INTERNATIONAL STANDARD

ISO 15877-2

Second edition
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Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) —

Part 2: Pipes

Systèmes de canalisations en plastique pour les installations d'eau chaude et froide — Poly(chlorure de vinyle) chloré (PVC-C) — Partie 2: Tubes

Reference number
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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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 15877-2 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems*, in collaboration with ISO Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This part of ISO 15877 is a part of a System Standard for plastics piping systems of a particular material for a specified application. There are a number of such System Standards.

The System Standards are consistent with general standards on functional requirements and recommended practices for installation.

This second edition cancels and replaces the first edition (ISO 15877-2:2003).

ISO 15877 consists of the following parts [1)], under the general title *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C)*:

— *Part 1: General*

— *Part 2: Pipes*

— *Part 3: Fittings*

— *Part 5: Fitness for purpose of the system*

— *Part 7: Guidance for the assessment of conformity* [Technical Specification].

1) This System Standard does not incorporate a Part 4: *Ancillary equipment* or a Part 6: *Guidance for installation*. For ancillary equipment, separate standards can apply. Guidance for installation of plastics piping systems made from different materials, intended to be used for hot and cold water installations, is covered by ENV 12108 [5].

At the date of publication of this part of ISO 15877, System Standards Series for piping systems of other plastics materials used for hot and cold water installations are the following:

ISO 15874 (all parts), *Plastics piping systems for hot and cold water installations — Polypropylene (PP)*

ISO 15875 (all parts), *Plastics piping systems for hot and cold water installations — Crosslinked polyethylene (PE-X)*

ISO 15876 (all parts), *Plastics piping systems for hot and cold water installations — Polybutylene (PB)*

ISO 22391:— [2] (all parts), *Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT)*

2) To be published. (Revisions of ISO 22391-1:2007, ISO 22391-2:2007, ISO 22391-3:2007, ISO 22391-5:2007.)

Introduction

The System Standard, of which this is Part 2, specifies the requirements for a piping system when made from chlorinated poly(vinyl chloride) (PVC-C). The piping system is intended to be used for hot and cold water installations and for heating system installations.

In respect of potential adverse effects on the quality of water intended for human consumption caused by the product covered by this part of ISO 15877, the following are relevant.

a) This part of ISO 15877 provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA.

b) It should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

When using solvent cement, relevant national safety rules or regulations concerning their use (e.g. protection of workers) are to be observed.

Requirements and test methods for material and components other than pipes are specified in ISO 15877-1 and ISO 15877-3. Characteristics for fitness for purpose (mainly for joints) are covered in ISO 15877-5. ISO/TS 15877-7 gives guidance for the assessment of conformity.

This part of ISO 15877 specifies the characteristics of pipes.

Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) —

Part 2: Pipes

1 Scope

This part of ISO 15877 specifies the requirements of pipes made from chlorinated poly(vinyl chloride) (PVC-C) for piping systems intended to be used for hot and cold water installations within buildings for the conveyance of water, whether or not intended for human consumption (domestic systems) and for heating systems, under design pressures and temperatures appropriate to the class of application (see Table 1 of ISO 15877-1:2009).

This part of ISO 15877 covers a range of service conditions (application classes), design pressures and pipe series. For values of T_D, T_{max} and T_{mal} in excess of those in Table 1 of ISO 15877-1:2009, this part of ISO 15877 does not apply.

NOTE It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

It also specifies the test parameters for the test methods referred to in this part of ISO 15877.

In conjunction with the other parts of ISO 15877, it is applicable to PVC-C pipes, their joints and joints with components of PVC-C, other plastics and non-plastics materials intended to be used for hot and cold water installations.

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 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 1167-2, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 2: Preparation of pipe test pieces*

ISO 2505, *Thermoplastics pipes — Longitudinal reversion — Test methods and parameters*

ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 6259-1, *Thermoplastics pipes — Determination of tensile properties — Part 1: General test method*

ISO 6259-2, *Thermoplastics pipes — Determination of tensile properties — Part 2: Pipes made of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C) and high-impact poly(vinyl chloride) (PVC-HI)*

ISO 7686, *Plastics pipes and fittings — Determination of opacity*

ISO 9080, *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

ISO 15877-1:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 1: General*

ISO 15877-3:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 3: Fittings*

ISO 15877-5:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 5: Fitness for purpose of the system*

EN 727, *Plastics piping and ducting systems — Thermoplastics pipes and fittings — Determination of Vicat softening temperature (VST)*

EN 744, *Plastics piping and ducting systems — Thermoplastics pipes — Test method for resistance to external blows by the round-the-clock method*

3 Terms, definitions and symbols

For the purposes of this document, the terms and definitions given in ISO 15877-1 and the following symbols apply.

l length of pipe

σ_y tensile strength at yield point

4 Material

4.1 General

The PVC-C material from which the pipes are made shall conform to this part of ISO 15877 and to the relevant requirements of ISO 15877-1.

4.2 Pipe material

The material from which the pipes are made shall be a chlorinated poly(vinyl chloride) (PVC-C) resin to which are added those additives that are needed to facilitate the manufacture of pipes conforming to this part of ISO 15877.

4.3 Evaluation of σ_{LPL}-values

The pipe material should be evaluated in accordance with ISO 9080 or equivalent, where internal pressure tests are made in accordance with ISO 1167-1 and ISO 1167-2 to find the σ_{LPL}-value. The σ_{LPL}-value thus determined shall be at least as high as the corresponding values of the reference curves given in Figure 1 or Figure 2, as applicable, over the complete range of times.

NOTE 1 One equivalent way of evaluation is to calculate the σ_{LPL}-value for each temperature (e.g. for 20 °C, 60 °C and 95 °C or 100 °C) individually.

NOTE 2 The reference curves in Figure 1 for Type I PVC-C in the temperature range of 10 °C to 95 °C are derived from Equation (1):

$$\log t = -109{,}95 - \frac{21\,897{,}4}{T} \times \log\sigma + \frac{43\,702{,}87}{T} + 50{,}742\,02 \times \log\sigma \qquad (1)$$

The reference curves in Figure 2 for Type II PVC-C in the temperature range of 10 °C to 100 °C are derived from Equation (2):

$$\log t = -115,839 - \frac{22\,980}{T} \times \log\sigma + \frac{45\,647,94}{T} + 54,732\,19 \times \log\sigma \quad (2)$$

To demonstrate conformance to the reference lines, pipe samples should be tested at the following temperatures and at various hoop stresses such that, at each of the temperatures given, at least three failure times fall in each of the following time intervals:

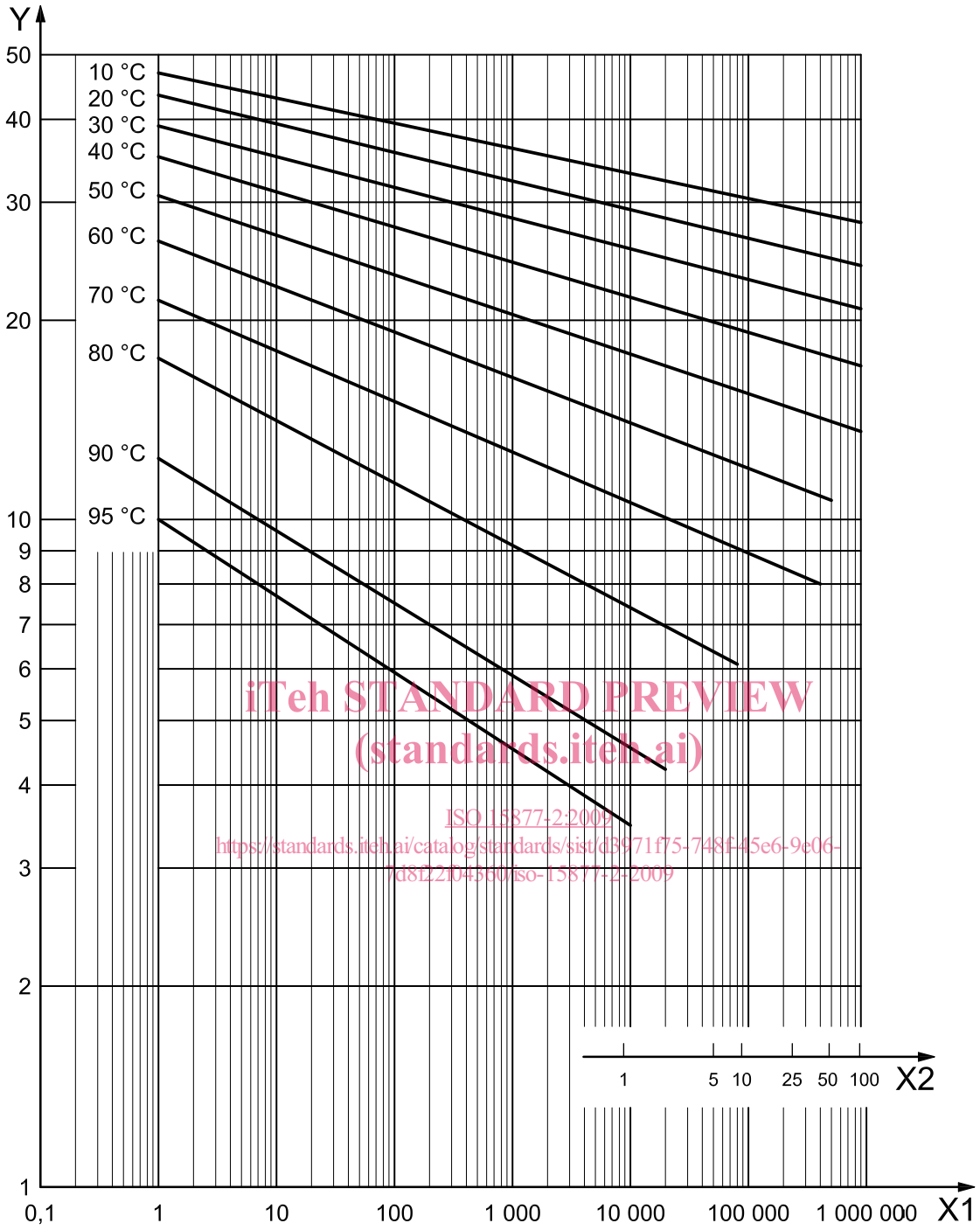
PVC-C Type I: Temperatures 20 °C; 60 °C to 70 °C; 95 °C;

PVC-C Type I: Time intervals 10 h to 100 h, 100 h to 1 000 h,1 000 h to 8 760 h and above 8 760 h;

PVC-C Type II: Temperatures 20 °C; 60 °C to 70 °C; 100 °C;

PVC-C Type II: Time intervals 10 h to 100 h, 100 h to 1 000 h,1 000 h to 8 760 h and above 8 760 h.

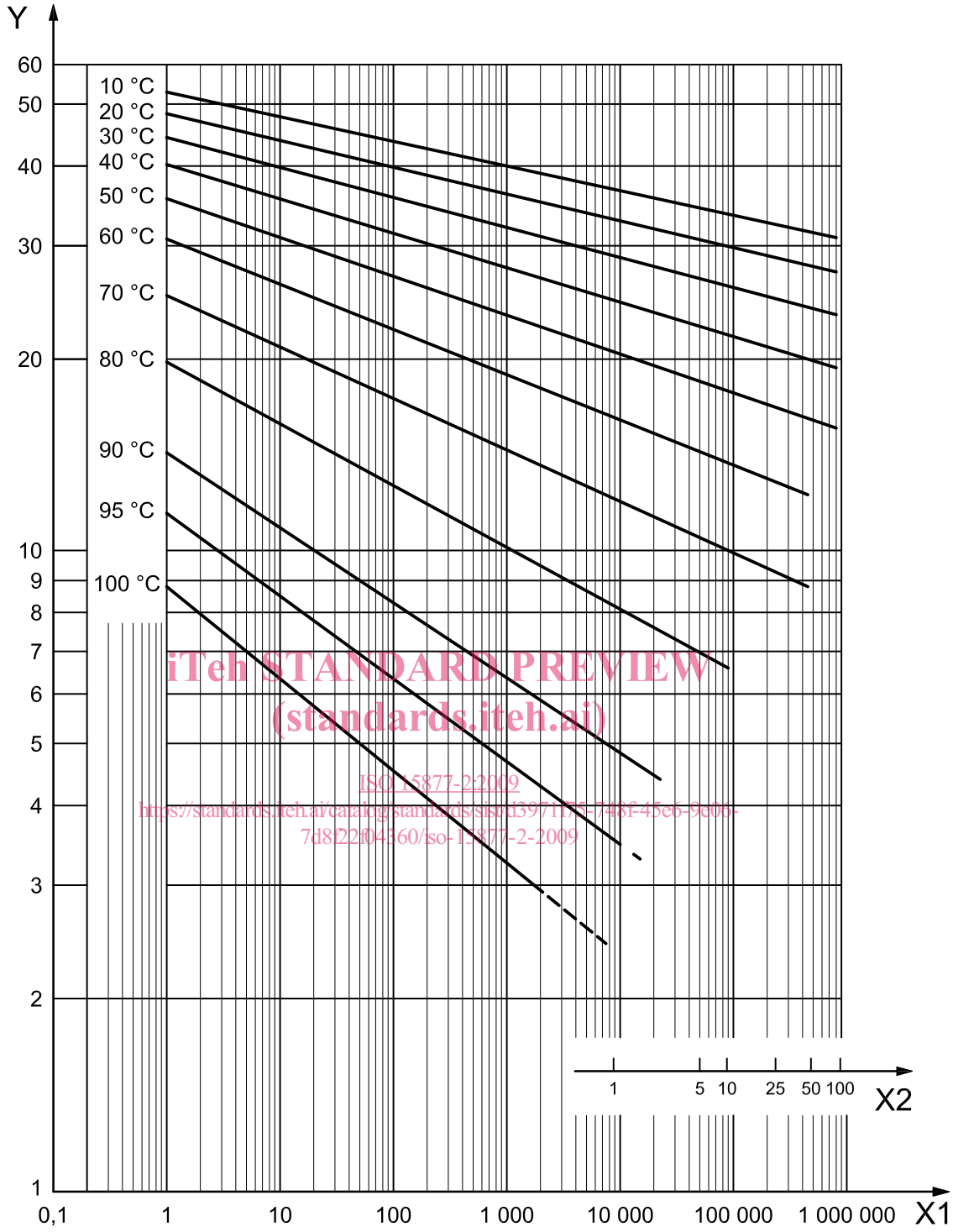
In tests lasting more than 8 760 h, once no failure is reached at a stress and time at least on or above the reference line, any time after that can be considered as the failure time. Testing should be carried out in accordance with ISO 1167-1. Conformance to the reference lines should be demonstrated by plotting the individual experimental results on the graph. At least 97,5 % of them should lie on or above the reference line.



Key

X1 time to fracture, expressed in hours
X2 time to fracture, expressed in years
Y hydrostatic stress, expressed in megapascals

Figure 1 — Reference curves for the expected hydrostatic strength of PVC-C Type I pipe material



Key

X1 time to fracture, expressed in hours
X2 time to fracture, expressed in years
Y hydrostatic stress, expressed in megapascals

Figure 2 — Reference curves for the expected hydrostatic strength of PVC-C Type II pipe material