INTERNATIONAL STANDARD

ISO 4422-1

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Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications —

Part 1: General

Tubes et raccords en poly(chlorure de vinyle) non plastifié (PVC-U) pour l'adduction d'eau — Spécifications —

Partie 1: Généralités

Reference number
ISO 4422-1:1996(E)

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.

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 4422-1 was prepared by 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*.

Together with the other parts, this part of ISO 4422 cancels and replaces ISO 4422:1990, which has been technically revised.

ISO 4422 consists of the following parts, under the general title *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications*:

— *Part 1: General*

— *Part 2: Pipes (with or without integral sockets)*

— *Part 3: Fittings and joints*

— *Part 4: Valves and ancillary equipment*

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

ISO 4422 is one of a series of system standards for plastics piping systems which are being prepared within ISO/TC 138. Each system standard is based on a specific material for a specific application.

They conform to a standard multi-part format, each part dealing with a specific aspect of the overall system.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

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NOTE 1 At the present time, the reference document for the installation code is ISO/TR 4191, and this document will ultimately form part 6 of this International Standard.

Introduction

This international Standard, of which this is part 1, specifies the properties and performance of a piping system and its components made from unplasticized poly(vinyl chloride) (PVC-U), to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings.

This part of the International Standard covers general aspects of the material and its application.

Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications —

Part 1: General

1 Scope

This part of ISO 4422 specifies the general aspects of pipes, joints, fittings (post-formed and moulded) and ancillaries, made of unplasticized poly(vinyl chloride) (PVC-U), for a piping system intended to be used for buried water mains and services and for water supplies above ground, both inside and outside buildings.

The pipes, joints, fittings and ancillaries covered by this part of ISO 4422 are intended for the conveyance of cold water under pressure at temperatures up to approximately 20 °C, for general purposes and for the supply of drinking water. This part of ISO 4422 is also applicable to water up to and including 45 °C (see figure 1 in ISO 4422-2:1996).

Fittings made by hot-gas fusion and hot-plate fusion techniques are not covered by this part of ISO 4422.

NOTE 2 For installation of components covered by this International Standard, reference should be made to ISO/TR 4191.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4422. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4422 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3:1973, *Preferred numbers — Series of preferred numbers.*

ISO 3114:1977, *Unplasticized polyvinyl chloride (PVC) pipes for potable water supply — Extractability of lead and tin — Test method.*

ISO/TR 4191:1989, *Unplasticized polyvinyl chloride (PVC-U) pipes for water supply — Recommended practice for laying.*

ISO 4422-2:1996, *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications — Part 2: Pipes (with or without integral sockets).*

ISO 6992:1986, *Unplasticized polyvinyl chloride (PVC-U) pipes for drinking water supply — Extractability of cadmium and mercury occurring as impurities.*

ISO/TR 9080:1992, *Thermoplastics pipes for the transport of fluids — Methods of extrapolation of hydrostatic stress rupture data to determine the long-term hydrostatic strength of thermoplastics pipe materials.*

Guidelines for drinking water quality, Vol. 1: Recommendations, (WHO, Geneva, 1984).

3 Definitions

For the purposes of the various parts of this International Standard, the following definitions apply.

3.1 nominal outside diameter, d_n: A numerical designation of size which is common to all components in a thermoplastics piping system other than flanges and components designated by thread size. It is a convenient round number for reference purposes.

NOTE 3 For pipe conforming to ISO 161-1, the nominal outside diameter, expressed in millimetres, is the minimum mean outside diameter $d_{em,\,min}$.

3.2 nominal wall thickness, e_n: The specified wall thickness, in millimetres. It is identical to the specified minimum wall thickness at any point $e_{y,\,min}$.

3.3 nominal pressure, PN: An alphanumeric designation related to the mechanical characteristics of the components of a piping system and used for reference purposes.

3.4 hydrostatic pressure, p: The internal water pressure applied to a piping system.

3.5 working pressure: The maximum pressure which a piping system can sustain in continuous use under given service conditions without pressure surge.

NOTE 4 For thermoplastics piping systems, the value of the nominal pressure is equal to the working pressure at a temperature of 20 °C, expressed in bars.

3.6 hydrostatic stress, σ: The stress induced in the wall of a pipe when it is subjected to internal water pressure. The stress in megapascals is related to the internal water pressure p in bars, the nominal wall thickness e_n in millimetres and the nominal outside diameter of the pipe d_n in millimetres by the following equation:

$$\sigma = \frac{p \times (d_n - e_n)}{20\ e_n}$$

NOTE 5 If σ and p are given in the same units, the denominator becomes $2e_n$.

3.7 long-term hydrostatic strength for 50 years at 20 °C, σ_{LTHS}: A quantity with the unit of stress, i.e. megapascals, which can be considered to be a property of the material under consideration. It represents the 50 % lower confidence limit for the long-term hydrostatic strength and equals the predicted average strength at a temperature of 20 °C and a time of 50 years with internal water pressure.

3.8 lower confidence limit, σ_{LCL}: A quantity with the unit of stress, i.e. megapascals, which can be considered to be a property of the material under consideration, and represents the 97,5 % lower confidence limit of the predicted long-term hydrostatic strength at a temperature of 20 °C and a time of 50 years with internal water pressure.

NOTE 6 The value of this quantity is determined by the method given in ISO/TR 9080.

3.9 minimum required strength (MRS): The value of σ_{LCL} rounded to the next lower value of the R 10 series from ISO 3 when σ_{LCL} is below 10 MPa, or to the next lower value of the R 20 series when σ_{LCL} is higher than 10 MPa.

NOTE 7 See also clause 5 of ISO 4422-2:1996.

3.10 overall service (design) coefficient, C: An overal coefficient with a value greater than one, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in σ_{LCL}.

4 Material

4.1 The material from which the pipes, fittings and valves are made shall be PVC-U compound. This compound shall consist substantially of PVC-U resin, to which shall be added only those materials necessary to facilitate the production of pipes and fittings in conformity to this International Standard. All additives shall be uniformly dispersed.

None of these additives shall be used, separately or together, in quantities sufficient to constitute a toxic, organoleptic or microbial growth hazard or to impair the fabrication or solvent-cementing properties of the product or to prevent conformity to any of the applicable requirements specified in this International Standard.

4.2 The use of the manufacturer's own reprocessable material produced during the manufacture and works testing of products conforming to this International Standard is permissible. No reprocessable or recyclable material obtained from external sources shall be used.

5 Effect of materials on water quality

When used under the conditions for which they are designed, non-metallic materials in contact with, or likely to come into contact with, drinking water shall not constitute a toxic hazard, shall not support microbial growth and shall not give rise to any unpleasant taste or odour, cloudiness or discoloration of the water.

The concentrations of any chemical or biological agents leached from materials in contact with drinking water, and the values of the relevant organoleptic/physical parameters, shall not exceed the maximum limits recommended by the World Health Organization in its publication *Guidelines for drinking water quality, Vol. 1: Recommendations.*

If lead or mono/dialkyl tin compounds are permitted to be used as stabilizers, the extracted quantities of lead or tin measured as metals shall be determined in accordance with ISO 3114. The levels shall not exceed the levels permitted in the appropriate national regulations, or as otherwise agreed between the interested parties.

Cadmium and mercury levels shall not exceed those specified in ISO 6992.

Where applicable, pipes, fittings and valves shall also conform to the current national regulations concerning other substances in contact with drinking water.

ICS 83.140; 91.140.60

Descriptors: piping, water supply, pipes (tubes), water pipes, plastics products, unplasticized polyvinyl chloride, plastic tubes, pipe fittings, specifications, generalities.

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