INTERNATIONAL STANDARD

ISO 15877-1

Second edition
2009-03-15

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

Part 1: General

Systèmes de canalisations en plastique pour les installations d'eau chaude et froide — Poly(chlorure de vinyle) chloré (PVC-C) — Partie 1: Généralités

Reference number
ISO 15877-1:2009(E)

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

Published in Switzerland

Contents

Page

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 15877-1 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 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 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 15877-1:2003).

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 [3].

At the date of publication of this part of ISO 15877, System Standards Series for piping systems of other plastics materials used for the same application 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 1, 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 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 components of the piping system are specified in ISO 15877-2 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 general aspects of the plastics piping system.

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

Part 1: General

1 Scope

This part of ISO 15877 specifies the general requirements of chlorinated poly(vinyl chloride) (PVC-C) 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).

This part of ISO 15877 covers a range of service conditions (classes of application), design pressures and pipe dimension classes. For values of T_D, T_{max} and T_{mal} in excess of those in Table 1, 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 and fittings, their joints and joints with components of 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 472, *Plastics — Vocabulary*

ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 1158, *Plastics — Vinyl chloride homopolymers and copolymers — Determination of chlorine content*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method*

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

ISO 15877-2:2009, *Plastics piping systems for hot and cold water installations — Chlorinated poly(vinyl chloride) (PVC-C) — Part 2: Pipes*

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

3 Terms and definitions, symbols and abbreviated terms

For the purposes of this document, the following terms and definitions, symbols and abbreviated terms apply.

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and ISO 1043-1 and the following apply.

3.1.1 Geometrical

3.1.1.1 Nominal size

3.1.1.1.1
nominal size DN
numerical designation of the size of a component, which is a convenient round number, approximately equal to the manufacturing dimensions

3.1.1.1.2
nominal size DN/OD
nominal size, related to outside diameter

NOTE Nominal size is expressed in millimetres.

3.1.1.2
nominal outside diameter
d_n
specified diameter assigned to a nominal size DN/OD

NOTE 1 According to ISO 15877, the nominal outside diameter, d_n, of a pipe or spigot end of a fitting is equal to its minimum mean outside diameter, $d_{em,min}$.

NOTE 2 Nominal outside diameter is expressed in millimetres.

3.1.1.3
outside diameter
d_e
measured outside diameter through the cross-section at any point of a pipe or spigot end of a fitting, rounded up to the nearest 0,1 mm

3.1.1.4
mean outside diameter
d_{em}
measured length of the outer circumference of a pipe or spigot end of a fitting in any cross section divided by π ($\approx$ 3,142), rounded up to the nearest 0,1 mm

3.1.1.5
minimum mean outside diameter
$d_{em,min}$
minimum value of the mean outside diameter as specified for a given nominal size

3.1.1.6
maximum mean outside diameter
$d_{em,max}$
maximum value of the mean outside diameter as specified for a given nominal size

3.1.1.7
mean inside diameter of socket
d_{sm}
arithmetic mean of two measured inside diameters perpendicular to each other at the midpoint of the socket length

3.1.1.8
out-of-roundness
ovality
difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-sectional plane of a pipe or spigot end of a fitting, or the difference between the measured maximum inside diameter and the measured minimum inside diameter in the same cross-sectional plane of a socket

3.1.1.9
nominal wall thickness
e_n
numerical designation of the wall thickness of a component, approximately equal to the manufacturing dimension

NOTE 1 According to ISO 15877, the nominal wall thickness, e_n, of a pipe or spigot end of a fitting is equal to the specified minimum wall thickness, e_{min}.

NOTE 2 Nominal wall thickness is expressed in millimetres.

3.1.1.10
wall thickness
e
measured wall thickness at any point around the circumference of a component, rounded up to the nearest 0,1 mm

3.1.1.11
minimum wall thickness
e_{min}
minimum wall thickness at any point around the circumference of a component, as specified

3.1.1.12
maximum wall thickness
e_{max}
maximum wall thickness at any point around the circumference of a component, as specified

3.1.1.13
tolerance
permitted variation of the specified value of a quantity, expressed as the difference between the permitted maximum and the permitted minimum value

3.1.1.14
pipe series
S
dimensionless number for pipe designation conforming to ISO 4065 [1]

NOTE According to ISO 15877, the pipe series S is used as a means of selecting pipe sizes for practical purposes (see ISO 15877-2).

3.1.1.15
calculated pipe value
S_{calc}
value for a specific pipe calculated according to the following equation, rounded up to the nearest 0,1 mm:

$$S_{calc} = \frac{d_n - e_n}{2e_n}$$

where

d_n is the nominal outside diameter, in millimetres;

e_n is the nominal wall thickness, in millimetres.

3.1.2 Related to service conditions

3.1.2.1
design pressure
p_D
highest pressure related to the circumstances for which the system has been designed and is intended to be used

NOTE The design pressure, p_D, is equal to the maximum design pressure (MDP), as specified in EN 806-1 [4].

3.1.2.2
hydrostatic stress
σ
stress induced in the wall of a pipe when a pressure is applied using water as a medium

NOTE 1 It is calculated using the following approximate equation:

$$\sigma = p \times \frac{(d_{em} - e_{min})}{2e_{min}}$$

where

p is the applied pressure, in megapascals;

d_{em} is the mean outside diameter of the pipe, in millimetres;

e_{min} is the minimum wall thickness, in millimetres.

NOTE 2 Hydrostatic stress is expressed in megapascals.

3.1.2.3
design temperature
T_D
temperature or a combination of temperatures of the conveyed water, dependent on the service conditions for which the system has been designed

3.1.2.4
maximum design temperature
T_{max}
highest design temperature, T_D, occurring for short periods only

3.1.2.5
malfunction temperature
T_{mal}
highest temperature that can be reached when the control limits are exceeded

3.1.2.6
cold water temperature
T_{cold}
temperature of conveyed cold water of up to approximately 25 °C

NOTE For design purposes, 20 °C is used.

3.1.2.7
treated water for heating installations
water, intended for heating installations, which contains additives which have no detrimental effect on the system

3.1.3 Related to material characteristics

3.1.3.1
lower predictive limit of long-term hydrostatic strength
σ_{LPL}
quantity which can be considered as a material property, representing the 97,5 % lower confidence limit of the predicted average long-term hydrostatic strength at the given temperature, T, and time, t

NOTE Lower predictive limit is expressed in megapascals.

3.1.3.2
design stress
σ_D
allowable stress in the pipe material, σ_{DP}, or in the plastics fitting material, σ_{DF}, for a given application or service condition, respectively

NOTE 1 See also Annex A of ISO 15877-2:2009.

NOTE 2 Design stress is expressed in megapascals.

3.1.3.3
overall service coefficient
overall design coefficient
C
overall coefficient with a value greater than 1, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the lower predictive limit, LPL

3.1.3.4
virgin material
material in a form such as granules or powder that has not been subjected to use or processing other than that required for its manufacture and to which no reprocessable or recyclable material has been added

3.1.3.5
own reprocessable material
material prepared from rejected unused pipes and fittings, including trimmings from the production of pipes and fittings, that will be reprocessed in a manufacturer's plant after having been previously processed by the same manufacturer by a process such as moulding or extrusion and for which the complete formulation or material specification is known

3.1.3.6
pipes with barrier layer
plastics pipes provided with a thin barrier layer, e.g. to prevent or greatly diminish the diffusion of gases and the transmission of light through the pipe wall, and where the design stress requirements are totally met by the base polymer (PVC-C)

3.2 Symbols and abbreviated terms

3.2.1 Symbols

C	overall service (design) coefficient
d_e	outside diameter (at any point)
d_{em}	mean outside diameter