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## Ductile iron pipes and fittings — Seal coats for cement mortar linings

*Tuyaux et raccords en fonte ductile — Seal coats pour les revêtements de mortier de ciment*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 2, *Cast iron pipes, fittings and their joints*.

This third edition cancels and replaces the second edition (ISO 16132:2016) which has been technically revised.

The main changes are as follows:

- X-cut method has been incorporated instead of cross-cut for adhesion test as per ISO 16276-2:2007;
- a list of performance tests and routine tests has been incorporated in [Annex F](#);
- short-term sealing efficiency and long-term sealing efficiency methods in [Annex A](#) and [Annex B](#) have been modified.

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](http://www.iso.org/members.html).

## Introduction

The intended purpose of a seal coat is to reduce the contact between a cement mortar lining and the contents of a water main, thereby restricting the leaching of inorganic materials into the water supply.

Seal coats are usually specified where the pipeline is to convey soft waters and/or where residence times are very long. Supply water quality data for such pipelines should be discussed between the prospective client and the seal coated pipe supplier to ensure the suitability of the product for use.

Attention is drawn to the fact that seal coated cement mortar lined surfaces in contact with, or likely to come into contact with, potable water need to conform to the requirements of national or international water supply or water quality regulations. Approval can be required for the individual components of the system, or for the combined system, depending upon the requirements of those national or international water supply or water quality regulations when used

- in accordance with the product manufacturer's instructions for use,
- under any other appropriate conditions defined for that product within any published list of substances, products and processes approved to those water supply or water quality regulations.

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# Ductile iron pipes and fittings — Seal coats for cement mortar linings

## 1 Scope

This document specifies the requirements for seal coatings for factory application to the surfaces of cement mortar linings, which are factory applied to the interior of ductile iron pipes and fittings.

It provides the performance requirements for short-term sealing efficiency, long-term durability and cyclic pressure, as well as the routine testing requirements for visual appearance, coating thickness and adhesion.

This document is applicable to products for potable and irrigation water and for other applications as per agreement between manufacturer and customer.

## 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 2531:2009, *Ductile iron pipes, fittings, accessories and their joints for water applications*

ISO 2439:2008, *Flexible cellular polymeric materials — Determination of hardness (indentation technique)*

ISO 10523, *Water quality — Determination of pH*

ISO 16276-2:2007, *Corrosion protection of steel structures by protective paint systems — Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating — Part 2: Cross-cut testing and X-cut testing*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/>

### 3.1

#### **ductile iron**

type of cast iron used for pipes, fittings and accessories in which graphite is present primarily in spheroidal form

### 3.2

#### **fitting**

casting other than a pipe, which allows pipeline deviation or change of direction or bore

Note 1 to entry: Flanged sockets, flanged spigots and collars are also classified as fittings.

**3.3**  
**test film**

film of consistent thickness and density, morphologically stable at the temperature of the substrate during seal coat application, used as a surrogate surface for the measurement of coating thicknesses

**3.4**  
**pipe**

casting of uniform bore, with straight axis, having either socket, spigot or flanged ends

Note 1 to entry: This does not apply to flanged sockets or flanged spigots and collars, which are classified as fittings.

**3.5**  
**product**

seal coated, cement mortar lined iron pipe or fitting

**3.6**  
**seal coat**

coating applied over a cement mortar lining to control the interactions between the lining and the inside flowing fluid

**3.7**  
**performance test**

proof of design test, done once and repeated only after a relevant change of material or supplier of the seal coat or lining, or relevant change in process design

**4 Materials in contact with water intended for human consumption**

Manufacturers shall submit the hygienic certificate of seal coat meeting the requirement of ISO 2531:2009, 4.1.4 for the material in contact with water intended for human consumption, in case the pipes are to be used for water application.

**5 Performance test requirements**

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**5.1 Short-term sealing efficiency**

When tested in accordance with [Annex A](#), the pH of the test water shall not exceed 9,5.

By agreement between the manufacturer of the product and the customer, other performance tests with other exposure periods, test waters and/or limits of pH value can be undertaken to suit particular national or customer requirements.

**5.2 Long-term sealing efficiency**

When tested in accordance with [Annex B](#), the pH of the test water shall not exceed 9,5 for each of the test samples.

By agreement between the manufacturer of the product and the customer, other performance tests with other exposure periods, test waters and/or limits of pH value can be undertaken to suit particular national or customer requirements.

If the seal coat has been documented by the manufacturer to a National Standard and successfully used for a minimum of five years, the performance of the type test in accordance with [Annex B](#) is only required for significant changes in the coating material, type or formulation which may adversely affect the performance of the seal coat.

### 5.3 Cyclic pressure

When tested in accordance with [Annex C](#), visual inspection shall display no peeling of the seal coat or cracking with a width in excess of 0,8 mm. It is permissible to have some precipitation of white alkaline deposit.

At the conclusion of the visual inspection, the pipe samples shall immediately be tested for sealing efficiency in accordance with [Annex A](#). When tested in accordance with [Annex A](#), the pH of the test water shall not exceed 9,5 in either of the pipe samples.

If the seal coat has been tested and successfully used for a minimum of 10 years, the performance of the type test in accordance with [Annex C](#) is only required for significant changes in the coating material, type, or formulation which can adversely affect the performance of the seal coat.

## 6 Routine test requirements

### 6.1 General

Coating and re-work procedures (e.g. drying regimes for solvent-based coatings and mixing and curing regimes for multi-component materials) shall be defined by the manufacturer of the product in agreement with the seal coat supplier, if necessary, so as to enable the product to conform to the requirements of this document.

The tests specified in [6.2](#) to [6.4](#) shall be carried out on factory seal coated pipes or fittings as opposed to separately prepared samples.

Sampling plans for the tests specified in [6.2](#) to [6.4](#), specific to the seal coating material used, the size of the batch and the storage conditions, shall be specified by the manufacturer of the product for each batch of product.

Where a non-conforming product is identified, the product shall either be re-worked, so that it meets the requirements of this document, or be rejected.

### 6.2 Visual appearance

When examined visually, the seal coated pipes shall be free from any coating irregularities likely to be detrimental to the performance of the seal coat (as required by the performance tests in this document). The manufacturer shall define those coating irregularities (e.g. hairline cracks or pinholes) which are considered not to be detrimental to the performance of the seal coat (as required by the performance tests in this document), taking into account the nature of the seal coat material.

### 6.3 Coating thickness

When tested in accordance with [Annex D](#) or any appropriate method defined in ISO 2808, the wet or dry coating thickness shall be within the limits specified by the manufacturer of the product in conjunction with the seal coat supplier, if necessary.

### 6.4 Adhesion

When tested in accordance with [Annex E](#), one of the following requirements shall be met:

- where a cross cut is made in the seal coat, the adhesive strength of seal coat shall fall within Level 0 and Level 2 as defined in [Annex E](#);
- where no cross cut is used, the area of disbonded coating shall be less than 10 % of the test area.

Any area damaged during testing shall be repaired in accordance with a procedure defined by the manufacturer of the product in agreement with the seal coat supplier.

## 7 Marking

Each seal coated pipe or fitting shall be identified with the pipe manufacturer's name or mark.

In addition, seal coated pipes shall be indelibly and legibly marked on the external surface with the number of this document. Where pipes are bundled, the required markings can be applied to the bundle rather than to individual pipes.

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