BRITISH STANDARD

BS EN 12293:2000
BS 2782-11: Method 1123T:2000

Plastics piping systems — Thermoplastics pipes and fittings for hot and cold water — Test method for the resistance of mounted assemblies to temperature cycling

The European Standard EN 12293:1999 has the status of a British Standard

ICS 23.040.20; 23.040.45

National foreword

This British Standard is the official English language version of EN 12293:2000.

The UK participation in its preparation was entrusted to Technical Committee PRI/61, Plastics piping systems and components, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible 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 committee can be obtained on request to its secretary.

The responsible UK committee gives the following advice concerning the use and interpretation of this British Standard.

a) In **3.2** a) and in **3.3** reference is made to "water velocity". This is residual text from the draft standard which should have been changed to reflect redrafting of **3.1** a), of **3.3** and of clause **7** to to remove references to water velocity and/or to relate instead to the specified limits for the temperature variation throughout the test piece. For consistency with the wording of **3.1** a), of **3.3** and of **6.2** in EN 12293:1999, it is considered that in **3.2** a) the words "(see **6.2**)" should now be read as "(see **3.3**)".

b) In **3.8**, the tensioning device is required to stress the pipe to the stress given in the referring standard. At the time of going to print, neither the referring standards nor this standard provide enough detail to calculate the force needed. In principle, this force could be based on actual pipe dimensions (if so, the detail is required as to how and where it is to be measured) or taken from the referring standard (if this is the case then the standard might choose to require use of nominal or of specified minimum or maximum valves for the thickness and likewise for the diameter; differing results will be obtained depending upon the options specified). If a stress or force has to be quantified, then this standard needs details of the equation to be used relative to specific actual or nominal dimensions of the pipe.

The equation could be based on either type of dimension, taking either worst-case or mid-tolerance values.

This British Standard, having been prepared under the direction of the Sector Committee for Materials and Chemicals, was published under the authority of the Standards Committee and comes into effect on 15 May 2000

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Amendments issued since publication

Amd. No.	Date	Comments

In the absence of any specific requirements in the standard or spcification making reference to this standard, the responsible UK committee recommends that 3.8 is read as though worded as follows.

"**3.8 Tensioning device**, capable of applying the force, F_i, necessary to achieve the required initial tensile stress (see **5.3**) when the force is determined using the following equation:

$$F_i = 0{,}25\pi[(d_{em,max.})^2 - \{d_{em,max.} - 2(e_{min.} + t_e)\}^2] \qquad (1)$$

where

$d_{em,max.}$ is the maximum mean outside diameter specified in the referrring standard
$e_{min.}$ is the minimum wall thickness specified in the referring standard
t_e is the maximum positive tolerance specified for the wall thickness in the referring standard."

and in **5.3,** following "referring standard" insert "(see 3.8).

c) In clause **4**, item a) requires a minimum of three pre-stressed pipes for branch A as shown in Figure 1. The stress conditions during the test may be significantly affected by the number of joints in that branch if any movement is possible within each joint. UK experience indicates that there is some permanent slip at each pipe socket interface during the first cycle. This may be as little as 0,5 mm. If there are six interfaces on the stressed length (one at each end of three pipes) then there may be at least 3 mm permanent set. If however 10 straight double-socket connectors are used there would be 20 pipe/socket interfaces and hence at least 10 mm permanent set. This would make a significant difference to the stress in the pipe for the duration of the test. The UK committee recommends therefore that the number of pipes in branch A should not be more than five, and should preferably be just three.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

WARNING This British Standard, which is identical with EN 12293:1999, does not necessarily detail all the precautions necessary to meet the requirements of the Health and Safety at Work etc. Act 1974. Attention should be paid to any appropriate safety precautions and the method should be operated only by trained personnel.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12293

July 1999

ICS 23.040.20; 23.040.45

English version

Plastics piping systems - Thermoplastics pipes and fittings for hot and cold water - Test method for the resistance of mounted assemblies to temperature cycling

Systèmes de canalisations en plastique - Tubes thermoplastiques et raccords pour installations d'eau chaude et froide sous pression - Méthode d'essai de la résistance des assemblages à des cycles de températures

Kunststoff-Rohrleitungssysteme - Rohre aus Thermoplasten und Formstücke für Warm- und Kaltwasser - Prüfverfahren des Widerstandes von montierten Baugruppen gegen Temperaturwechselbeanspruchung

This European Standard was approved by CEN on 13 December 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 12293:1999 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 155, Plastics piping systems and ducting systems, the Secretariat of which is held by NNI.

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 January 2000, and conflicting national standards shall be withdrawn at the latest by January 2000.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

The material-dependent parameters and/or performance requirements are incorporated in the System Standard(s) concerned.

This standard is one of a series of standards on test methods which support System Standards for plastics piping systems and ducting systems.

1 Scope

This standard specifies a method for testing the resistance to temperature cycling of joints for piping systems with rigid or flexible thermoplastics pipes.

It is applicable to thermoplastics piping systems intended to be used in hot and cold water pressure applications.

2 Principle

A test assembly of pipes and fittings is subjected to temperature cycling by the passage of water under pressure using hot and cold water alternately for a specified number of cycles.

While being subjected to temperature cycling parts of the assembly of pipes and fittings are maintained under tensile stress and/or flexural strain by the use of static clamps.

During and after the test the assembly is monitored for signs of leakage.

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

a) the test temperatures (see 3.1, 3.2 and 6.1);
b) the duration of a complete cycle and each part of the cycle (see 3.1, 3.2 and 6.1);
c) the test pressure (see 3.6 and 6.1);
d) the tensile stress (see 3.8 and 5.3);
e) the bending radius (see clause 4 and Figures 1 and 2);
f) the total number of cycles, including the first five cycles (see 6.2 and 6.3).

3 Apparatus

3.1 Cold water source, capable of all of the following:

a) supplying the water volume necessary to maintain the temperature variation throughout the test piece within the specified maximum difference (see 6.2);
b) supplying this water at the lowest temperature specified in the referring standard to within ±5 °C;
c) supplying this water for the duration of at least each cycle as specified in the referring standard.

3.2 Hot water source, capable of all of the following:

a) supplying the water volume necessary to achieve the required water velocity (see 6.2);
b) supplying this water at the highest temperature specified in the referring standard to within ±2 °C;
c) supplying this water for the duration of at least each cycle as specified in the referring standard.

3.3 Balancing valves, capable of regulating the water velocity as necessary to maintain the temperature variation throughout the test piece within the specified maximum difference (see 6.2).

3.4 Alternation equipment, capable of achieving each change in hot and cold water temperature at the inlet within 1 min.

3.5 Thermometer(s), capable of checking conformity to the specified test temperatures (see 3.1, 3.2 and 6.2).

3.6 Pressure gauge(s) and a device, for regulating the water pressure in the test assembly at the pressure specified in the referring standard to an accuracy of ±0,5 bar[1)], except for brief pressure spikes that may occur when the temperature of water is changed.

3.7 Supporting brackets, as appropriate, comprising anchor brackets (fixed points) capable of restraining piping components, and guide brackets, capable of supporting piping components without inhibiting longitudinal movement (see clause 5 and Figure 1).

3.8 Tensioning device, capable of applying the required initial tensile stress (see 5.3).

NOTE: This is to simulate stress which may be induced in any fixed pipe section as a result of contraction caused by cooling to temperatures below those prevailing during installation.

4 Test assembly

The test assembly shall comprise an assembly of pipes and fittings jointed and clipped in accordance with Figure 1 and the manufacturer's recommended practice, except as follows.

If, when following the manufacturer's recommended practice, the pipe cannot be bent to the configuration shown for branch C in Figure 1, e.g. because of the material, wall thickness and/or outside diameter of the pipe, then branch C shall conform to Figure 2.

The test assembly as shown in Figure 1 shall include the following:

a) for branch A: at least three pre-stressed pipes linked by straight connectors, stressed in accordance with 5.3, where the free length of such a combination shall be (3 000 ± 5) mm;

b) for branch B: at least two straight pipes, each free to move and having a free length of (300 ± 5) mm;

c) for branch C: at least one bend (see Figure 1 or 2, as appropriate) supported by ends. The free length of pipe shall either be in the range of $27d_n$ to $28d_n$, where d_n is the nominal diameter of the pipe, or alternatively shall have a length which enables the minimum pipe bending radius, as stated by the manufacturer, to be formed.

5 Preparation of the test assembly

5.1 If applicable, subject the test assembly to preconditioning in accordance with the recommendations of the manufacturer(s) of piping components and/or the jointing components (e.g. adhesive).

5.2 Condition the test assembly at a room temperature of (23 ± 5) °C for at least 1 h.

5.3 Pre-stress branch A of the test assembly to the tensile stress specified in the referring standard and fix in position the free ends of the stressed branch.

5.4 Fill the test assembly with cold water so that all air is expelled.

6 Procedure

6.1 Start the sequence of cycles, of cold and then hot water, specified in the referring standard [see b) and f) of the note to clause 2] under the conditions of pressure and temperatures applicable to the class of service conditions as specified in the referring standard.

6.2 Within the first five cycles:

a) adjust the balancing valve(s) so that for the remainder of the test, during each part of the water cycle where a temperature is to be maintained the temperature drop between the inlet and the outlet of the test assembly will be less than 5 °C;

b) perform any tightening or adjustment of joints necessary to eliminate any leakage.

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1) 1 bar = 10^5 N/m^2 = 100 kPa

6.3 Throughout and following completion of the number of cycles specified by the referring standard, inspect all joints for any signs of leakage, e.g. scaling.

If leakage occurs, record the type and position of the leakage and when it was observed.

7 Test report

The test report shall include the following information:

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

b) the identification of the components under test, including the class of service condition and the operating pressure;

c) whether the pipe was flexible or rigid;

d) in the case of flexible pipes, the bending radius applied in branch C;

e) the tensile stress in branch A;

f) the test temperatures (lower and higher temperature of the cycle), in degrees Celsius;

g) the duration of the complete cycle and each part of the cycle, in minutes;

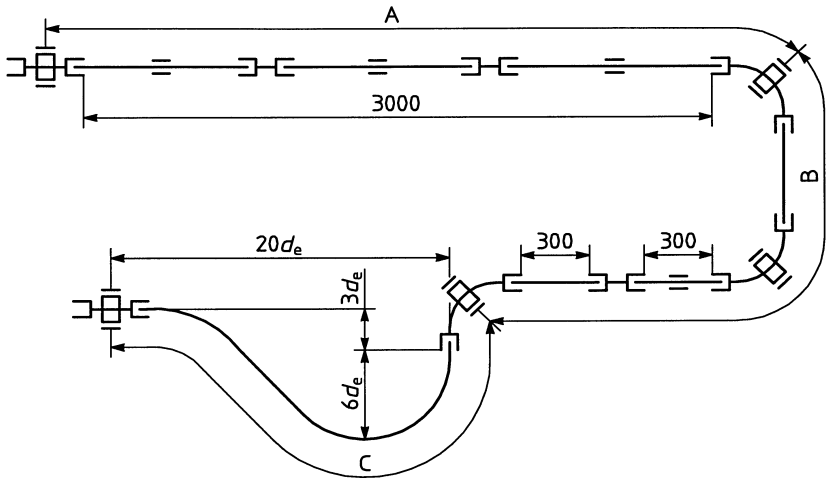
h) the total number of complete cycles (including the first five cycles);

i) the test pressure, in bars;

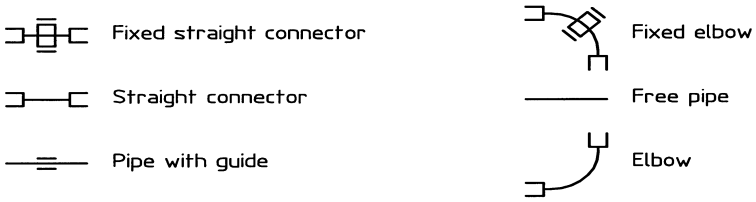
j) signs of leakage, if any, and where and when it occurred;

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

l) the date of test.

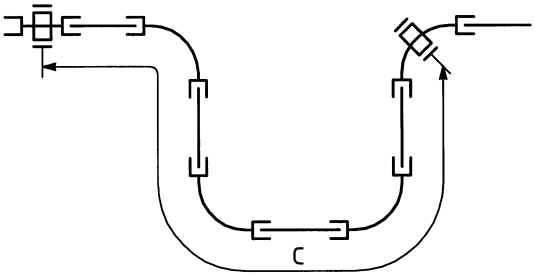


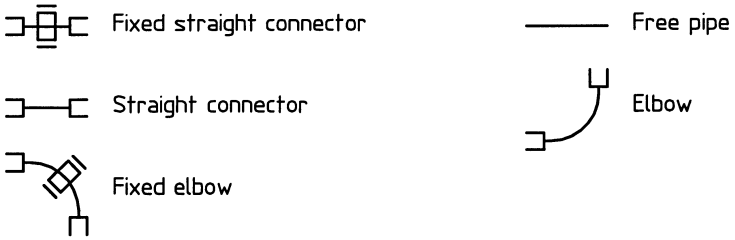
Dimensions in millimetres



A Branch A (anchored section)
B Branch B (section free to expand and contract)
C Branch C (cold bent pipe section)

Figure 1 — Test arrangement





C Branch C (for rigid pipes)

Figure 2 — Alternative test arrangement of branch C for rigid pipes

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