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Plastics piping systems — Multilayer pipe systems for indoor gas installations —

Part 2: Code of practice

Systèmes de canalisations en matières plastiques — Tubes multicouches et leurs assemblages destinés à l'alimentation en gaz à l'intérieur des bâtiments —

Partie 2: Code de pratique

Reference number
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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 17484-2 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*.

ISO 17484 consists of the following parts, under the general title *Plastics piping systems — Multilayer pipe systems for indoor gas installations*:

— *Part 1: Specifications for systems*

— *Part 2: Code of practice*

Introduction

ISO 17484 applies to multilayer pipe systems intended to be installed inside buildings.

The scope of this part of ISO 17484 has been limited to a maximum operating pressure (MOP) of 5 bar (500 kPa).

Although these materials are able to withstand higher pressures, a lower maximum working pressure has been selected taking into account use for gas within buildings. Therefore, a rather high safety factor has been incorporated into the functional requirements. Currently, in some countries multilayer piping is installed only under specific conditions, but this is not the case everywhere. Generally, interest in multilayer pipe systems has been increasing. Cost-effective material installation cost is a good argument for the reconsideration of conventional installation techniques. Compared with traditional materials and installation techniques, multilayer systems offer ease of installation and are more cost-effective.

The working pressure of gas in buildings for domestic or commercial use is usually not more than 100 mbar (10 kPa). Only in very rare cases is a higher working pressure applied.

When higher pressures are applied, it is very important to take into account national regulations for the fitting of (industrial) gas installations.

It is likely that new pipe constructions or materials like multilayer pipe and PEX systems will be accepted in more countries in the coming years. At present, in the majority of countries only steel and copper pipework are permitted for gas supply within buildings, other materials being forbidden explicitly. However, it would be expected that national standards and laws will be changed in favour of the application of new installation techniques.

Plastics piping systems — Multilayer pipe systems for indoor gas installations —

Part 2: Code of practice

1 Scope

This part of ISO 17484 specifies the recommended practice for the installation of multilayer pipe systems in accordance with ISO 17484-1.

It is applicable to pipe systems used in buildings to supply gas with a maximum operating pressure (MOP) up to and including 5 bar[1)].

This part of ISO 17484 specifies common basic principles for indoor gas systems. Users of this part of ISO 17484 should be aware that more detailed national standards and/or codes of practice can exist in ISO member countries. These existing regulations, as well as new national regulations, take precedence over this part of ISO 17484. It is intended to be applied in association with these national standards and/or codes of practice setting out the above-mentioned basic principles.

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 17484-1, *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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17484-1 and the following apply.

3.1
equipotential bond
means of ensuring that metallic gas pipework and other metallic parts of the building are at the same potential

NOTE For safety reasons, this equipotential bonding is connected to earth.

1) 1 bar = 0,1 MPa = 0,1 N/mm^2 = 10^5 N/m^2.

4 Design

4.1 Reference to installation standards

This part of ISO 17484 gives functional recommendations for the design of gas pipework within buildings. In addition to this part of ISO 17484, more detailed national standards shall be applied.

NOTE 1 Installation techniques differ from country to country. These different techniques are often based on "installation tradition", differences in the construction of buildings, differences in climatic conditions, etc. For these reasons it is difficult to produce a general standard for installation. This is also why EN 1775 gives only functional recommendations. In many cases EN 1775 offers more than one solution. Each national standards body may select the most appropriate possibility that could be described in a more detailed way in a national standard.

National restrictions relative to the MOP shall be taken into account.

NOTE 2 Additional safety devices are required by some national standards bodies, for example excess flow valves, thermal valves or overpressure valves.

4.2 Pipework components

The pipework components shall be appropriate for:

— the types of gases being distributed;

NOTE Particular attention should be given to the content of hydrogen sulfide, and to water content, dust content and water/hydrocarbon dew point with respect to materials, drainage of low points and filtration.

— the pipework design pressure;

— the location of the pipework;

— the pipework temperature under normal operating conditions.

5 Location of pipework

5.1 General requirements for location of pipework

The location of the pipework shall minimize the risk of damage caused by, for example mechanical impact, UV exposure, accelerated corrosion, chemical attack, extreme temperatures and lightning, or else additional safety measures shall be applied.

The route and location of pipework built within the internal structure shall be such that third party damage is minimized and that any building movement does not lead to failure.

The route of pipework in buildings should be located in ventilated spaces.

Ventilation shall be adequate to safely dilute any small gas leak taking due account of the density of the gas (heavier than air, e.g. LPG, or lighter than air, e.g. natural gas).

Where it is not possible to achieve adequate ventilation, other solutions shall be applied, e.g. ventilated sleeves, ducts, pipes or the filling of the space around the pipe with inert materials, etc.

The route of the pipework shall be as short as practicable and the number of joints kept to a minimum.

The use of diagonal routes should always be avoided.

Where pipework is concealed, particular attention shall be given to the mode of construction and to corrosion protection of the pipework.

The position of the pipework in relation to other services shall be such that it can function properly and be used with safety.

Pipework shall not be located near high voltage conductors or hot or chilled water systems, nor shall it be subjected to vibrations unless appropriate precautions are taken.

NOTE Spaces reserved for other uses, such as lift shafts, garbage chutes, transformers, sewage pipes and bomb shelters, should be avoided unless specific precautions are taken.

Where temperature change and building movements can lead to significant stresses on pipework, adequate provisions shall be made for moving the pipework.

The effects of lightning shall be taken into consideration when designing the pipework.

Where the distributed gas is wet or has a low vapour pressure, pipework shall be protected against frost and/or condensation and siphons shall be fitted at low points.

5.2 Protection in case of fire

The designer shall consider the possibility of an outbreak of fire at a building where gas pipework is in use, causing damage to the fabric of the building and, consequently or separately, to the gas pipework.

The design objective shall be to minimize the likelihood of an explosion or serious aggravation of the fire.

The design objective may be achieved, for example, by the use of one or more of the following:

— accessible manual means of isolation;

— automatic means of isolation;

— location of all or part of the pipework in an enclosure providing protection in the event of fire;

— coating pipework with a protective material to enable the pipework to withstand high temperatures for a given period of time.

NOTE In the event of fire, even if rupture does not occur, the pipework shall be carefully inspected and tested.

5.3 Additional safety devices

Where required by risk assessment, specific additional protection shall be installed to protect against the consequence of failure of a component of the pipework.

NOTE This may be a safety device (for example, one that protects against excessive temperatures or excess flow) or a passive protection measure (e.g. enclosure of the pipework).

The number, location and sizing of excess flow device(s) shall be assessed and should be optimized during design to allow such a device to actuate when a failure of a pipework component occurs and to cope with the locally allowed pressure drop values. This process shall rely on accurate pressure drop values given by system/component manufacturers, e.g. in design specification recommendations.

6 Materials and components

The MOP for multilayer pipe gas systems is 5 bar (500 kPa). The system shall meet the requirements of ISO 17484-1.

PE-X systems are suitable for the whole temperature range specified in ISO 17484-1, i.e. −20 °C to +60 °C.

The manufacturer shall be consulted with respect to prolonged operation at temperatures above 40 °C and up to 60 °C, and below 0 °C.

7 Construction

This part of ISO 17484 gives functional requirements for the construction of pipework. National standards shall be applied if available.

Special attention shall be paid to the following.

— The assembly instructions of the manufacturer shall be followed.

— During the installation of the pipework, care shall be taken to prevent the ingress of foreign matter (e.g. dirt, water, other detrimental substances) into the pipes or fittings.

— The pipework shall be protected during installation.

— If it is foreseen that pipework may be damaged as a result of other construction work after installation, the pipework shall be protected adequately.

EXAMPLE Open pipework on a floor that has not yet been embedded in concrete could be easily damaged by construction workers walking over the pipework.

— Only appropriate tools, accessories and procedures specific to a technique and approved by the pipe and/or fitting manufacturer shall be used to perform joints.

— Multilayer M-pipes shall be connected to the equipotential bonding system of the house.

NOTE Some types of M-pipe systems are electrically earthed during installation of the fittings. For these systems, connection to the equipotential bonding system is not necessary.

8 Jointing procedures

8.1 General

Multilayer and PEX pipes are generally delivered as a complete system. The pipes, fittings, tools, etc. would have been tested as a complete system. However, components are generally not compatible with systems of another brand.

Installation operatives applying different systems should be aware of this lack of compatibility.

Repair instructions are supplied by the manufacturer because of the lack of compatibility.

The manufacturer shall provide a transition fitting intended to be connected to a standardized system, the connection complying with the relevant standards, e.g. ISO 7-1.

NOTE Some countries require standardized dimensions (outside diameter and/or wall thickness). Standardization of dimensions at the international level is not yet available.

Special attention should be paid to:

— assembly instructions given by the manufacturer;

— non-interchangeability of pipes and/or fittings of one system manufacturer with pipes and/or fittings of another system manufacturer, except where interchangeability is indicated by each of the system manufacturers;

— use of only those tools, accessories (e.g. jaws and collars) and procedures which are appropriate to the jointing system being applied by the installation operative;

— connection of multilayer M-pipes (which comprise at least one metallic layer, e.g. PEX-Al-PEX or PE-AL-PE) to the equipotential bonding system of the building.

8.2 Installation process

The installation process should take into account the manufacturer's recommendations.

9 Pressure testing and commissioning

9.1 General recommendations

Pipework shall be put into service only if the tests specified in Clause 9 have been successfully carried out.

The tests shall be carried out on the whole pipework or on separate sections.

Before testing, all pipework open ends shall be sealed. Any leaktight device used to seal the pipework shall be capable of withstanding the test pressure.

In general, means of isolation in the closed position should not be assumed to be leaktight.

Tests shall be conducted by the authorized person identified as being responsible for their execution.

Test reporting shall entail the preparation of a test report by the authorized person. This report shall enable the section of the pipework concerned to be clearly identified. It should give in detail the date, the type of tests performed, the readings measured (duration, pressure, temperature, etc.) and the results obtained.

In cases where the results of tests are negative, leaks shall be identified by appropriate means, for example use of an appropriate leak-detection fluid. The leak-detection fluid shall not adversely affect the material of the pipes and fittings. Defective parts shall be replaced or repaired. After elimination of leaks, the test shall be repeated until the results are positive.

NOTE For components made of stainless steel, the level of chloride ions in the leak-detection fluid shall be below 30 mg/l.

9.2 Recommendations relating to the safety of persons and property during testing

The test procedure shall not jeopardize the safety of persons and property.

Before testing, the authorized person shall have full knowledge of the pipework and shall verify the validity of information about the pipework. The authorized person shall ensure, or have certificates or documents attesting, that the pipework has been constructed in compliance with legal requirements and regulations in force and in accordance with the design specifications.

Depending on the test pressure selected, the type of joint(s) used and the location of the pipework, the person authorized to carry out tests with a fluid under pressure shall judge whether it is necessary to first carry out non-destructive tests.

The applied test pressure shall not exceed the pressure that the pipework is able to withstand. If necessary, appliances shall be disconnected or isolated.

Any sudden increase in pressure within the pipework to be tested shall be avoided.

9.3 Tightness testing

All pipework shall be subjected to a tightness test.

The applied tightness test pressure shall be at least equal to the operating pressure.

9.4 Test fluids

The test fluid to be used shall be either air, inert gas (e.g. nitrogen) or the gas to be distributed, as follows:

a) Use of inert gas

When inert gas or air is used from a storage vessel under pressure, precautions shall be taken to ensure that the pressure inside the pipework does not exceed the specified test pressure;

b) Utilization of the gas to be distributed

Where the use of air or inert gas is not practicable, it may be acceptable to use the gas to be distributed as a test fluid for tightness tests carried out at operating pressure, provided that all joints are easily accessible.

If the test is not immediately followed by commissioning of the pipework, the gas to be distributed shall be purged from the pipework and the pipework shall be sealed after purging.

9.5 Test conditions

Test fluid temperature and atmospheric pressure can affect strength testing and tightness testing because of their effects on measured pressures. Variation in these parameters shall be taken into account in the assessment of the results of the tests.

9.6 Strength testing

The strength test shall be carried out at high pressure to assure the integrity of a system. This test does not intend to determine the long-term strength of the pipework, but to detect installation faults, such as unpressed fittings or serious pipe damage. In practice, a strength test of approximately 1 h will be sufficient for the minimum pressures specified in Table 1. The minimum pressure for the strength test is given in Table 1. At higher test pressures the testing time could be reduced considerably, up to a minimum testing duration of 30 s.

The strength test pressure (STP) is a function of the MOP, as shown in Table 1.

Table 1 — Strength test pressure as a function of the maximum operating pressure

MOP bar	**STP** bar
$2 < \text{MOP} \leqslant 5$	$> 1{,}40 \times \text{MOP}$
$0{,}1 < \text{MOP} \leqslant 2$	$> 1{,}75 \times \text{MOP}$
$\text{MOP} \leqslant 0{,}1$	$\geqslant 2{,}5 \times \text{MOP}$

The strength test may be performed simultaneously with the tightness test, using the same fluid at the same pressure level of the strength test.

If the strength test is not combined with the tightness test, the strength test shall precede it.

If the strength test is not combined with the tightness test, the duration of the strength test shall be to the time required to confirm, by appropriate means, that there has been no rupture in the pipework.

All fittings integral with the pipework, such as regulators, meters, means of isolation, safety devices, etc., which are not capable of withstanding the pressure selected for the test, shall be removed prior to the test. The means of isolation shall be capable of passing this test.

In this case, either the fitting shall be replaced with a section of pipework, or parts of the pipework situated upstream and downstream of the removed component shall be sealed and tested separately.

Appliances shall be disconnected before the strength test is performed.

10 Storage and handling

10.1 General

Multilayer pipes are available as coiled pipe and in straight lengths (only the larger sizes, generally). Care shall be taken during the transport, handling and storage of pipes, fittings and other items to avoid damage.

Care shall be taken to prevent the ingress of foreign matter (e.g. dirt, water and other detrimental substances) into the pipes or fittings.

10.2 Storage

Pipes and fittings shall be stored in such a way as to minimize the possibility of the material being damaged by crushing, piercing or exposure to direct sunlight. Contact with aggressive reagents or solvents shall be avoided. The manufacturer's storage recommendations shall be followed.

Fittings shall be stored in their original packaging until ready for use.

Straight lengths of pipes stored shall be stacked on a reasonably flat surface, free from sharp objects, stones or projections likely to deform or damage these pipes. Stacking shall never be a cause of distortion of the pipe cross-section.

NOTE Covering of the pipe to protect it against UV radiation can sometimes create excessive heat which can also be detrimental to the pipe performance.

10.3 Handling

Dragging of pipes or coils along rough surfaces shall be avoided.

Bibliography

[1] ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

[2] ISO/TS 10839, *Polyethylene pipes and fittings for the supply of gaseous fuels — Code of practice for design, handling and installation*

[3] EN 1775, *Gas supply — Gas pipework for buildings — Maximum operating pressure less than or equal to 5 bar — Functional recommendations*

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