BRITISH STANDARD

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1997

Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) components — Test methods to prove the design of rigid locked socket-and-spigot joints with elastomeric seals

The European Standard EN 1448 : 1996 has the status of a British Standard

ICS 23.040.60

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee PRI/61, Plastics piping systems and components, upon which the following bodies were represented:

British Gas plc
British Plastics Federation
British Plumbing Fittings Manufacturers' Association
British Valve and Actuator Manufacturers' Association
Chartered Institution of Water and Environmental Management
Department of the Environment (British Board of Agrèment)
Department of the Environment (Building Research Establishment)
Department of the Environment (Property and Buildings Directorate)
Department of Transport
Electricity Association
Federation of Civil Engineering Contractors
Health and Safety Executive
Institute of Building Control
Institute of Materials
Institution of Civil Engineers
Institution of Gas Engineers
National Association of Plumbing, Heating and Mechanical Services Contractors
Pipeline Industries Guild
Plastics Land Drainage Manufacturers' Association
Society of British Gas Industries
Society of British Water Industries
Water Companies Association
Water Services Association of England and Wales

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Association of Consulting Engineers
Engineering Equipment and Materials Users' Association
Institution of Mechanical Engineers
RAPRA Technology Ltd.

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

National foreword

This British Standard has been prepared by Technical Committee PRI/61 and is the English language version of EN 1448 : 1996 *Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) components — Test methods to prove the design of rigid locked socket-and-spigot joints with elastomeric seals*, published by the European Committee for Standardization (CEN).

It is incorporated into BS 2782 *Methods of testing plastics : Part 12 : Reinforced plastics pipes, fittings and valves*, as Method 1224E : 1997, for association with related test methods for plastics materials and plastics piping components.

This standard has been prepared for reference by other standards under preparation by CEN for specification of reinforced plastics piping systems and components. It has been implemented to enable experience of the methods to be gained and for use for other fresh applications.

It is also for use for the revision or amendment of other national standards as practicable, but it should not be presumed to apply to any existing standard or specification which contains or makes reference to a different test method until that standard/specification has been amended or revised to make reference to this method and adjust any requirements as appropriate.

Warning note 1. Attention is drawn to the requirements of **6.4.3**, and table 1, which involve application of a test pressure corresponding to at least four times the nominal pressure of the component under test. It is essential to ensure that any components subjected to such pressures, such as the end caps and any associated securing bolts as indicated in figure 1, are selected and contained acordingly.

Warning note 2. This British Standard, which is identical with EN 1448 : 1996, 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.

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

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 8, an inside back cover and a back cover.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1448

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Descriptors: Plastic tubes, pipe fittings, reinforced plastics, glass reinforced plastics, thermosetting resins, tests, joining, seals: stoppers, rubber, flexural strength, pressure resistance, hydrostatic pressure

English version

Plastics piping systems — Glass-reinforced thermosetting plastics (GRP) components — Test methods to prove the design of rigid locked socket-and-spigot joints with elastomeric seals

Systèmes de canalisations en plastique — Composants en plastique thermodurcissable renforcé de verre (PRV) — Méthodes d'essai pour confimer la conception d'assemblages mâle-femelle verrouillés rigides à joints d'etanchéité en élastomère

Kunststoff-Rohrleitungssysteme — Bauteile aus glasfaserverstärkten duroplastischen Kunststoffen (GFK) — Prüfverfahren zur Bauartprüfung von zugfesten Muffe- und Spitzende- Verbindungen mit elastomeren Dichtungen

This European Standard was approved by CEN on 1996-07-12. 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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

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 standard is based on the Draft International Standard ISO/DIS 7432 *Pipes and fittings of glass-fibre reinforced thermosetting plastics (GRP) — Rigid locked socket and spigot joints with elastomeric sealing rings — Performance requirements and test methods*, prepared by the International Organization for Standardization (ISO). It is a modification of ISO/DIS 7432 for reasons of possible applicability to other test conditions and alignment with texts of other standards on test methods.

The modifications are as follows:

– test parameters (pressure, time, temperature) are not specified;

– performance requirements are not given;

– editorial changes have been introduced.

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

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

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 May 1997, and conflicting national standards shall be withdrawn at the latest by May 1997.

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

Introduction

In a pipework system, pipes and fittings of different nominal pressures and stiffnesses may be used.

A joint may be made between pipes and/or fittings and should be designed such that its performance is equal to or better than the requirements of the pipeline, but not necessarily of the components being joined.

The requirements for the assembly of the joint are not included in this standard, but they should be in accordance with the manufacturer's recommendations.

1 Scope

This standard specifies methods of test for rigid locked socket-and-spigot joints using elastomeric sealing rings for plastics piping systems of glass-reinforced thermosetting plastics (GRP) for pressure and non-pressure applications. This standard is only applicable to the joint and covers methods of test to prove its design.

The tests detailed in **6.1** to **6.4** inclusive are applicable to rigid locked socket-and-spigot joints intended to be used in buried or above ground applications.

NOTE. The only purpose of testing the resistance to negative pressure is to give adequate safety against infiltration of pollutants through the joint into the fluid carried in the piping system. Under these test conditions pipes with low stiffnesses may require support to prevent them from buckling.

This test procedure is applicable to joints for pipes and fittings of all nominal sizes.

In addition the bending tests covered in **6.5** can be used to prove the design where the joints are intended to be used in buried applications where the soils are known to have very poor properties or where particular above ground applications make their use appropriate.

The tests detailed in **6.5** are applicable to joints for pipes and fittings up to and including DN 600.

All tests given in this standard are applicable for evaluating joints intended for applications conveying liquids at temperatures up to and including 50 °C and may be applicable to joints for use at higher temperatures (see clause **2**).

2 Principle

A joint is subjected to specified internal pressures. The procedure includes prolonged static tests at elevated pressures and also cyclic testing.

A method is included to test the resistance of the joint to an internal negative pressure.

An additional series of tests under bending conditions is included for special applications.

At the end of each test the joint is inspected for signs of leakage and damage.

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

a) if applicable, the bending load to be applied, i.e. *F*, (see **3.5**, **3.6** and **6.5**);

b) the number of test pieces to be used (see **4.1**);

c) the length, *L*, of the assembled test piece (see **4.2**);

d) the nominal pressure relevant to the joint under test (see **4.2** and **6.2** to **6.4**);

e) if applicable, conditioning other than as given in **4.3**;

f) the test temperature and its permissible deviations (see clause **5**);

g) if applicable, any criteria indicative of damage to the joint components [see clause **6** and j) of clause **7**];

h) the acceptable increase in pressure over 1 h for negative pressure test (see **6.3**).

3 Apparatus

3.1 *End sealing devices*, of size and type appropriate to the joint system under test. The end-sealing devices shall be anchored to the pipes when end thrust loads are to be applied (see **6.2** to **6.4**), and shall permit free axial movement of the test pipes when end thrust loads are not to be applied (see **6.5**).

3.2 *A source of hydrostatic pressure*, to meet the needs of the test (see clause **6**).

3.3 *A means to measure the gauge pressure*, at the top of the pipe and check conformity to the specified pressures (see clause **6**).

3.4 *Vacuum pump or equivalent*, capable of applying the required negative gauge pressure (see **6.3**).

3.5 *Strap or cradle*, extending up to a 180° arc of the pipe barrel or the joint, fixed at the appropriate position to apply a bending load (see **3.6**).

3.6 *Means of applying and measuring the required bending load* (*F*, see **6.5.4**) to an accuracy within ± 5 %, if applicable.

4 Test pieces

4.1 Number

The number of test pieces shall be as specified in the referring standard.

4.2 Arrangement

The test piece shall be an assembly of one or two pieces of pipe, as applicable, of the correct size and nominal pressure, as specified in the referring standard, in between which the joint to be tested is located.

The length, *L*, of the assembly shall be not less than that specified in the referring standard and shall allow, if required (see **6.5**), the joint under test to be located in the middle of the test arrangement.

The joint shall be assembled in accordance with the manufacturer's recommendations and, if applicable, the requirements of the referring standard.

Warning: Bolts which are normally supplied for use at a certain PN rating can reasonably be used in tests at 2 × (PN), but it would be dangerous to use them at 4 × (PN). Therefore when performing the test described in **6.4** it is recommended that the capacity of the bolts be checked and, if necessary, suitable higher capacity bolts should be used.

4.3 Conditioning

Unless otherwise specified in the referring standard, condition the test pieces at the test temperature (see clause **5**) for at least 24 h prior to testing.

5 Test temperature

Conduct the following procedure at the temperature specified in the referring standard.

6 Procedure

6.1 Sequence for pressure testing

Subject each test piece (see **4.2**) to those of the following tests specified in the referring standard, in the sequence as given in table 1 and **6.2** to **6.4**.

NOTE. Each reference to hydrostatic pressure specifies an internal gauge pressure (i.e. relative to atmospheric pressure) and the nominal pressure is that relevant to the joint under test.

If a test is interrupted, record the details in the test report and repeat the particular test before carrying on to the next in the series of tests, if applicable. Failure of the end caps shall not constitute failure of the joint. If the test conditions are invalidated thereby, repeat the particular test after replacing the failed component.

6.2 Resistance to internal pressure including hydrostatic end thrust

6.2.1 Using a conditioned test piece conforming to clause **4**, assemble the test arrangement as shown in figure 1.

6.2.2 Connect the end caps to the pipes in such a way that the full loads induced by the internal pressure will be transmitted along the pipes to the joint under test.

6.2.3 Fill the test piece with water, taking care to avoid entrapping air.

6.2.4 Apply an initial hydrostatic pressure of 1,5 times the nominal pressure of the joint, expressed in bars[1)], and maintain within ±2 % for 15 min.

Inspect the joint for signs of leakage or damage. If either has occurred stop the test, disassemble and continue in accordance with **6.1**, otherwise continue in accordance with **6.2.5**.

6.2.5 Maintain within ±2 % for a further 15 min the hydrostatic pressure of 1,5 times the nominal pressure of the joint, expressed in bars.

6.2.6 Raise the hydrostatic pressure to twice the nominal pressure of the joint, expressed in bars, and maintain within ±2 % for not less than 24 h.

6.2.7 Inspect the joint and record any signs of leakage or damage. If either has occurred stop the test, disassemble and continue in accordance with **6.1**, otherwise continue in accordance with **6.2.8**.

6.2.8 Reduce the pressure to atmospheric.

Table 1. Summary of test conditions for pressure testing

Test	Tests and sequence	Minimum test pressure	Minimum duration
Initial leakage	Initial pressure	1,5 × (PN)	15 min
Resistance to internal pressure with hydrostatic end thrust	Preliminary hydrostatic pressure	1,5 × (PN)	15 min
	Maintained hydrostatic pressure	2 × (PN)	24 h
	Positive cyclic pressure	Atmospheric to 1,5 × (PN) to atmospheric	10 cycles of 1.5 min to 3 min each
External pressure differential[1)]	Negative pressure[2)]	-0,8 bar (-0.8 MPa)[3)]	1 h
Short duration pressure resistance with hydrostatic end thrust	Preliminary hydrostatic pressure	1,5 × (PN)	15 min
	Maintained hydrostatic pressure	4 × (PN)	6 min

[1)] This test can be performed at any point in the sequence detailed.

[2)] Relative to atmospheric pressure, i.e. approximately 0,2 bar (0,02 MPa) absolute.

[3)] If the referring standard requires a different negative pressure, then that shall be used.

[1)] 1 bar = 10^5 N/m^2 = 0,1 MPa

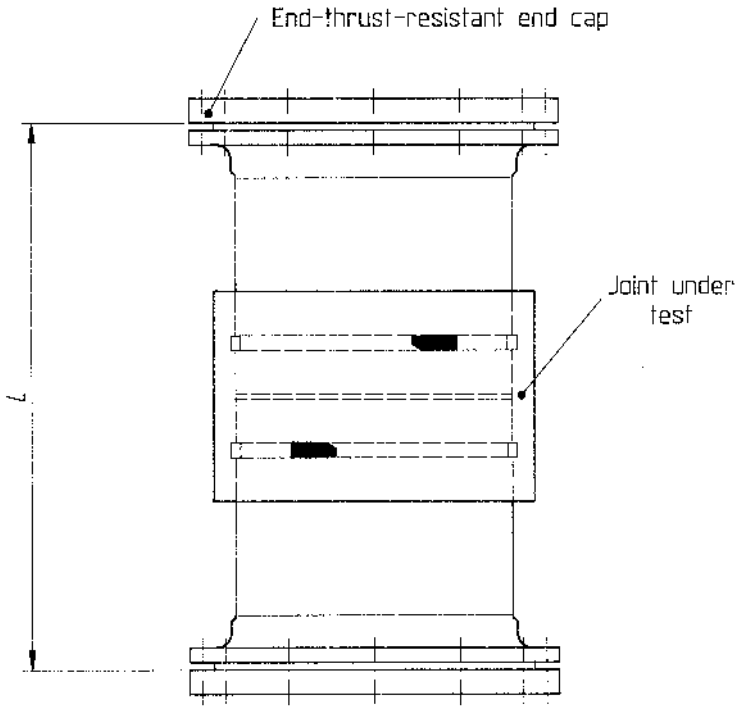

Figure 1. Typical test arrangement for tests detailed in 6.1 to 6.4

6.2.9 Steadily raise the internal pressure to 1,5 times the nominal pressure of the joint, expressed in bars, and reduce again to atmospheric pressure so as to complete the cycle in between 1,5 min and 3 min inclusive.

6.2.10 Repeat the cycle given in **6.2.9** a further nine times.

6.2.11 Inspect the joint and record any signs of leakage or damage.

6.3 Resistance to negative pressure

6.3.1 Empty the test piece and connect to the vacuum pump (see **3.4**).

6.3.2 Reduce the pressure to at least 0,8 bar below atmospheric pressure (approximately 0,2 bar absolute pressure). Record the pressure achieved.

6.3.3 Close the valve between the test piece and the vacuum pump and leave for 1 h.

6.3.4 After this hour record any increase in pressure [see g) of the note to clause **2**]

6.3.5 Restore atmospheric pressure and inspect for and record any signs of damage to the joint.

If an increase in pressure in excess of the acceptable level [see h) of the note to clause **2**] has occurred (see **6.3.4**), inspect for sources of leakage other than the joint and, if found, repeat the test.

6.4 Short duration resistance to internal pressure including end thrust

6.4.1 Fill the test piece with water, taking care to avoid entrapping air.

6.4.2 Apply an initial hydrostatic pressure of 1,5 times the nominal pressure of the joint, expressed in bars, and maintain within ± 2 % for 15 min.

Inspect the joint for signs of leakage or damage. If either has occurred stop the test, disassemble and continue in accordance with **6.1**, otherwise continue in accordance with **6.4.3**.

6.4.3 Raise the hydrostatic pressure so that a pressure equal to four times the nominal pressure of the joint, expressed in bars, is reached in not less than 1 min and not more than 5 min (see warning note to **4.2**). Maintain this pressure within ± 2 % for 6 min without causing the joint to rupture (leakage of the joint shall not constitute failure).

6.4.4 Reduce the pressure to atmospheric, empty the test piece and disassemble.

6.4.5 Inspect the joint and record any signs of rupture.

6.4.6 If tests under transverse bending conditions are not required continue in accordance with clause **7** otherwise continue in accordance with **6.5**.

6.5 Resistance of the joint to a transverse bending load and pressure excluding hydrostatic end thrust

NOTE. Each reference to hydrostatic pressure specifies an internal gauge pressure (i.e. relative to atmospheric pressure) and the nominal pressure is that relevant to the joint under test.

6.5.1 Using a conditioned test piece conforming to clause **4**, assemble the test arrangement as shown in figure 2 so that the joint under test is located in the middle.

NOTE. Depending on the test arrangement used for the tests in accordance with **6.2** to **6.4** the same test piece can be used for this test, if the joint did not leak or rupture when tested in accordance with **6.4**.

6.5.2 Fill the test piece with water, taking care to avoid entrapping air.

6.5.3 Apply an initial hydrostatic pressure of 1,5 times the nominal pressure of the joint, expressed in bars, and maintain within ± 2 % for 15 min.

Inspect the joint for signs of leakage or damage. If either has occurred stop the test, disassemble and continue in accordance with **6.1**, otherwise continue in accordance with **6.5.4**.

6.5.4 Apply the bending load, F (see figure 2), specified in the referring standard.

6.5.5 Maintain within ± 2 % for a further 15 min the hydrostatic pressure of 1,5 times the nominal pressure of the joint, expressed in bars, and the applied load.

6.5.6 Raise the hydrostatic pressure to twice the nominal pressure of the joint, expressed in bars, and maintain within ± 2 % for not less than 24 h.

6.5.7 Inspect the joint for signs of leakage or damage. If either has occurred stop the test, disassemble and continue in accordance with **6.1**, otherwise continue in accordance with **6.5.8**.

6.5.8 Remove the bending load, F, depressurize the test piece, empty it and disassemble.

6.5.9 Inspect the joint and record any signs of damage.

Table 2. Summary of test conditions for transverse bending test

Test	Tests and sequence	Minimum test pressure	Minimum duration
Initial leakage	Initial pressure (without transverse bending load F)	1,5 × (PN)	15 min
Resistance to bending without hydrostatic end thrust	Preliminary hydrostatic pressure(with transverse bending load F)	1,5 × (PN)	15 min
	Maintained hydrostatic pressure(with transverse bending load F)	2 × (PN)	24 h

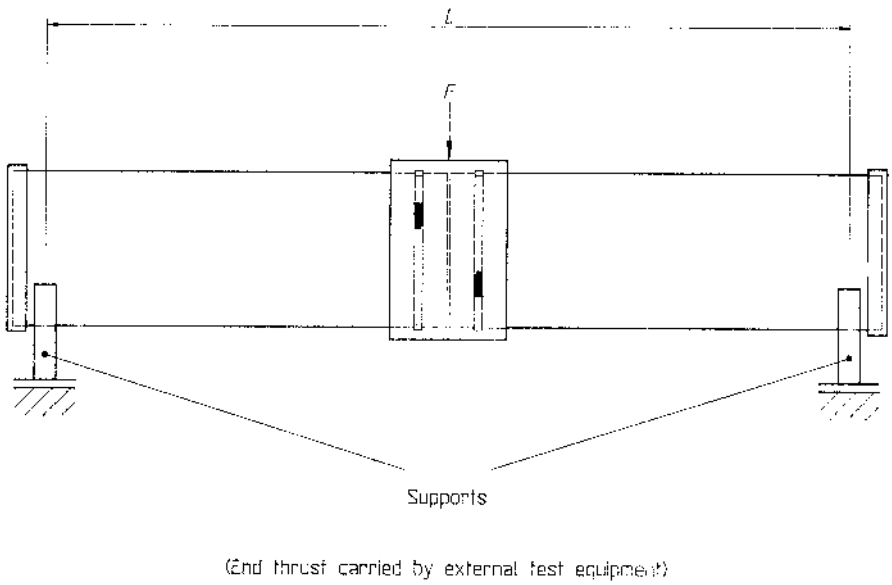

Figure 2. Typical arrangement for test detailed in 6.5

7 Test report

The test report shall include the following information:

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

b) the full identification of the pipes and tested joint;

c) the nominal pressure, PN, of the pipe(s) and joint;

d) the details of the jointing procedures used;

e) the temperature range during the tests;

f) a description of the tests to which the joint was subjected;

g) the positive and negative pressures applied, in bars;

h) the bending load applied, i.e. *F*, if applicable;

i) any observations on the leaktightness of the joint during each test;

j) any observations on the condition of the joint components at the end of the testing cycles given in tables 1 and 2;

k) the details of interruptions, if any, to the test sequence;

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

m) the dates of the period of test.

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