INTERNATIONAL STANDARD

ISO 16132

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16132 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*, Subcommittee SC 2, *Cast iron pipes, fittings and their joints*.

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 may 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; and

— 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.

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

1 Scope

This International Standard 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 also gives performance test requirements for short term sealing efficiency and long term durability and requirements for routine testing for visual appearance, coating thickness and adhesion.

This International Standard is applicable to products for potable and other water applications.

2 Normative references

The following referenced documents are indispensable for the application 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 2439:1997, *Flexible cellular polymeric materials — Determination of hardness (indentation technique)*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 10523, *Water quality — Determination of pH*

ASTM D3330-02, *Standard Test Method for Peel Adhesion of Pressure Sensitive Tape*

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given below apply.

3.1
ductile iron
cast iron in which graphite is present in substantially spheroidal form

3.2
fitting
casting other than a pipe, which allows pipeline deviation or change of direction or bore

NOTE Flanged-socket pieces, flanged-spigot pieces and collars are 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, straight in axis, having spigot, socket, flange or plain ends

NOTE This does not include flanged socket pieces, flanged spigot pieces 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 contents of the conduit

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 Performance test requirements

4.1 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 may be undertaken to suit particular national or customer requirements.

4.2 Long term 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 may be undertaken to suit particular national or customer requirements.

However, if the seal coat has been tested and 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 could adversely affect the performance of the seal coat.

5 Routine Test Requirements

5.1 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 International Standard.

The tests specified in 5.2 to 5.4 shall be carried out on factory seal coated pipes or fittings as opposed to separately prepared test pieces.

Sampling plans for the tests specified in 5.2 to 5.4, 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 International Standard, or be rejected.

5.2 Visual appearance

When examined visually, the seal coat 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 International Standard). 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 International Standard), taking into account the nature of the seal coat material.

5.3 Coating thickness

When tested in accordance with Annex C 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.

5.4 Adhesion

When tested in accordance with Annex D, one of the following requirements shall be met:

— where a cross cut is made in the seal coat, the adhesive strength shall fall within the range of 1 to 3; or

— 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.

6 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 and year of this International Standard.

NOTE Where pipes are bundled, the required markings may be applied to the bundle rather than to individual pipes.

Annex A
(normative)

Short term sealing efficiency

A.1 Principle

The initial or short term sealing efficiency of a seal coat applied to a cement mortar lined surface that is exposed to a given test water is determined by measuring the pH of test water after three successive 24 h periods of exposure within a seal coated pipe sample.

A.2 Materials and apparatus

A.2.1 **Paraffin wax, solventless epoxy, silicone resin** or other suitable sealing material.

A.2.2 **Test water**, having bicarbonate alkalinity of approximately 26 mg/l as $CaCO_3$, at equilibrium with the atmosphere (i.e. no artificially induced carbon dioxide level), and with a stable pH of 8 ± 0,1.

This water shall be produced by dissolving (0,027 8 ± 0,000 5) g of $CaCl_2$ (calcium chloride) and (0,042 8 ± 0,000 5) g of $NaHCO_3$ (sodium bicarbonate) in 1 l of distilled water.

A.2.3 **Petroleum jelly**.

A.3 Apparatus

A.3.1 **Glass plate**.

A.3.2 **pH meter**, having capacity to measure pH 0 to pH 14, with discrimination of a pH of 0,01 or better.

A.4 Preparation of test samples

The test shall be carried out using a nominally 500 mm long DN 150 seal coated and cement mortar lined pipe, with double spigot. The sample(s) shall be cut from pipes taken from normal production batches.

A.5 Procedure

A.5.1 Seal the pipe at its lower end in a shallow pan of molten paraffin wax, solventless epoxy, silicone resin or other suitable sealing material (A.2.1). Allow the material to harden.

A.5.2 Fill the pipe with test water (A.2.2) at room temperature.

A.5.3 Cover the top of the pipe with a glass plate (A.3.1) and seal it with petroleum jelly (A.2.3).

A.5.4 After (24 ± 1) h, dispose of the water, rinse and refill with test water (A.2.2).

A.5.5 Repeat A.5.4 twice, sampling the water after the third 24 h exposure period.

A.5.6 Determine the pH of the water sample using the pH meter (A.3.2) in accordance with ISO 10523.

Annex B
(normative)

Long term efficiency

B.1 Principle

The long term durability of a seal coat, applied to a cement mortar lining, is determined by measuring the sealing efficiency of the seal coat, after exposure to a cycle of swabbing, high velocity flowing water, pressurization and de-pressurization for a period of three months.

B.2 Materials

B.2.1 **Test water**, shall be the same as that defined for test water in Annex A.

B.3 Apparatus

B.3.1 **Soft foam swab**, bullet shaped, with a nominal density of 25 kg/m^3 to 35 kg/m^3, and an indentation hardness index (method A of ISO 2439:1997) of (200 ± 50) N. When placed inside the test pipe, the swab shall be of a diameter such that a compression of 15 % to 25 % is achieved.

B.3.2 **Pump**, capable of pumping to produce a flow velocity of 2 m/s in the test pipes.

B.3.3 **Pressure gauge**, capable of measuring pressure of at least 6 bar with a minimum discrimination of 0,5 bar.

B.3.4 **Water meter** or **alternative device**, to enable the measurement of a flow velocity of at least 2 m/s with a minimum discrimination of 0,2 m/s.

B.3.5 **Hand pump** or **alternative device**, to enable pressurization of the test pipeline.

B.3.6 **Flow control valve**, e.g. gate valve or alternative device, to enable setting of the flow velocity.

B.3.7 **Air bleed valve**, to enable the removal of air from the pipeline.

B.3.8 **Outlet/inlet valve**, to allow the pipeline to be filled with water and drained of water.

B.3.9 **Connecting pipeline components**, to enable the assembly and restraint of the pipeline.

B.3.10 **DN 150 flow development pipes (FDP)**, a minimum of 500 mm long, to establish uniform flow in the pipeline after a bend.

B.3.11 **Accumulator**, (optional device) to reduce pressure variations during the test.

B.3.12 **Pressure relief valve**, (optional device) to prevent over pressurization during the test.

B.3.13 **Water cooler**, (optional device) to prevent overheating of the water during the test.

B.4 Preparation of test samples

The test shall be carried out using two nominally 500 mm long, DN 150 seal coated, cement mortar lined, ductile iron pipe samples. These samples shall be cut from two ductile iron pipes taken from normal production batches. Prior to the test, the seal coat and the swab shall be wetted and the swab shall be passed through each of the test samples once.