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**Structured-wall thermoplastics pipes —  
Oven test**

*Tubes en matières thermoplastiques à parois structurées — Essai à l'étuve*



Reference number  
ISO 12091:1995(E)

## Foreword

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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.

International Standard ISO 12091 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications*.

Annex A forms an integral part of this International Standard. Annexes B and C are for information only.

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# Structured-wall thermoplastics pipes — Oven test

## 1 Scope

This International Standard specifies a method for assessing the pipe wall homogeneity of non-smooth, structured-wall thermoplastics pipes by inspection of the effects of heating in an oven.

The method is not applicable to the testing of pipes with a smooth external surface.

NOTE 1 This test does not include measurement of the longitudinal reversion (see annex C).

## 2 Definitions

For the purposes of this International Standard, the following definitions apply:

**2.1 wall separation:** Separation between the layers in multilayer designs.

NOTE 2 Wall separation is normally recognized as the formation of visible bubbles in the surface layer of the pipe. Separation of layers at the cut ends is not considered to constitute a failure.

**2.2 blister:** Separation of a pipe wall layer internally in the form of a bubble.

## 3 Principle

A piece of pipe of given length is heated in an oven at a specified temperature for a specified length of time.

After the heating period, the surfaces of the pipe are examined and any physical defects such as cracks, blisters or wall separation are noted. Cracks and blisters are expressed as a percentage of the wall thickness. Wall separation is expressed as a percentage of the pipe circumference.

## 4 Apparatus

**4.1 Air-circulation oven,** thermostatically controlled, with a heating power such that it is capable of operating at the temperature specified in annex A for the material under test and re-establishing this temperature within 15 min after the introduction of the test pieces.

The oven shall be equipped with a thermostat capable of maintaining the temperature to within  $\pm 2$  °C of the specified temperature.

## 5 Test pieces

**5.1** The sampling procedure for obtaining test pieces shall be as specified in the referring standard.

**5.2** Each test piece shall comprise a pipe of length  $300 \text{ mm} \pm 20 \text{ mm}$ . The test piece may be cut longitudinally into two equal-sized sections if the outside diameter is less than or equal to 400 mm, or four equal-sized sections if the outside diameter is greater than 400 mm.

NOTE 3 The referring standard should define the optional procedure for cutting the test piece into sections. This will depend on the wall structure of the pipe.

**5.3** The number of test pieces shall be as specified in the referring standard. However, it is recommended to use at least three test pieces.

## 6 Procedure

**6.1** Condition the test pieces (or test piece sections) for at least 2 h at  $23 \text{ °C} \pm 2 \text{ °C}$ .

**6.2** Establish the oven temperature at the value specified in annex A for the material under test.

**6.3** Place the test pieces in the oven in such a manner that they do not touch each other or the sides of the oven.

NOTE 4 If the test pieces are placed horizontally, it is recommended that they are placed on a bed of talc, fine sand or ballotini.

**6.4** Leave the test pieces in the oven for the period specified in annex A, where this period is measured from the time when the temperature of the oven has returned to the specified temperature.

**6.5** Remove the test pieces from the oven, taking care not to deform or damage them.

**6.6** Allow the test pieces to cool in air until they can be handled.

**6.7** Examine each test piece and determine the largest dimension of each type of physical defect such as cracks, blisters, wall separation and/or any other physical defect as required by the referring standard.

## 7 Test report

The test report shall include at least the following information:

- a) a reference to this International Standard;
- b) full identification of the pipe tested;
- c) the oven temperature and test duration;
- d) the maximum measurements of any cracks or blisters, expressed as a percentage of the wall or layer thickness;
- e) the maximum measurements of any wall separation, expressed as a percentage of the pipe circumference or as a percentage of the sum of all four sections of the test piece;
- f) a description of any other visible defects.

## Annex A

(normative)

### Conditions for the oven test for structured-wall thermoplastics pipes

**Table A.1 — Test conditions to be used with different materials and wall thicknesses**

Material <sup>1)</sup>	Oven temperature °C	Time in oven minutes
PVC-U	$150 \pm 2$	30 for $e \leq 10$ <sup>2)</sup> 60 for $e > 10$
PE	$110 \pm 2$	
PP homopolymers and block copolymers	$150 \pm 2$	
PP random copolymers	$135 \pm 2$	
1) The symbols are as defined in ISO 1043-1. 2) $e$ is the wall thickness in millimetres.		

## Annex B (informative)

### Basic specifications

**B.1** The following requirements are recommended as basic specifications.

Any test piece examined for signs of cracks, blisters or wall separation shall conform to the following requirements:

- for all parts of the pipe surface, the depth of the cracks or the thickness of the blisters shall not

exceed 30 % of the original wall thickness, and the total length of wall separation round the circumference shall not exceed 20 % of the pipe circumference.

**B.2** For special applications, more stringent requirements may be adopted if required by the referring standard.

## **Annex C**

(informative)

### **Bibliography**

- [1] ISO 1043-1:1987, *Plastics — Symbols — Part 1: Basic polymers and their special characteristics*.
- [2] ISO 2505-1:1994, *Thermoplastics pipes — Longitudinal reversion — Part 1: Determination methods*.
- [3] ISO 2505-2:1994, *Thermoplastics pipes — Longitudinal reversion — Part 2: Determination parameters*.

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