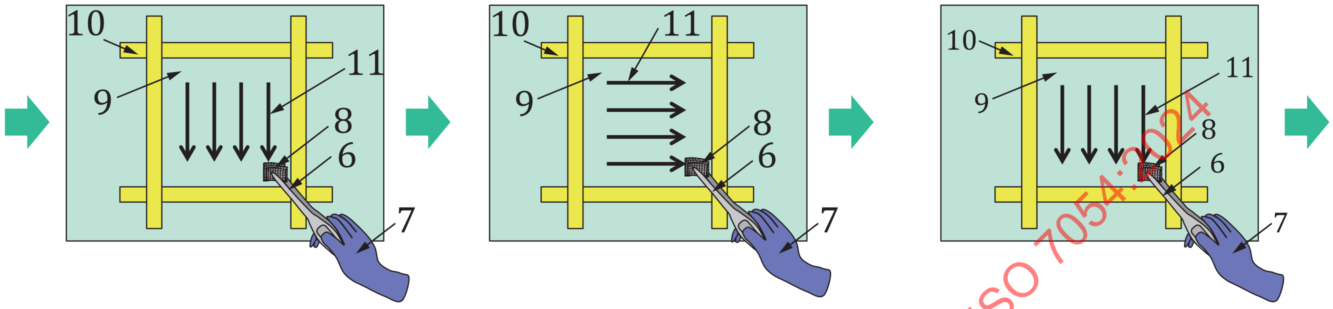
Figure 4 — Flowchart of wiping method

6.2 Wiping

This subclause specifies the procedure for wiping the subject area of the deposition measurement. The step of wiping on real structures or equipment is shown in Figure 5. A piece of clean and wet gauze, cotton or sponge are taken with cleaned gloves or tweezers for wiping. The subject area is defined using masking tape to outline the subject area, or by attaching the magnetic sheet or plastic frame with double-sided tape, or by drawing a frame using a marker. The dimensions of the subject area should be measured precisely using a ruler or calliper. Depositions should be incorporated into the gauze, cotton or sponge adequately after the subject area has been wiped more than three times. The pattern and direction of wiping are shown in Figures 5 b), c), and d). The subject area should be wiped in the same direction and the wiping direction should be parallel to the frame as shown in Figure 5 b). The wiping direction at the next step as shown in Figure 5 c) should be changed to the right angle to the previous wiping direction. The wiping direction at the final step as shown in Figure 5 d) should be changed to the right angle to the previous wiping direction. The outside of the frame should not be wiped. The water should not be spilled during wiping. The wet gauze, cotton or sponge should be thoroughly squeezed to prevent water spilling. After wiping, put the gauze, cotton or sponge in a new, clean plastic storage bag. If there is spilling, the spilled water should be contained in a storage bag with the gauze, cotton or sponge after wiping. Any excess liquid should be kept in the same bag until analysis. The sample number, date of wiping, wiping location, wiping part, wiping area, environment, weather in the three days before wiping, etc., should be written on the plastic storage bag as shown in Figure 5 f). Users should wait three days after rain to ensure that the depositions are not washed away by the rain.



a) Take clean gauze, cotton or sponge out of storage bag for wiping



b) Step 1: Wipe in parallel lines against square

c) Step 2: Wipe 90 ° to step 1

d) Step 3: Wipe 90 ° to step 2

e) Step 4: Store gauze, cotton or sponge agent in cleaned plastic storage bag

f) Step 5: Record wiping details on storage bag (e.g. date, area, part of structure or equipment, site, climate)

Key

1 clean plastic storage bag
2 new, clean and wet gauze
3 new, clean and wet cotton
4 new clean and wet sponge
5 water leftover after wiping, used as blank solution for deposition concentration measurement
6 clean tweezers to hold wiping gauze, cotton or sponge, can also be held with clean glove
7 clean glove
8 wet gauze, cotton or sponge for wiping
9 wiping area defined by masking tape, frames or lines drawn with marker
10 masking tape
11 wiping direction (parallel to sides of square)
12 wet gauze, cotton or sponge after wiping structure or equipment

13 new clean plastic storage bag for gauze, cotton or sponge after wiping: different from gauze, cotton or sponge storage bag used before wiping

14 solution spilled during wiping

15 wiping information recorded on storage bag

Figure 5 — Wiping procedure (cleaning, wiping pattern/ direction and storage of gauze, cotton or sponge)

6.3 Cautions for wiping

This subclause describes general precautions to take when wiping in order to obtain precise deposition concentration data. The precautions are as follows:

a) Wiping should be done after three to seven consecutive days of good weather to ensure that the depositions have not been washed away by rain. The deposition concentration is only considered reliable under these conditions.

b) When the area to be wiped is under a roof or indoors, the measurement should be done at least twice at a prescribed interval to evaluate the deposition accumulation effect.

c) The angle between the wiping area and the ground should be 90°, as shown in Figure 5. If any other angle is used, special care is required to collect correct deposition concentration data.

d) When the angle between the wiping area and the ground is 180°, the conditions at the back side of the wiping area are similar to those of an area under a roof.

e) The type of material and its surface conditions are not considered except in the case of highly water repellent (hydrophobic) materials, highly hydrophilic materials and heavily-corroded rusty surfaces.

f) Information on the treatment and conditions of the surface should be recorded on the plastic storage bag.

g) When depositions adhere to materials (such as metals, alloys, corroded materials, painted materials, materials with different surface roughness, glass and organic materials) in different ways, the concentration of the depositions should be calculated by using a calibration factor, such as an appropriate correction coefficient.

h) When the concentrations of the depositions differ at different wiping pressures, care should be taken to use the same pressure to ensure that the deposition concentration data are correct.

i) Grade 2 water, as described in ISO 3696, should be used to clean the tools and perform extractions to reduce the risk of contamination.

j) To obtain precise data on the deposition concentrations and their annual averages, the concentration of the depositions on a given part should be measured several times, at minimum once in each season.

k) In very humid environments, gaseous pollutants such as hydrogen sulfide, sulfur oxide, sulfur dioxide, nitrogen oxide, nitrogen dioxide and ammonia change to sulfate ion, nitrate ion and ammonium ion, which adhere to the surfaces of structures and equipment. A thin layer of water forms in humid environments, and this water can contain dissolved gaseous pollutants. These gaseous depositions can be collected on the wet gauze, cotton or sponge when the wiping method is used.

6.4 Extraction

This subclause specifies the procedure for extracting the depositions collected by wiping from the gauze, cotton or sponge used in wiping. The steps of the extraction are as follows:

a) Immerse the gauze, cotton or sponge for wiping in 100 ml to 500 ml of distilled, pure or deionized water for 10 min to 30 min.

b) Soluble depositions such as soluble salts on the gauze, cotton or sponge are extracted in the solution.

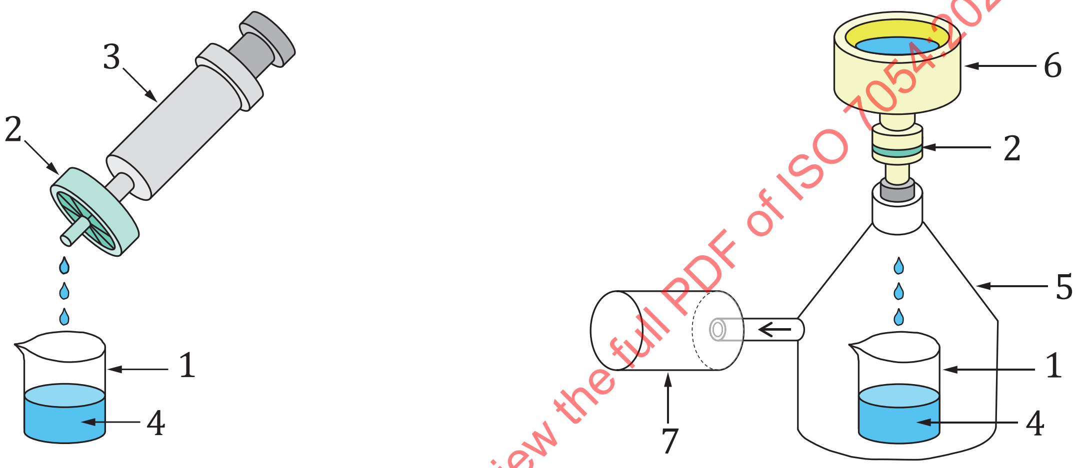
c) Apply ultrasonic washing to the solution in which the gauze, cotton or sponge has been immersed for 10 min to 30 min to extract the soluble depositions. Ultrasonic washing should be repeated at least three times.

d) After extracting the soluble depositions, filter out the insoluble depositions from the solution. A syringe filter may be used, as shown in Figure 6 a).

e) When the insoluble depositions cannot be filtered by gravity, filtrations under reduced pressure may be performed with a suction pump, vacuum pump or aspirator, as shown in Figure 6 b).

f) Allow the filter with the insoluble depositions to dry so the insoluble depositions can be weighed. The filter should be weighed before use. Subtract the original mass of the filter from the mass after the test to determine the precise mass of the insoluble depositions.

g) The nominal pore size of the filter can be selected based on the diameter of the dust or insoluble particles. The size of the filter mesh also depends on the capacity of the deposition measurement tool.



a) Filtration with syringe filter **b) Filtration with reduced pressure flask**

Key

1	beaker
2	filter (e.g. membrane filter with a pore size of $2{,}0 \times 10^{-7}$ mm or smaller)
3	syringe
4	filtrate
5	vacuum flask
6	funnel
7	suction pump, vacuum pump or aspirator for pressure reduction

Figure 6 — Filtrations with a syringe filter and a reduced pressure flask with suction pump, vacuum pump or aspirator

7 Analysis

7.1 Soluble deposition concentration measurement method by detector tube

The solution after filtration can be analysed using a detector tube to determine the concentration of the depositions of Cl^-, SO_4^{2-} and other ions. When using a Cl^- detector tube, cut both ends of the tube and immerse the bottom end into the solution. The detection tube method to determine chloride on clean surfaces for preparing steel substrates before applying paint is described in ISO 8502-2, ISO 8502-5, ISO 8502-6 and ISO 8502-9.

7.2 Soluble deposition concentration measurement method by ion chromatography

The solution after filtration can also be analysed by ion chromatography to determine the concentration of Cl^-, SO_4^{2-} and other ions. Ion chromatography is a powerful tool that can detect many different types of ions. This information is useful for understanding the mechanisms of corrosion and degradation as well as the synergistic or antagonistic effects of each ion producing the acceleration or inhibition of corrosion.

7.3 Soluble deposition concentration measurement method by other analysis devices

A salt concentration meter or conductometer for salt component measurement can be used to determine the soluble depositions. The conductometric measurement method for soluble salts is described as the Bresle method in ISO 8502-6 and ISO 8502-9.

7.4 Insoluble deposition concentration measurement methods

The amount of the insoluble depositions is determined by weighing the filter before and after filtration. The insoluble depositions remaining on the filter can be observed by using a scanning electron microscope. These depositions are detected by ICP-AES, ICP-OES and XRF are also useful for conducting quantitative analysis of depositions. The mass and chemical components of the insoluble depositions on the filter are measured by using a scale.

8 Expression of results

8.1 Units of soluble and insoluble deposition concentrations

Determining the concentration of the depositions on real structures and equipment can provide information on the rates of deposition and corrosion. This is useful for finding ways to control corrosion and maintain the structures and equipment.

When the exposure times or operating times of a structure, equipment or exposure test specimens are known, the rate of deposition is expressed by the mass per unit area per unit time, for example, as milligrams per square meter per day ($mg\ m^{-2}\ day^{-1}$).

When the exposure or operating times is not known, the deposition concentration is expressed by the mass per unit area, for example, as milligrams per square metre ($mg\ m^{-2}$). Because the time component is not considered in the wiping method specified in this document, the deposition concentration obtained by the wiping method cannot be compared with the deposition rate obtained by the method described in ISO 9225, where the unit is $mg\ m^{-2}\ day^{-1}$. However, the deposition concentrations expressed by $mg\ m^{-2}$ is still useful for understanding the corrosion risk and corrosivity of the environment.

The wiping method can also be used to obtain seasonal and annual average corrosion data. If the depositions on real structure, equipment or exposure test specimens are wiped on the same part of the surface every month, the annual average can be calculated as a deposition concentration rate. In this case, the unit can be either the mass per unit area per unit time, for example, $mg\ m^{-2}\ day^{-1}$, or the mass per unit area, for example, $mg\ m^{-2}$.

8.2 Expression of soluble deposition concentration result

The results are expressed as the deposition concentration of each ion, in $mg\ m^{-2}$, $C_{s,d,w}$. The results are calculated using Formula (1):

$$C_{\mathrm{s,d,w}} = \frac{m_1\, v_1\, a_1 - m_0\, v_0\, a_0}{A} \tag{1}$$

where

m_1 is the concentration, expressed in mg/l, of ions in extract of the deposition, such as Cl^-, SO_4^{2-}, etc., which were wiped from the real structures or equipment with the gauze, cotton or sponge;

m_0 is the blank solution concentration, expressed in mg/l, of the ion in distilled, pure or deionized water into which the clean and non-exposed gauze, cotton or sponge is immersed;

a_1 is the dilution magnification of the extract;

a_0 is the dilution magnification of the blank solution;

v_1 is the volume of the extract, expressed in l;

v_0 is the volume of the blank solution, expressed in l;

A is the wiping area, expressed in m^2.

8.3 Expression of insoluble deposition concentration result

The results are expressed as the insoluble deposition concentration of each element, in mg m^{-2}, $C_{i,d,w}$, and are calculated by using Formula (2):

$$C_{i,d,w} = \frac{n_1 - n_0}{A} \tag{2}$$

where

n_1 is the total mass, expressed in mg, of insoluble deposition elements such as Si, Al, etc. on the filter, which were wiped from the real structures or equipment with gauze, cotton or sponge;

n_0 is the total mass, expressed in mg, of the insoluble deposition element on the filter in distilled, pure or deionized water into which the clean and non-exposed gauze, cotton or sponge is immersed;

A is the wiping area, expressed in m^2.

9 Test report

The report shall include at least the following information.

a) all details necessary to identify the material examined;

b) a reference to this document, i.e. ISO 7054:2024;

c) the type of surface examined, its size and, if appropriate, its location and position on the real structure or equipment which was the object of the test;

d) the climatic classification (e.g. as defined in IEC 60721-1), temperature, relative humidity, time of wetness (e.g. as defined in ISO 9223), and the address of the location where the wiping test took place and its distance from the seashore;

e) the method of collecting depositions such as gases and particles from the real structure or equipment;

f) the dates when the samples were taken and the deposition concentration was measured, the exposure time of the real structure or equipment, the weather during wiping and the weather conditions during the three days preceding wiping;

g) the type and concentration of the soluble deposition, such as the ions detected in the extract;

h) the type and concentration of the insoluble deposition, such as the elements captured on the filter;

i) the concentrations of the soluble depositions in the extract measured with a detector tube, ion chromatograph or salt concentration meter;

j) the various anions and cations in the extract measured to evaluate the corrosive environments;

k) the mass and chemical composition of the insoluble depositions on the filter after extraction measured with a scale or by ICP-AES, ICP-OES or XRF;

l) the unit used to express the deposition concentrations, e.g. mg m^{-2};

m) any deviations from the procedure;

n) any unusual features observed.

The wiping method can be used to compare the concentrations of depositions and evaluate their corrosive environments:

- on different parts of real structures and equipment (see Annex A);
- on real structures and equipment installed in different environments (see Annex B);
- to check contamination before and after changing the wiping agent, cleaning water and the extraction and measurement methods.

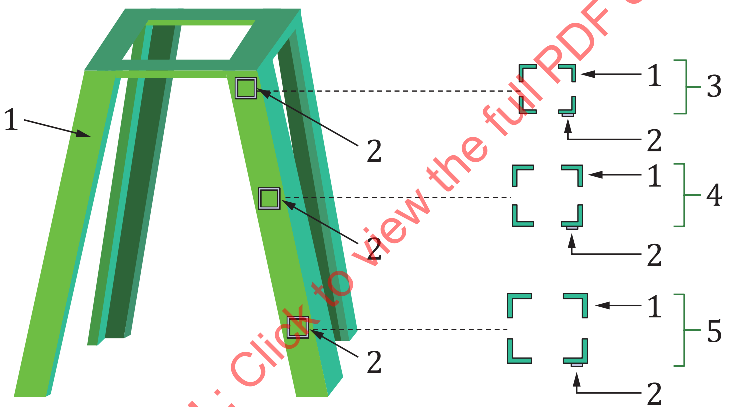
Annex A
(informative)

Example of deposition measurement of different parts of real steel structure

A.1 Wiping method for comparison of the deposition concentration at different heights on a steel structure

The wiping method can be used to compare the concentration of depositions on different parts of real structures and equipment to evaluate the corrosive environments. An example of a deposition measurement of various parts of a real steel structure is shown in Figure A.1.

The wiping areas selected in this case were located at heights of 11 m, 49 m and 81 m on the real steel structure, which were exposed to rainfall. Therefore, a date was chosen for wiping when no rain had fallen for at least three days to ensure that the depositions had not been washed away by rain.



a) Real steel structure

b) Cross-section view of angle-type steel structure at each height

Key

1	angle-type steel member
2	wiping areas defined by masking tape, frames or line drawn with marker
3	81 m
4	49 m
5	11 m

Figure A.1 — Example of the wiping areas at different heights of steel structure

A.2 Data on deposition concentration on steel structure at different heights for comparison of corrosive environments

An example of measurement data on deposition concentration at three heights of a real steel structure is shown in Figure A.2.

This example uses the average of four sets data on ion concentrations, which were taken every three months between 21 September 2012 and 28 August 2013, to compare the corrosive environments.