DRAFT INTERNATIONAL STANDARD ISO/DIS 17455

ISO/TC **138**/SC **5** Secretariat: **NEN**

Voting begins on: **2003-07-10**

Voting terminates on: **2003-12-10**

Plastics piping systems — Multilayer pipes — Determination of the oxygen permeability of the barrier pipe

Systèmes de canalisations en plastique — Tubes multicouches — Détermination de la perméabilité à l'oxygène de la couche barrière d'un tube

ICS 23.040.20

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Contents

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 3.

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 17455 was prepared by Technical Committee ISO/TC 138, *General properties of pipes, fittings and valves of plastics materials and their accessories*, Subcommittee SC 5, *Test methods and basic specifications*.

Introduction

In response to the worldwide demand for specifications, requirements and test methods for multilayer pipes, working group 16 of ISO/TC 138/SC 5 was created at the Kyoto meeting 1998 in Kyoto, Japan. The working group started drafting five test standards for multilayer pipes:

— ISO/CD 17453 *Plastics piping systems - Multilayer M pipes - Test method for the strength of the weld by the use of a cone*

— ISO/CD 17454 *Plastics piping systems - Multilayer M pipes - Test method for the adhesion of the different layers by using a pulling rig*

— ISO/CD 17456 *Plastics piping systems - Multilayer pipes - Determination of the long term hydrostatic strength*

— ISO/CD 18124 *Plastics piping systems - Multilayer M pipes - Test method for the adhesion of the different layers by the use of a cone*

At the ISO/TC 138/SC 5 meeting in Sydney 2002 it was decided to merge the ISO/CD 17453 and ISO/CD 18124.

Only multilayer pipes are dealt with in this International Standard and for these purposes cross-linked polyethylene (PE-X) as well as adhesives are to be considered as a thermoplastics material.

Plastics piping systems — Multilayer pipes — Determination of the oxygen permeability of the barrier pipe

1 Scope

This International Standard specifies the definitions and test method for multilayer pipes for testing the oxygen permeability of the barrier layer of the pipe.

For determination of the test results two test methods are described:

— Method I: Dynamic testing method.

— Method II: Static testing method.

In principle both methods give the same results. The method to be applied is not depending on the application used for, but can be specified in the referring standard

NOTE Acceptance of any inner layer (see definitions) made from a specific grade of material is subjected to the relevant product standard or system standard and the requirements detailed in that standard.

2 Principle

Measurement of the oxygen transfer through the wall of the test piece under specified conditions.

The oxygen increase is measured in a system of which the test piece forms part. Oxygen can only be transported through the wall of the test piece. Therefore the increased amount of oxygen in the closed system is the result of the functioning of the barrier layer of the test piece.

3 Terms and definitions

For the purpose of this International Standard, the following terms, definitions and abbreviations apply.

3.1
multilayer pipe
pipe comprising layers of different materials

3.2
multilayer M pipe
multilayer pipe comprising layers of polymers and one or more metal layers. The wall thickness of the pipe consists of at least 60 % of polymer layers

3.3
multilayer P pipe
a multilayer pipe comprising of two or more polymer layers

3.4
inner layer
the layer in contact with the liquid or gas

3.5
outer layer
the layer exposed to the outer environment

3.6
embedded layer
any layer between the outer and inner layer

NOTE There can be more than one embedded layer.

3.7
barrier layer
layer to prevent or geatly diminish oxygen transport from outside the pipe into the inside water

3.8
closed system
the closed system is consisting out of stainless steel parts of pipes, couplings and tap including the test piece constructed in such a way that only through the test piece (pipe wall) oxygen can be transported to the inside of the test piece (pipe)

3.9
flux
the oxygen permeability of the barrier the pipe

4 Symbols (and abbreviated terms)

d_e Manufacturers nominal outside diameter, expressed in millimeters

p_a Standard atmospheric pressure (1000 mbar at 20 °C) expressed in bar.

T Test temperature (40 °C, 80 °C or otherwise specified) expressed in degrees Celcius.

NOTE All other symbols are defined at the relevant equations.

5 Apparatus

The test assembly shall include the following main elements:

5.1
Oven
Capable of maintaining a constant temperature in the range in the range of (40 ± 0,5) °C to (85 ± 0,5) °C.

5.2
Closed system
The closed system consisting of stainless steel parts of pipes, couplings and taps and is including the test piece.

5.3
Valves (only for Method II)
The closed system also includes valves to isolate (airtight) the test piece from the closed system.

5.4
Circulation pump
Capable of a variable delivery with a capacity of more than 0,5 dm^3/min.

5.5
Oxygen sensor
Capable of functioning between (40 ± 0,5) °C to (85 ± 0,5) °C, with a range of 0,1 ppb – 20 ppm.

5.6
water pressure meter
with a range of (1 ± 0,1) to (4 ± 0,1) bar.

5.7
atmospheric pressure meter,
with a range of (965 ± 1) mbar to (1035 ± 1) mbar.

5.8
water flow meter
with a range of (0,15 ± 0,05) dm^3/min to (0,5 ± 0,05) dm^3/min.

5.9
water temperature meter
with a range of (40 ± 0,05) °C to (85 ± 0,05) °C.

5.10
air temperature meter
with a range of (40 ± 0,5) to (85 ± 0,5) °C

5.11
airtight vessel
for preparation of water with an oxygen concentration of < 10 ppb (nominally oxygen-free)

NOTE Normally sink plates or helium is used for this process.

5.12
watercirculation pump
with variable delivery with a capacity of more than 0,5 dm^3/min

5.13
registration device,
capable of registering (graphical writer or computer) oxygen concentration as a function of time

6 Test piece

6.1 Number of test pieces

Unless otherwise specified the number of pipe test pieces shall be one.

6.2 Preparation

The test piece shall have a free length of (20 ± 0,5) m.

Prepare the test piece in accordance with the manufacturer's instructions taking into account the minimum free length.

The relevant dimensions of the test piece shall be measured and recorded.

7 Preconditioning

Preconditioning the test piece as specified in the reffering product-or system standard.