Plastics piping systems for hot and cold water installations-Polypropylene (PP)-Part 1: General

Introduction

The System Standard, of which this is Part 1, specifies the requirements for a piping system and its components when made from polypropylene (PP). The piping system is intended to be used for hot and cold water installations.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by EN ISO 15874;

1) This standard provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;
2) 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.

Requirements and test methods for components of the piping system are specified in Part 2 and Part 3 of EN ISO 15874:2003. Characteristics for fitness of purpose (mainly for joints) are covered in Part 5. Part 7 (CEN ISO/TS 15874-7) gives guidance for the assessment of conformity.

This Part of EN ISO 15874 specifies the general aspects of the plastics piping system.

1. Scope

This Part of EN ISO 15874 specifies the general aspects of polypropylene (PP) 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 according to the class of application (see Table 1).This standard covers a range of service conditions (classes of application), design pressures and pipe dimension classes.

It also specifies the test parameters for the test methods referred to in this standard

In conjunction with the other Parts of EN ISO 15874 .It is applicable to PP pipes, fittings, their joints and to joints with components of other plastics and non-plastics materials intended to be used for hot and cold water installations.

2. Normative references

This Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments)

EN ISO 15874-2:2003, Plastics piping system for hot and cold water installations -- Polypropylene (PP) -- Part2: Pipes (ISO 15874-2:2003)

EN ISO 15874-3:2003, Plastics piping systems for hot and cold water installations -- Polypropylene (PP) --Part 3: Fittings (ISO 15874-3:2003)

ISO 472:1999, Plastics -- Vocabulary

ISO 1043-1:2001, Plastics -- Symbols and abbreviated terms -- Part 1: Basic polymers and their special characteristics

3 Terms and definitions, symbols and abbreviated terms

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

3.1 Terms and definitions

In addition to the terms and definitions given below, the terms and definitions given in IS0472:1999 and ISO 1043-1:2001 apply.

3.1.1 Geometrical terms and definitions

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 in millimetres(mm)

3.1.1.1.2 nominal size DN/OD

nominal size, related to outside diameter

3.1.1.2 nominal outside diameter (d_n)

specified diameter, in millimetres, assigned to a nominal size DN/OD

3.1.1.3 outside diameter (at any point) (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~ (= 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})

arithmetical 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 in millimetres (mm)

3.1.1.10 wall thickness (at any point) (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 (at any point) (e_{min})

minimum wall thickness at any point around the circumference of a component, as specified

3.1.1.12 maximum wall thickness at any point (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

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:

$S_{calc}=(d_n-e_n)/2e_n$

Where:

d_n is the nominal outside diameter, in millimetres;

e_n is the nominal wall thickness, expressed in millimeters

3.1.2 Terms and definitions 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

3.1.2.2 hydrostatic stress (σ)

stress, expressed in megapascals, induced in the wall of a pipe when a pressure is applied using water as a medium. It is calculated using the following approximate equation:

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

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 millimeters.

3.1.2.3 deslgn temperature (T_D)

a 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 (Tmax)

highest design temperature, T_D, occurring for short periods only

3.1.2.5 malfunction temperature (Tmal)

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℃

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 Terms and definitions related to material characteristics

3.1.3.1 lower confidence limit (LCL)

quantity,expressed in megapascals(MPa), 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.

3.1.3.2 design stress(σ_D)

allowable stress, in megapascais(MPa) ,in the pipe material, σ_{DP} ,or in the plastics fitting material, σ_{DF} ,for a given application or set of service conditions, respectively

3.1.3.3 overall service (design) coefficient (C)

overall coefficient with a value greate than one, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the lower

confidence limit, LCL

3.1.3.4 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 manufacture's plant after having been previously processed by the same manufacturer by a process such as moulding or extrudion and for which the complete formulation or material specification is known.

3.1.3.5 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(PP).

3.2 Symbols

C overall service (design) coefficient
d_e outside diameter(at any point)
d_{em} mean outside diameter
$d_{em,min}$ minimum mean outside diameter
$d_{em,max}$ maximum mean outside diameter
d_n nominal outside diameter
d_{sm} mean inside diameter of socket
e wall thickness at any point
e_{max} maximum wall thickness at any point
e_{min} minimum wall thickness at any point
e_n nominal wall thickness
ρ internal hydrostatic pressure
ρ_D design pressure
S_{calc} calculated pipe value
$S_{calc,max}$ maximum calculated pipe value
T temperature
T_{cold} cold water temperature
T_D design temperature
T_{mal} malfunction temperature
T_{max} maximum design temperature
t time
σ hydrostatic stress
σ_{cold} design stress at 20 ^{0}C
σ_D design stress
σ_{DF} design stress of plastics fitting material
σ_{DP} design stress of pipe material
σ_F hydrostatic stress values of plastics fitting material
σ_P hydrostatic stress values of plastics pipe material
σ_{LCL} lower confidence limit of long-term hydrostatic strength

3.3 Abbreviated terms

DN nominal size
DN/OD nominal size,outside diameter related
LCL lower confidence limit
MDP maximum design pressure
PP polypropylene
S pipe series

4 Classification of service conditions

The performance requirements for piping systems conforming to EN ISO 15874 are specified for four different application classes and are shown in Table 1.

For any application the parties concerned shall agree the selection of the applicable class conforming to Table 1.Each application class shall be combined with an operating pressure, PD, of 4 bar 2), 6 bar, 8 bar or 10 bar, as applicable.

Table 1—Classification of service conditions

Application class	Design Temperature T_D ^{0}C	Time2) at T_D years	T_{max} ^{0}C	Time at T_{max} years	T_{mal} ^{0}C	Time at T_{mal} h	Typical field of application
1 [1)]	60	49	80	1	95	100	Hot water supply (60 ^{0}C)
2 [1)]	70	49	80	1	95	100	Hot water supply (70 ^{0}C)
4 [2)]	20 2,5 Followed by 40 I 20 Followed by 60 I 25 Followed by (see next column)		70 Followed by (see next column)	2.5	100	100	Underfloor heating and low temperature radiators

5 [2]	20 14 Followed by 60 I 25 Followed by 80 10 Followed by (see next column)	90 1 Followed by (see next column)	100	100	High temperature radiators
1) A country may select either class 1 or class 2 to conform to its national regulations. 2) Where more than one design temperature appears for any class, the times should be aggregated (e.g. the design temperature profile for 50 years for class 5 is: 20 ^{0}C for 14 years followed by 60 ^{0}C for 25 years, 80 ^{0}C for 10 years, 90 ^{0}C for 1 year and 100 ^{0}C for 100 h).					
NOTE For values of T_D, T_{max} and T_{mal} in excess of those in this table, this standard does not apply.					

All systems which satisfy the conditions specified in table 1 shall also be suitable for the conveyance of cold water for a period of 50 years at a temperature of 20℃ and a design pressure of 10 bar.

All heating installations shall only use water or treated water as the transfer fluid

5 Material

5.1 General

The material from which the pipes and fittings are made shall be polypropylene (PP) which shall conform to EN ISO 15874-2 and EN ISO 15874-3 as applicable.

This standard is applicable to three types of polypropylene, as follows:

Polypropylene homopolymer PP-H (also known as type 1)

Polypropylene block copolymer PP-B (also known as type 2)

Polypropylene random copolymer PP-R (also known as type 3)

Where

PP-H comprises all polypropylene homopolymers

PP-B comprises thermoplastic propylene “block” copolymers having not more than 50% of another olefinic monomer (or monomers),having no functional group other than the olefinic group, copolymerized with propylene.

PP-R comprises thermoplastic propylene random copolymers having not more than 50% of another olefinic monomer (or monomers),having no functional group other than the olefinic group,copolymerized with propylene.

5.2 Influence on water intended for human consumption

All plastics and non-plastics for components of the PP piping system, when in permanent or temporary contact with water which is intended for human consumption, shall not adversely affect the quality of the drinking water.

5.3 Reprocessable material

The use of the manufacturer's own reprocessable material obtained during the production and works testing of products conforming to this standard is permitted in addition to the use of virgin material. Reprocessable material obtained from external sources and recyclable material shall not be used.