

Loss Prevention Standard

LPS 1219: Issue 3.1

Requirements and testing procedures for the LPCB approval and listing of pipe couplings

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PARTICIPATING ORGANISATIONS

This standard was prepared by Expert Group C and approved by the LPC Fire and Security Board of BRE Global Ltd. The following organisations participated in the preparation of this standard:-

Association of British Insurers
 Association of Chief Police Officers
 Association for Specialist Fire Protection
 British Automatic Fire Sprinkler Association
 British Fire Protection Systems Association
 British Security Industry Association
 Confederation of British Industry
 Chief Fire Officers' Association
 Door & Hardware Federation
 Electrical Contractors Association
 Fire Sprinkler Association
 Health & Safety Executive
 International Fire Sprinkler Association
 London Fire and Civil Defence Authority
 Local Government Association
 National Fire Sprinkler Association
 Risk Engineering Data Exchange Group
 Royal Institution of Chartered Surveyors

REVISION OF LOSS PREVENTION STANDARDS

Loss Prevention Standards will be revised by issue of revised editions or amendments. Details will be posted on our website at www.redbooklive.com

Technical or other changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g. corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments. (See amendments table on page 13)

The issue number will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

USERS OF LOSS PREVENTION STANDARDS SHOULD ENSURE THAT THEY POSSESS THE LATEST ISSUE AND ALL AMENDMENTS.

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FOREWORD

This standard identifies the evaluation and testing practices undertaken by LPCB for the purposes of approval and listing of products. LPCB listing of products and services for inclusion in the “Red Book” is based on the following

- i. Satisfactory product performance during testing and audit testing by LPCB
- ii. Satisfactory product construction
- iii. Satisfactory system installation
- iv. Satisfactory manufacturing processes
- v. Satisfactory product or system service experience
- vi. Satisfactory verification by the LPCB of the establishment and maintenance of the manufacturer’s or service provider’s quality management systems

NOTES

Compliance with this LPS does not of itself confer immunity from legal obligations. Users of LPSs should ensure that they possess the latest issue and all amendments.

LPCB welcomes comments of a technical or editorial nature and these should be addressed to “the Technical Director” at enquiries@breglobal.co.uk.

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Listed products and services appear in the LPCB “List of Approved Products and Services” which may be viewed on our website: www.redbooklive.com or by downloading the LPCB Red Book App from the App Store (for iPhone and iPad), from Google Play (for Android devices) or from the Windows Store (for Windows 8 Phones and Tablets from 2014).

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1. SCOPE

This document specifies design criteria and performance requirements for pipework couplings and fittings made from ferrous materials for use with pipes of 1" (25mm) to 12" (323mm) O.D. (nominal) in LPCB approved wet and dry pipe automatic sprinkler and sprayer systems.

2. GENERAL REQUIREMENTS

- 2.1 The couplings/fittings shall be suitable for use with steel pipework in accordance with ISO 65 or ISO 4200. Where couplings or fittings are designed to take screwed pipes, the thread shall be in accordance with ISO 7/1-Rp1.

The couplings/fittings and joints shall be designed and manufactured to withstand the following service conditions:-

	Internal pipe conditions	Normal external ambient conditions
DRY	0 to 4 bar air	-20°C to +70°C
WET	0 to 12 bar water	+1°C to +70°C

Table 1 – Pipe coupling and fitting service conditions

The use of proprietary pipe couplings in LPCB approved sprinkler systems will be limited to normal ambient conditions below +70°C. When normal temperatures exceed 70°C screw joints shall be used.

It must be possible to disconnect the coupling, after installation, without damage to the body of the coupling or the pipework.

The coupling shall be capable of making a leak-tight joint, when coupled in accordance with the manufacturer's instructions and subjected to the design conditions stated above.

3. TEST PREPARATION AND CONDITIONS

Tests shall be carried out using pipe in accordance with ISO 65 medium grade up to DN150, or ISO 4200 with 5.4mm wall thickness, for greater than DN150 up to DN 300.

Pipes shall be grooved or prepared as per the manufacturer's instructions. Where the preparation is not suitable for the wall thickness stated above, the minimum wall thickness compatible with that process shall be submitted.

Wall thickness of pipe used is to be recorded for each test, together with pipe groove dimensions.

Bolts are to be tightened to torque figures recommended or agreed by the manufacturer.

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Unless otherwise stated, tests shall be undertaken on a coupling/fitting assembly depicted in Figs. 1, 2 or 3.

4. EXAMINATION

- 4.1 Samples of the couplings and fittings shall be visually examined and selected essential dimensional checks compared with the manufacturer's drawings.
- 4.2 At least one fitting, coupling and seal, of each size and arrangement shall be sectioned. Material defects or porosity shall be noted.

5. TESTS

Each coupling size and fitting requiring approval shall be subjected to the tests as described in 5.1 to 5.6.

5.1 Pressure tests

The tests described in 5.1.1 to 5.1.3 shall be performed within the manufacturer's stated limitations for angular deflection and lateral displacement of associated pipework.

5.1.1 Hydrostatic fluctuation pressure test

The coupling assembly shall be pressurised with water to a gauge pressure of 12 bar ± 1 bar for 2min, +30s/-0s to establish a datum. The assembly shall then be drained before being subjected to the greatest vacuum attainable to a maximum of 600mm of mercury or $-0.8\text{bar} +0\text{bar}/-0.1$ bar for 2min +30s/-0s, and allowed to return to atmospheric pressure in not less than 5s. The assembly shall then be pressurised with water to 12 bar $\pm 1\text{bar}$ for 2 min +30s/-0s.

The assembly shall be examined for leakage throughout the test. The relative movement of each pipe shall be recorded at the greatest vacuum and at each pressure.

There shall be no leakage.

5.1.2 Hydrostatic pressure test

The coupling assembly shall be pressurised with water to a pressure of 12 bar to stabilise the assembly and to establish a datum mark. Pressure shall then be increased in the following stages:

- a) 48 bar ± 1 bar and held for 2 min +30s/-0s;
- b) 60 bar ± 1 bar and held for 2 min +30s/-0s; and
- c) Four times working pressure (if greater than 60 bar) and held for 2 min +30s/-0s.

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The pressure increase to be at a steady rate and each target pressure to be achieved in not less than 30s.

The pressure at the end of the test shall then be released in not less than 30s down to 12 bar, at which pressure the relative movement to the datum shall be measured.

There shall be no leakage.

5.1.3 Air Leakage Test

The coupling assembly shall be pressurised with air to 3 bar +0.5/-0 bar. The assembly shall be immersed in water to establish that there is no visible leakage.

5.2 Low temperature resistance

The assembly shall be pressurised with air to 3.5 \pm 0.5 bar at 20°C and checked for leakage. The assembly shall be cooled to a temperature of $-20^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for 90 days + 5 days/-0 days. The assembly pressure is to be recorded at regular intervals not exceeding 7 days. There shall be no leakage.

Note: A reduction in pressure due to the reduction in temperature is acceptable.

5.3 High temperature ageing

A coupling/fitting assembly shall be configured as in Fig. 1. The assembly shall be pressurised with air to 3 bar +0.5 bar/-0 bar for 3 minutes and checked for leakage in accordance with 5.1.3.

The assembly shall be depressurised and placed in an oven at 95°C + 5°C/-0°C for 90 days +5/-0 days or 135°C + 5°C/-0°C for 45 days +5/-0 days (depending on materials, and as directed by the manufacturer).

Following heat exposure, the assembly shall be conditioned at an ambient temperature of 24°C \pm 5°C for a minimum of 24 hours. The assembly shall then be submerged in water and pressurised with air to 3 bar \pm 0.5bar for a minimum of 5 minutes.

There shall be no loss of air pressure observed by the formation of air bubbles at the coupling during the 5 minute test period.

The test assembly shall then be disassembled and the gasket shall not crack when two diametrically opposite points are squeezed together by hand until they touch. Gaskets intended for use with components 200mm and larger shall also not crack when opposite sides are twisted by hand into a half turn.

During the tests the following requirements shall be met:

- a) The coupling assembly shall show no evidence of air leakage.

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- b) There shall be no evidence of cracking of the gasket.

5.4 Dry-pipe fire test

5.4.1 This test shall be performed unless technical evaluation of the material and design of the coupling assembly demonstrates that it is unnecessary.

5.4.2 The test shall be carried out indoors. A coupling/fitting assembly shall be configured as in Fig. 2. The test procedure shall be as follows:

- a) The assembly shall be pressurised with air to 3 bar +0.5 bar/-0 bar for 3 minutes;
- b) The assembly shall then be subjected to the fire test (as defined in Fig. 2) during which the air pressure shall be kept constant by venting.
 - Within 60 seconds of initiation of the test a temperature of 800°C shall be achieved 13mm-15mm from the surface of the coupling; and
 - An average temperature of 800°C shall be maintained around the coupling for a period of at least 6 minutes.
- c) 7 min +30s/-0s after the start of the test the fire tray shall be removed and the assembly shall be filled with cold water and pressurised to 8 bar ±1 bar for 2 min ±30s/-0s;
- d) After the water pressure test the assembly shall be disassembled and visually examined for evidence of fire damage and/or distortion that may affect the integrity of the assembly;

5.4.3 The coupling shall satisfy the following requirements:

- a) The coupling must maintain the integrity of the pipework throughout the test; and
- b) There shall be no visual evidence of fire damage and/or distortion of those coupling components which assist in maintaining the integrity of the pipework.

5.5 Bend test

5.5.1 Coupling assemblies shall be filled with water ensuring there is no trapped air in the assembly. The assembly shall be hydrostatically pressurised to their maximum allowable working pressure for the duration of the test. The couplings shall not leak or fail when subjected to the bending moments specified in Table 2 and in the manner described.

Angles of deflection and applied bending moment shall be monitored and recorded at each pressure throughout the test.

Note: The bend test should be applied to threaded outlet mechanical tees used for range pipes to test casting strength and grooved outlet mechanical tees tested as a fitting.

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Nominal pipe diameter mm	Bending Moment N.m
25	410
32	570
40	1100
50	1560
65	2400
80	3290
100	4940
125	7100
150	9610
200	15330
250	22760
300	31120

Table 2 – Bending moments

- 5.5.2 An assembly configured as in Fig. 3, positioned in a horizontal plane and with the pipe securely clamped shall be pressurised with water to 20 bar or the maximum working pressure whichever is the least, ± 1 bar. The pressure is to be maintained throughout the application of the bending moment.
- 5.5.3 A bending moment shall be applied horizontally to the free pipe until the manufacturer's recommended angle of deflection has been reached. The bending moment required to achieve this angle is to be recorded. There shall be no deflection greater than that recommended by the manufacturer. The bending moment required to achieve this angle is to be recorded and compared against the manufacturers' recommendations. It shall not be greater than this.
- 5.5.4 The appropriate bending moment for the pipe size shall then be applied to the free pipe and held for 2min +30s/-0s. The pressure is to be maintained throughout the application of the bending moment. The bending moment required to achieve this angle is to be recorded. There shall be no deflection greater than that recommended by the manufacturer. The bending moment required to achieve this angle is to be recorded and compared against the manufacturers' recommendations.
- 5.5.5 Repeat 5.5.3 & 5.5.4 at pressures of 12 bar ± 1 bar and 5 bar ± 0.5 bar.
- Note: If the maximum working pressure is less than 12 bar then apply the bending moment at the maximum and 5 bar only.*
- 5.5.6 Where reducing couplings/fittings are tested the appropriate bending moment for the smaller size pipe shall be applied at all pressures first and the test repeated using the appropriate bending moment for the larger size pipes.

No leakage shall occur and assembly integrity shall be maintained.

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5.6 Salt spray corrosion test

This test shall be performed unless technical evaluation of the material and design of the coupling assembly demonstrates that it is unnecessary.

At least one coupling of each product range shall be subjected to a salt spray conditioning in accordance with BS 2011: Part 2.1Kb:1977, Severity 1 (or the latest equivalent).

An assembly configured as in Fig. 1 shall first be subjected to the air leakage test of 5.1.3 before conditioning with the interior of the assembly exposed to the test atmosphere.

On completion of the salt spray conditioning, the assemblies shall be subjected to the tests of 5.1.1 and 5.1.2. No leakage shall occur. The corroded assemblies shall be dismantled and examined for the effects of the corrosion.

6. COUPLING FITTINGS

Where approval is required for coupling fittings, i.e. tee pieces, elbows, blank ends etc., these may be included in the test programmes for the couplings.

Composite assemblies may be considered suitable in some tests.

7. MARKING AND LABELLING

In addition to the requirements of Scheme Document SD034, the pipe couplings and fittings shall be permanently marked with the following details:

- a) Manufacturer's name or trade mark.
- b) Coupling type, name or model.
- c) External pipe diameter in mm.
- d) Means shall be provided on the seal to differentiate between different seal materials.

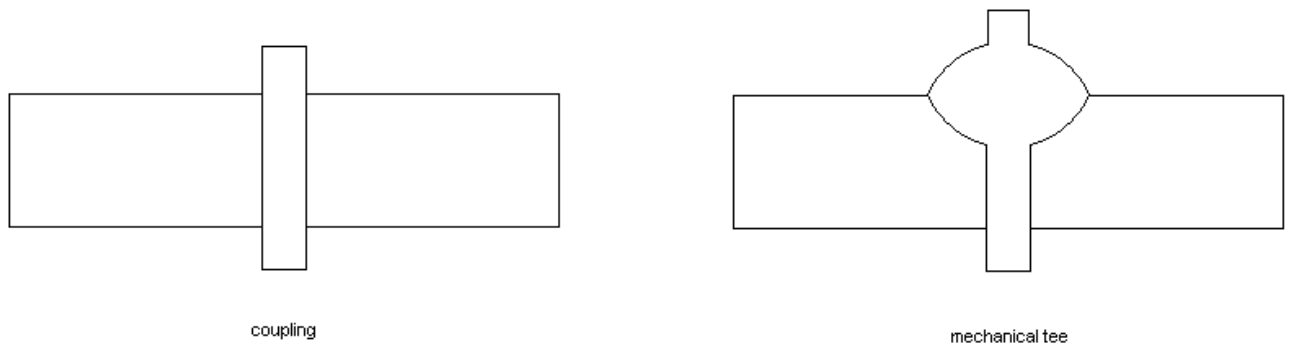
8. PUBLICATIONS REFERRED TO

ISO 65	:	Carbon Steel Tubes
ISO 4200	:	Plain End Steel Tubes
BS 2011: Part 2.1Kb:197	:	Basic Environmental Testing Procedures
ISO 7/1	:	Pipe threads where pressure-tight joints are made on the threads - Part 1: Designation, dimensions and tolerances

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9. FIGURES

Figure 1 – Coupling assembly for tests 5.1.1, 5.1.2, 5.1.3, 5.2, 5.3 & 5.6



Note 1: Pipe of a length 90mm to 200mm (300mm for mechanical tee) shall be fitted to the coupling and/or fitting. The pipe length may be kept to a minimum consistent with achieving a suitable joint and leak tight enclosure.

Note 2: Pipe shall be grooved or screwed at one end as appropriate and shall have a pressure/leak tight blank at the other end or a suitable fitting that can be adapted to ISO 7/1-Rp1.

Note 3: Mechanical tee outlet may be plugged with a threaded plug or a blank end cap and coupling as appropriate.

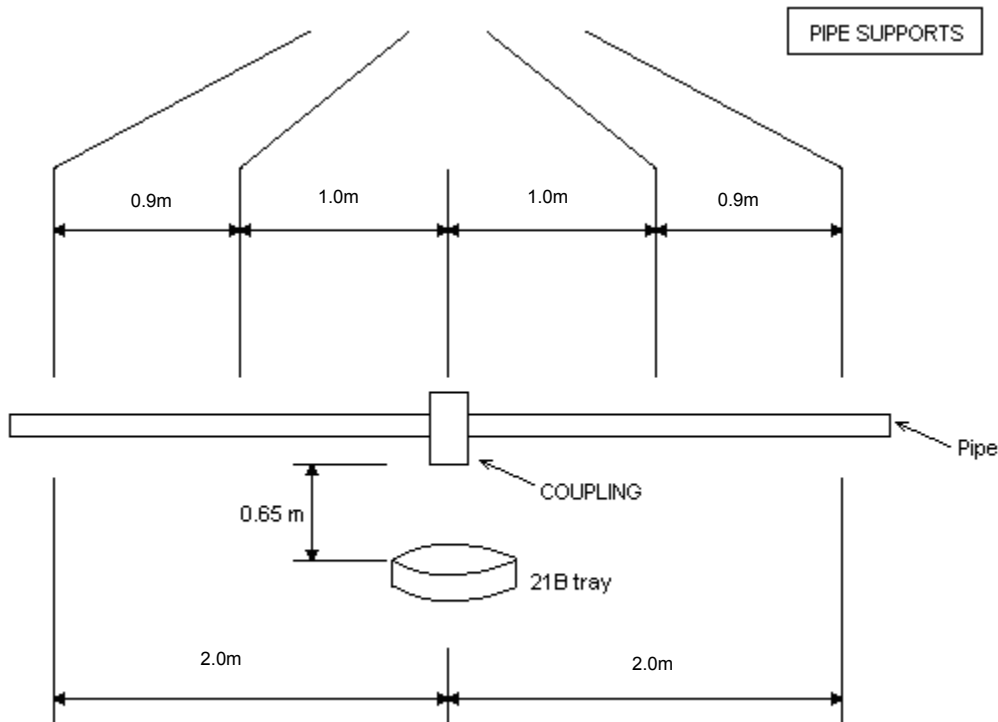
Note 4: Provision shall be made for:

- a) Pressure charging connection.
- b) Pressure monitoring.
- c) Vent valve.

Note 5: The testing shall permit free movement of the pipework in the coupling along the longitudinal axis of the pipework.

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Figure 2 – Coupling assembly and fire test for test 5.4



Notes 1: Pipe shall be grooved or screwed at one end and, as appropriate, shall have a pressure/leak tight blank at the other end or a suitable fitting that can be adapted to ISO 7/1-Rp 1.

Note 2: Provision shall be made for:

- a) Pressure charging connection.
- b) Pressuring monitoring.
- c) Vent valve (during heating to maintain 3 bar test pressure)
- d) Drainage.

Note 3: The pipe coupling assembly shall be supported as shown. The coupling shall be positioned over the centre of the fire test tray.

Note 4: For temperature monitoring, four thermocouples shall be placed at various places 13mm to 15mm from the coupling/fitting assembly, level with the horizontal centre line.

Note 5: For wet pipe fire test a band should be placed around the fire test tray to contain fire overspill and safety precautions observed.

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Note 6: Fire test – A 21B tray (BS EN3 Annex I) shall be filled with Heptane on water (to correct for uneven ground). The fire shall be capable of burning for 7 minutes. This is estimated to require 21mm depth of heptane (56 l). This may vary according to the actual dimensions of the tray as allowed by BS EN3.

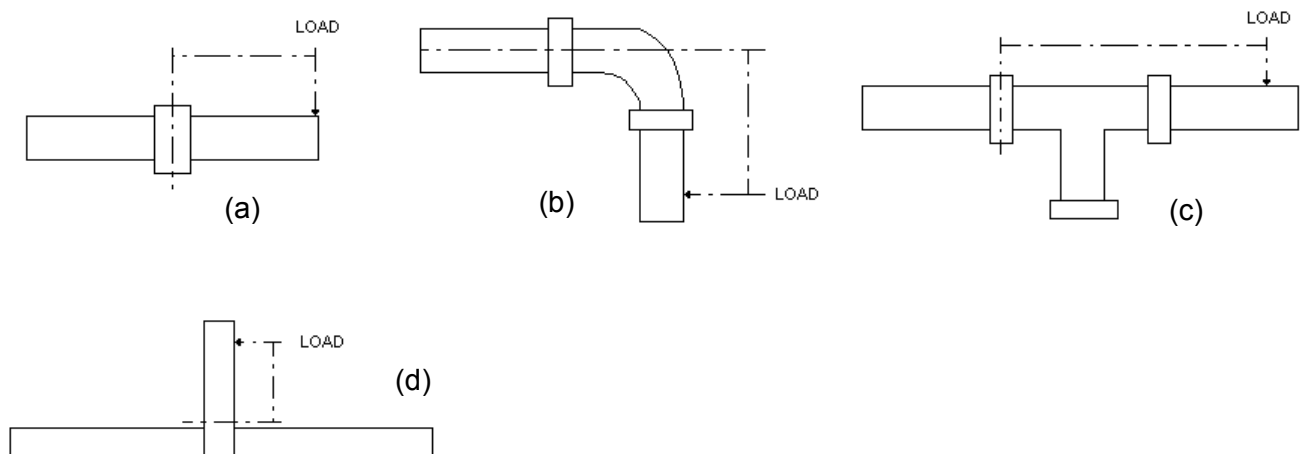


Figure 3 – Coupling assembly for test 5.5

Note 1: Pipe of a length 1m to 1.25m shall be fitted to the coupling and/or fitting.

Note 2: Pipe shall be grooved or screwed along and as appropriate and shall have a pressure/leak tight blank at the other end or a suitable fitting that can be adapted to ISO 7/1-Rp.

Note 3: Provision shall be made for:

- i) Pressure charging connection.
- ii) Pressure monitoring.
- iii) Vent valve.

Note 4: The bending moment is to be applied at the appropriate point measured from:

- a) Single coupling – centre line of coupling.
- b) 45° or 90° elbow – centre line of longitudinal axis of fixed pipe.
- c) tee piece – centre line of first coupling connected to fixed pipe.
- d) Mechanical tee – as for (a).

In the case of (b) and (c), the appropriate angles of deflection of the two couplings involved shall be calculated and combined for the required total angle of deflection.

Note 5: The testing shall permit the free pipe to move unimpeded and friction is to be reduced to a minimum.

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Amendments Issued Since Publication

DOCUMENT NO.	AMENDMENT DETAILS	SIGNATURE	DATE
LPS 1219	Copyright and address change	CJA	23/10/01
LPS 1219	<ol style="list-style-type: none"> 1. Change to scope, 2. Deletion of clause 5.4.2 3. Alteration to requirements in 5.4.1 in line with Panel C request 	PJF	31/07/02
LPS 1219-2.1	Further copyright change	CJA	13/08/02
LPS 1219-2.2	<ol style="list-style-type: none"> 1. Reformatting to standard template 2. Increase of max, working pressure to 12 bar 3. Update to bending moments in-line with ISO6182-12 	PJF	16/08/04
LPS 1219-3.0	Reformatting to new standard template. Included definition of fire test.	SNB	14/11/06
LPS 1219-3.1	<ol style="list-style-type: none"> 1. New front cover 2. Title added to header 3. Contents page moved to Page 1 4. Revision of Loss Prevention Standards amended on Page 2 5. Notes amended on Page 3 6. Repagination 	DC	Jan. 2014