BRITISH STANDARD

BS EN
580:2003

Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) pipes — Test methods for the resistance to dichloromethane at a specified temperature (DCMT)

The European Standard EN 580:2003 has the status of a British Standard

ICS 23.040.20

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 580:2003. It supersedes BS EN 580:1994 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PRI/88, Plastic piping systems, to Subcommittee PRI/88/4, Test methods, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 April 2003

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 9 and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 41775 1

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 580

April 2003

ICS 23.040.20

Supersedes EN 580:1993

English version

Plastics piping systems - Unplasticized poly(vinyl chloride) (PVC-U) pipes - Test method for the resistance to dichloromethane at a specified temperature (DCMT)

Systèmes de canalisations en plastiques - Tubes en poly(chlorure de vinyl) non-plastifié - Méthode d'essai de la résistance au dichlorométhane à une température spécifiée (DCMT)

Kunststoff-Rohrleitungssysteme - Rohre aus weichmacherfreiem Polyvinylchlorid (PVC-U) - Prüfverfahren für die Beständigkeit gegen Dichlormethan bei einer festgelegten Temperatur (DCMT)

This European Standard was approved by CEN on 14 February 2003.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (EN 580:2003) has been prepared by Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

This document supersedes EN 580:1993.

The modifications in principle are:

— the surface of the dichloromethane is minimised and protected by an increased thick layer of water on top of it (see 6.2);

— after immersion in the dichloromethane, the test piece is left for “dripping off” in the water layer before final drying and inspection (see 7.4).

The modifications permit to reduce annual consumption of dichloromethane and thus improve the environment for the staff conducting the test without reducing the number of tests. Practice has shown that this modified procedure and test arrangement can result in a reduction of dichloromethane consumption by more than 90 %.

This standard includes the following:

— Annex A, which is informative, gives a basis for describing the amount of attack:

— Annex B, which is informative, shows modifications in test equipment and procedure in order to make it possible to reduce the consumption of dichloromethane.

The material-dependent test parameters and/or performance requirements are incorporated in the referring standard(s).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The maximum temperature at which the unplasticized poly(vinyl chloride) (PVC-U) pipe is not attacked by dichloromethane gives an indication of the level and homogeneity of gelation of the pipe. This characteristic is related to the mechanical properties and, in particular, the long-term performance of the pipe.

1 Scope

This standard specifies a method for determining the resistance of unplasticized poly(vinyl chloride) (PVC-U) pipes to dichloromethane at a specified temperature (DCMT).

This standard is applicable to PVC-U pipes, irrespective of their use.

The method can be used as a rapid means of quality control during manufacture.

NOTE The temperature of the dichloromethane at which PVC-U shall not be attacked, is specified in the referring standard.

2 Principle

A piece of PVC-U pipe, of specified length, chamfered at one end to an angle dependent on its thickness, is immersed for (30 ± 1) min in dichloromethane at a specified temperature to verify that the PVC-U is not attacked at that temperature. The surface area of the dichloromethane is minimized and covered by a thick layer of water on top for safety reasons and to reduce evaporation. After immersion in the dichloromethane, the test piece is left for "dripping off" in the water layer before final drying and inspection.

NOTE 1 If the PVC-U has not sufficiently gelled, whitening of the surface will occur and, in the worst case, a precipitate will be observed.

NOTE 2 It is assumed that the following test parameters are set by the standard making reference to this standard:

a) the control temperature, *T*, for the dichloromethane (see 4.3 and 6.3);
b) the minimum wall thickness for which the test shall be applied.

3 Reagent

Dichloromethane, technical grade.

NOTE Dichloromethane, technical grade, contains small quantities (1 % maximum each) of chloromethane (CH_3Cl), of trichloromethane ($CHCl_3$) and of tetrachloromethane (CCl_4). It has been noted that even if the level of these impurities were to attain 5 % in total, the results would not be significantly different.

WARNING The boiling temperature of dichloromethane is low (40 °C). Consequently, it has a high vapour pressure at ambient temperature. Further, it can be toxic to skin and eyes. It is, therefore, necessary to take precautions when handling dichloromethane or test pieces, which have been immersed in it.
The vapours are also toxic: the threshold limit value (T.L.V.) comparable to the maximum admissible concentration (M.A.C.) is 100 ml/m^3 (ppm). Ventilation of the room or the area in which the container is placed and where the drying of the test piece takes place is, therefore, essential.

4 Apparatus

4.1 Chamfering machine (see 5.2)

4.2 Glass or stainless steel container, preferably of suitable dimensions to accommodate one or more test pieces (see clause 5), with a grating maintained at approximately 10 mm above the bottom of the container, a lid to limit evaporation of the liquid (see 6.1 and 6.2) and thermostatic control, with stirrer, capable of maintaining the temperature of the liquid at (T ± 0,5) °C with help of the refrigeration equipment (4.3)

NOTE It is recommended to use a cylindrical container of a suitable small diameter, e.g. slightly greater than 315 mm depending on the dimensions most frequently produced (larger pipes can be cut into a number of longitudinal sections to be able to accommodate to the size of the container, see 5.1).

Depending on the local conditions this container may be positioned in an existing vessel, previously used for larger tests, which can be filled with water (see annex B). The temperature control and stirring can take place in the old vessel in case the new container is relatively small and made from a heat transferring material like stainless steel. The grating should be made so it can be positioned in 2 levels as follows:

a) with the appropriate part of the test piece or sections of test piece immersed in the dichloromethane;

b) with the part of the test piece(s) which were immersed in the dichloromethane fully immersed in the water but not in contact with the dichloromethane.

4.3 **Refrigeration equipment**, capable of cooling the dichloromethane to the temperature as specified in the referring standard.

4.4 **Hood fitted with a fume extraction system**, for safety reasons (see warning in clause 3) mounted over the container (4.2).

5 Preparation of the test piece

5.1 Cut from the pipe to be tested a test piece 160 mm in length, such that the cut ends are perpendicular to the axis of the pipe. The wall thickness of the pipe shall be greater than the minimum thickness specified for this test by the referring standard [see item b) of note 2 in clause 2].

5.2 Chamfer, by cutting without tangible heating (see note), one of the ends of the test piece over its complete thickness. The angle of chamfer depends on the thickness of the pipe as given in Table 1 [see item b) of note 2 in clause 2].

NOTE The term "cutting" is intended to exclude grinding.

Table 1

Pipe wall thickness (*e*) mm	**Chamfering angle** degrees
$e < 8$	10
$8 \leq e < 16$	20
$16 \leq e$	30

5.3 Cool the test piece to ambient temperature.

5.4 If the test piece is larger than the diameter of the container, cut the test piece into a number of longitudinal sections. The width of the sawing blade shall be maximum 2,5 mm. The number of sections in which a pipe is cut shall be limited to the lowest possible considering the container size.

6 Immersion conditions

6.1 Fill the container with dichloromethane of known refractive index to a level sufficient to immerse the necessary portion of the test piece (see 7.2).

6.2 Cover the dichloromethane with a layer of water of preferably 250 mm to 300 mm, but not less than 20 mm.

6.3 Using the temperature controls, refrigeration equipment and stirrer as appropriate, establish and maintain the temperature of the dichloromethane in the container at ($T \pm 0{,}5$) °C [see item a) of note 2 in clause 2].

6.4 Maintain the level of dichloromethane in the container.

6.5 Ensure that the refractive index of the dichloromethane does not vary in service by more than ± 0,002 from its initial value.

NOTE In practice, the refractive index varies by 0,0005 every 3 months when some 700 to 800 tests are carried out per month. A check on the quality of the bath every 3 months should suffice.

7 Procedure

7.1 For the duration of the test, avoid touching the test piece with fingers (see warning in clause 3), e.g. by using tongs and gloves.

7.2 Place the test piece in the liquid so that the chamfered zone is completely immersed in the dichloromethane.

7.3 Leave the test piece for (30 ± 1) min in the dichloromethane.

7.4 After this immersion time, place the grate in position 2), see 4.2, for 10 to 15 min to let the dichloromethane “drip off”. See also annex B.

7.5 Remove the test piece from the container and leave it to dry in the air for at least 15 min and until the water is evaporated in a well-ventilated area or under a hood equipped with a ventilation system.

7.6 Examine the test piece and determine the results in accordance with clause 8.

8 Expression of results

8.1 If the test piece shows no sign of attack anywhere (other than swelling), express the result as "No attack".

8.2 If the test piece shows signs of attack anywhere, express the result as "Attacked" and if required describe the appearance and location of the attack.

NOTE For a possible description of the attack on the chamfer, see annex A.

9 Test report

The test report shall include the following information:

a) reference to this standard and to the referring standard;

b) complete identification of the pipe under test;

c) temperature, *T*, of the dichloromethane bath;

d) immersion time;

e) number of test pieces under test;

f) results of the test and any associated information;

g) any factors which may have affected the results, such as any incidents or any operating details not specified in this standard;

h) date of test.

Annex A
(informative)

Description of attack

In the case of attack, it is possible to express the result as a percentage of the total chamfer surface (see Figure A.1) in two aspects as follows:

a) percentage attack in the direction of the chamfer, i.e.

$$\text{Attack } 1 = \frac{a}{c} \times 100$$

where

a is the average dimension of the attacked zone in the axial direction on the chamfer surface;

c is the width of the chamfer;

b) percentage attack in the circumferential direction, i.e.

$$\text{Attack } 2 = \frac{b}{\pi D} \times 100$$

where

b is the average dimension of the attacked zone in the circumferential direction on the chamfer surface;

D is the outside diameter of the pipe.

The rounding interval for the result is 5.

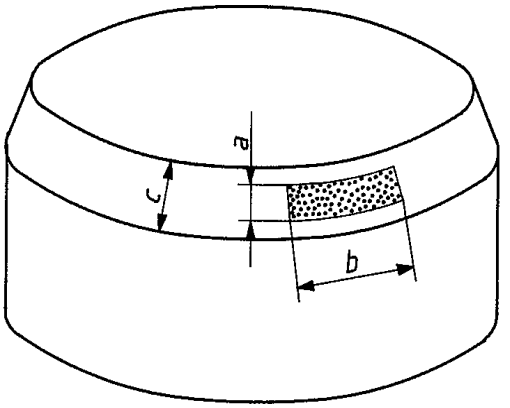
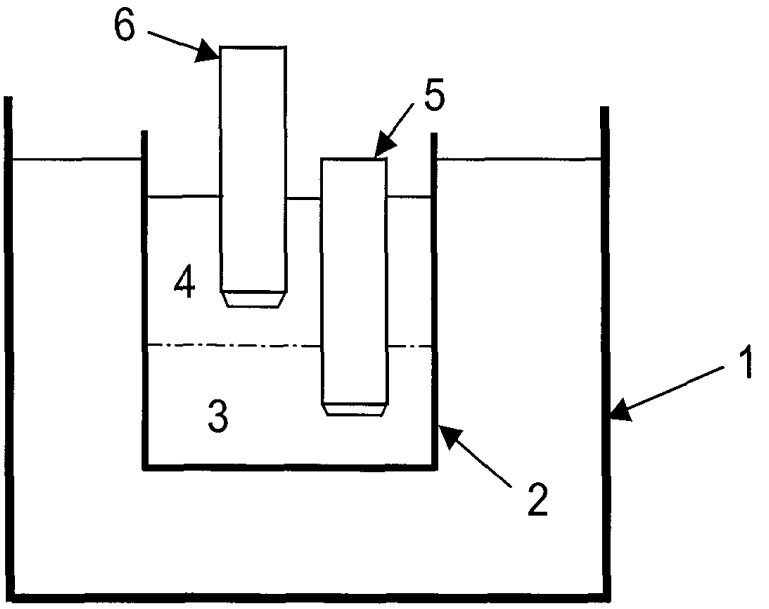


Figure A.1

Annex B
(informative)

Example of small vessel build into existing vessel

Figure B.1 shows an example of modifications in test equipment and procedure in order to make it possible to reduce the consumption of dichloromethane.



Key
1 Old vessel filled with water at the specified test temperature and stirred
2 New vessel
3 Dichloromethane volume
4 Water volume
5 Pipe in testing position
6 Pipe in ”drip off” position

Figure B.1

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