



Plastics piping systems — Multilayer pipe systems for indoor gas installations with a maximum operating pressure up to and including 5 bar (500 kPa) —

Part 1: Specifications for systems

Systèmes de canalisations en matières plastiques — Tubes multicouches et leurs assemblages pour une pression maximale de service inférieure ou égale à 5 bar (500 kPa) destinés à l'alimentation en gaz à l'intérieur des bâtiments —

Partie 1: Spécifications pour les systèmes

[Revision of first edition (ISO 17484-1:2006) and ISO 17484-1:2006/Cor.1:2008]

ICS 23.040.20; 23.040.45; 91.140.40

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Full standard:
<https://standards.iteh.ai/catalog/standards/sist/bbe56074-33ea-44d8-ad45-57bb58002b4f/iso-17484-1-2014>

Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

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

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

7 ctbents

Page

Foreword.....	vi
Introduction	vii
1 Scope	1
2 Normative references	2
3 Terms, definitions and symbols	3
3.1 Structural definitions	3
3.2 Geometrical definitions	3
3.3 Definitions related to pressure	4
3.4 Materials definitions	4
3.5 Definitions related to material characteristics	5
3.6 Terms related to service conditions	5
4 Requirements for the system	6
4.1 Pressure drop	6
4.2 Bending	6
4.3 Corrosive conditions	6
5 Pipes	6
5.1 Material	6
5.1.1 General	6
5.1.2 Reprocessible materials	6
5.1.3 Metallic materials	6
5.1.4 Product classification and construction group	7
5.2 General characteristics	7
5.2.1 General	7
5.2.2 Multilayer pipe construction	7
5.2.3 Minimum design coefficient	7
5.3 Dimensions of pipes	7
5.4 Mechanical properties	8
5.4.1 Long-term pressure strength	8
5.4.2 Strength of the joint line of M-pipe	9
5.4.3 Resistance to slow crack growth of the outer layer (cone test) for M-pipes	9
5.5 Physical properties	9
5.5.1 General	9
5.5.2 Additional requirements	9
6 Fittings	10
6.1 General	10
6.1.1 Fitting reference standards	10
6.1.2 Installation	11
6.2 Materials	11
6.3 Dimensions	11
6.4 Transition fittings	11
6.5 Rubber rings	11
7 Fitness for purpose	11
7.1 Diameter classes	11
7.2 Requirements	12
8 Marking and documentation	13
8.1 Legibility	13
8.2 Damage	13
8.3 Minimum marking requirements	13

8.3.1 Additional Instructions	14
Annex A (normative) List of the reference product standards	15
Annex B (normative) Test for delamination and strength of the joint line	16
B.1 Principle	16
B.2 Pipe sample	16
B.3 Cone	16
B.4 Procedure	16
B.5 Test report	17
Annex C (normative) Resistance to gas constituents	18
C.1 Principle	18
C.2 Specimen	18
C.3 Procedure	18
C.3.1 Cone test	18
C.3.2 Internal Pressure test	18
C.4 Test report	19
Annex D (normative) Thermal durability of the outer layer of M-pipes	20
D.1 Principle	20
D.2 Apparatus	20
D.3 Procedure	20
D.4 Test report	21
Annex E (normative) Adhesion test	22
E.1 Principle	22
E.2 Sample	22
E.3 Procedure	22
E.4 Test report	22
Annex F (normative) Odour permeability	23
F.1 Principle	23
F.2 Samples	23
F.3 Procedure	23
F.4 Test report	23
Annex G (normative) Resistance to tensile load on joints	24
G.1 Principle	24
G.2 Samples	24
G.3 Procedure	24
G.3.1 Short-term (1 h) test	24
G.3.2 Long-term (800 h) test	24
G.4 Test report	25
Annex H (normative) Crush test on joints	26
H.1 Principle	26
H.2 Samples	26
H.3 Procedure	26
H.4 Test report	27
Annex I (normative) Impact resistance test on joints	28
I.1 Principle	28
I.2 Pipe samples	28
I.3 Shape and mass of striker	28
I.4 Procedure	29
I.5 Test report	29
Annex J (normative) Thermal cycling test on joints	30
J.1 Principle	30
J.2 Samples	30
J.3 Procedure	30
J.4 Test report	31
Annex K (normative) Repeated bending test	32

K.1 Principle32
K.2 Samples32
K.3 Special tools32
K.4 Procedure32
K.5 Test report33
Bibliography34

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/bbe56074-33ea-44d8-ad45-57bb58002b4f/iso-17484-1-2014>

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 17484-1 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 4, *Plastics pipes and fittings for the supply of gaseous fuels*.

This second edition cancels and replaces the first edition (ISO 17484-1:2006) and ISO 17484-1:2006/Cor.1:2008, of which have been technically revised.

ISO 17484 consists of the following parts, under the general title *Plastics piping systems — Multilayer pipe systems for indoor gas installations with a maximum operating pressure up to and including 5 bar (500 kPa)*:

- *Part 1: Specifications for systems*
- *Part 2: Code of practice*

Introduction

This part of ISO 17484 was developed in response to worldwide demand for minimum specification for multi-layered pipes for indoor gas applications.

Multi-layered pipes are delivered generally as a complete system. Pipes, fittings, tools, etc., are not compatible with components of another brand, generally. An advantage is that all components are perfectly geared to one another, but for repairing, the lack of compatibility might be problematic in the future.

Fire safety of systems

Depending on the construction of the house, pipework layout and other local circumstances, it is possible that additional safety devices are required to fulfill the demands of fire safety. Safety aspects of the system will be described in the planned Part 2.

Code of practice

The planned second part of ISO 17484 will be the code of practice for installation.

Recommendations on design, construction and protection in case of fire of the gas indoor installation are given in EN 1775.

References to ISO/TC 138/SC5 work

Test methods referred to in this part of ISO 17484 have been developed by SC 5 as far as possible. However, not all test methods needed are in the working programme of SC 5. These test methods are placed in Annexes B to K of this part of ISO 17484. It is planned that these tests will be developed as International Standards in the future.

For multilayer pipe construction, consisting of a layer of a reference standard material, an adhesive and a non-stress-designed layer, procedure I and the relevant product standards are followed for all aspects, excluding the aspects of delamination and, if applicable, oxygen permeation.

For example, layers can have the following purposes:

- ability to withstand the pressure;
- ability to realize interlayer adhesion;
- ability to block or greatly diminish incoming UV and/or sunlight;
- ability to mechanically protect the outside layer;
- ability to control the longitudinal expansion;
- ability to give the multilayer pipe a colour (inside layer or outside layer).

Some characteristics can be combined in one layer.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Full standard:
<https://standards.iteh.ai/catalog/standards/sist/bbe56074-33ea-44d8-ad45-57bb58002b4f/iso-17484-1-2014>

Plastics piping systems — Multilayer pipe systems for indoor gas installations with a maximum operating pressure up to and including 5 bar (500 kPa) —

Part 1: Specifications for systems

1 Scope

This part of ISO 17484 specifies the general requirements and the performance requirements for multilayer pipe systems based on pipes, fittings and their joints intended to be used for gas supply within buildings.

PE-X and PE * pipes composed of one stress-designed layer, adhesive and a barrier layer are also covered by this part of ISO 17484.

This part of ISO 17484 gives guidance for the design of piping systems consisting of multilayer pipes based on thermoplastics, for which at least 60 % of the wall thickness is polymeric material. Polymeric materials intended for stress-designed layers and all inner layers are required to be polyethylene (PE) and/or crosslinked polyethylene (PE-X) in accordance with Annex A of this part of ISO 17484. The outer layer of a metal multilayer is required to be PE or PE-X. PE-RT is considered as PE but with specific properties concerning hoop-stress performance (see 5.4.2.).

This part of ISO 17484 applies to systems that operate at temperatures of – 20 °C up to 60 °C.

For the purpose of this part of ISO 17484, crosslinked polyethylene (PE-X) and adhesive layers are considered as thermoplastic materials.

For sizes greater than 63 mm the requirements of ISO 18225 have to be fulfilled in addition.

This part of ISO 17484 is applicable for piping systems used in buildings to supply gas with a maximum operating pressure up to and including 500 kPa (5 bar)¹⁾.

This standard applies to the following fuels:

- Category D gaseous fuel: natural gas; see ISO 13623;
- Category E gaseous fuel: LPG vapour, and natural gas or LPG vapour; see ISO 13623.

* Note: The maximum operation pressure of PE 80 may be lower than 5 bar.

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm²

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

ISO 161-1, *Thermoplastics pipes for the conveyance of fluids — Nominal outside diameters and nominal pressures — Part 1: Metric series*

ISO 497:1973, *Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers*

ISO 1167 (all parts), *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure*

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

ISO 3503, *Assembled joints between fittings and polyethylene (PE) pressure pipes — Test of leakproofness under internal pressure when subjected to bending*

ISO 8085-3:2001, *Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Metric series — Specifications — Part 3: Electrofusion fittings*

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

ISO 10838 (all parts), *Mechanical fittings for polyethylene piping systems for the supply of gaseous fuels*

ISO 11357-6, *Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time*

ISO 12162:1995, *Thermoplastics materials for pipes and fittings for pressure applications — Classification and designation — Overall service (design) coefficient*

ISO 13480, *Polyethylene pipes — Resistance to slow crack growth — Cone test method*

ISO 13623:2000, *Petroleum and natural gas industries — Pipeline transportation systems*

ISO 13951, *Plastics piping systems — Test method for the resistance of polyolefin pipe/pipe or pipe/fitting assemblies to tensile loading*

ISO 14531-1, *Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 1: Pipes*

ISO 14531-2, *Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 2: Electrofusion Fittings*

ISO 17454:2006, *Plastics piping systems — Multilayer pipes — Test method for the adhesion of the different layers using a pulling rig*

ISO 17456:—, *Plastics piping systems — Multilayer pipes — Determination of long-term strength*

ISO 18225, *Plastic piping systems — Multilayer piping systems for outdoor gas installations — Specifications for systems*

EN 713, *Plastics piping systems — Mechanical joints between fittings and polyolefin pressure pipes — Test method for leaktightness under internal pressure of assemblies subjected to bending*

EN 1555-3, *Plastics piping systems for the supply of gaseous fuels — Polyethylene(PE) — Part 3: Fittings*

3 Terms, definitions and symbols

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

3.1 Structural definitions

3.1.1

multilayer pipe

pipe comprising of several stress-designed layers

3.1.2

multilayer M-pipe

Pipe comprised of stress-designed polymeric layers and one or more stress-designed metallic layers

Note The wall thickness of the pipe consists of at least 60% of polymeric materials (e.g. PEX/Al/PEX or PE-RT/Al/PEX).

3.1.3

multilayer P-pipe

pipe comprised of more than one stress-designed polymeric layer (e.g. PE/PE-X)

3.1.4

layer

homogeneous circumferential section of pipe wall that has chemical and/or mechanical and/or physical characteristics different from those of its immediate neighbours

3.1.5

inner layer

layer in contact with the conveyed fluid

3.1.6

outer layer

layer exposed to the external environment

3.2 Geometrical definitions

3.2.1

nominal diameter

d_n

specified diameter, assigned to a nominal size (DN/OD or DN/ID)

NOTE The nominal diameter is expressed in units of millimetres.

3.2.2

outside diameter

d_e

diameter, measured through its cross section at any point of a pipe or the fitting end of a fitting, rounded to the next greater 0,1 mm

3.2.3

mean outside diameter

measured length of the outer circumference of the pipe divided by π , rounded up to the nearest 0,1 mm

NOTE The value for π is taken to be 3,142.

3.2.4

inside diameter

value of the measurement of the diameter through its cross section at any point of a pipe, rounded to the next greater 0,1 mm

3.2.5

SDR_m

metal layer standard dimension ratio, the nominal outside diameter (DN or OD) divided by the nominal wall thickness of the metal layer

3.2.6

wall thickness

difference between the pipe outside diameter used for joining and the pipe bore divided by 2

3.2.7

nominal wall thickness

e_n

wall thickness, corresponding to the minimum wall thickness at any point

NOTE The nominal wall thickness is expressed in units of millimetres.

3.2.8

mean wall thickness

e_m

arithmetic mean of at least four measurements regularly spaced around the same cross-sectional plane of the pipe, including the measured minimum and maximum values obtained, rounded up to the nearest 0,1 mm

3.3 Definitions related to pressure

3.3.1

design pressure

p_D

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

3.3.2

predicted design pressure

p_{CD}

pressure that represents the predicted design pressure after a lifetime of 50 years, using the 97,5 % reference line

NOTE The predicted design pressure is expressed in units of kilopascals (bars).

3.4 Materials definitions

3.4.1

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

3.4.2

own reprocessable material

material prepared from rejected unused pipes and fittings, including trimmings from the production of pipes and fittings that can 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 is known