LPCB®

Loss Prevention Standard

LPS 1041: Issue 1.3

Requirements and testing procedures for the LPCB approval and listing of dry pipe valve sets

This standard specifies the requirements and testing methods for dry pipe valve sets used in dry pipe automatic sprinkler systems, and additional requirements for dry pipe valves, trim, water motor alarms and accelerators/exhausters.

bre

CONTENTS **PAGE**

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
BRE (FRS)
British Automatic Sprinkler Association
British Fire Protection Systems Association
British Security Industry Association
Confederation of British Industry
Chief & Assistant Fire Chief Officers Association
Door & Shutter Manufacturers' Association
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
Office of the Deputy Prime Minister
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 28)

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.

FOREWORD

This standard identifies the evaluation and testing practices for the LPCB approval and listing of products. LPCB Listing of life safety and security products for inclusion in the "Red Book" is based on the following

i. Satisfactory product performance during testing and audit testing
ii. Satisfactory product construction
iii. Satisfactory manufacturing processes
iv. Satisfactory product service experience.

NB:- Compliance with this LPS standard does not in itself confer immunity from legal obligations.

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.

The BRE Trust, a registered charity, owns BRE and BRE Global. BRE Global and LPCB (part of BRE Global) test, assess, certificate and list products and services within the fire and security sectors. For further information on our services please contact BRE Global, Watford, Herts. WD25 9XX or e-mail to enquiries@breglobal.co.uk

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).

1 SCOPE

This standard specifies the LPCB requirements and testing methods for dry pipe valve sets used in dry pipe automatic sprinkler systems, and additional requirements for dry pipe valves, trim, water motor alarms and accelerators/exhausters.

2 DEFINITIONS

2.1 Accelerator

A quick opening device which hastens the operation of a dry pipe valve using a mechanical means other than by reducing the system air pressure.

2.2 Anti-reseat latch

Latch mechanism designed to prevent the sealing assembly from returning to its set position after operation.

2.3 Differential ratio

Ratio of system air pressure to water supply service pressure, expressed as gauge pressures, as measured at the trip point.

2.4 Differential type dry pipe valve

Type of dry pipe valve in which the air seat of the sealing assembly is of large diameter relative to the diameter of the water seat of the sealing assembly, with the two separated by an intermediate chamber maintained at atmospheric pressure.

2.5 Dry pipe valve

Automatic sprinkler water-supply control valve designed so that air pressure in a system of piping will hold back water pressure until the air pressure in the system is lowered sufficiently to cause automatic operation of the valve and admission of the water in the system, or the valve is tripped by direct action by an accelerator.

2.6 Dry Pipe Valve Set

An assembly complete with dry pipe valve, trim and water motor alarm. Optional items, such as accelerator, exhauster, flow meter, pressure switch and flow switch may also be included as part of the dry pipe valve set.

2.7 Exhauster

A quick opening device which discharges the system air directly to atmosphere to reduce the time to reach the trip point.

2.8 Intermediate chamber

That portion of a dry pipe valve which separates the air/or water sealing assembly seating surfaces and which is at atmospheric pressure when the valve is in the ready position.

2.9 Leak point

System air pressure and service water pressure at which water begins to emanate from the valve during the tripping sequence.

2.10 Maximum working pressure

Maximum working pressure at which a dry pipe valve is intended to operate.

2.11 Service Pressure

The static pressure at the inlet to the dry pipe valve when the valve is in the ready condition.

2.12 Mechanical type dry pipe valve

Type of dry pipe valve in which a mechanism acts to produce a force which is multiplied through a series of levers, links, or latches to maintain the water sealing assembly in the closed position. Operation of this type of valve is generally independent of water pressure.

2.13 Nominal pressure (PN)

A numerical designation which is a convenient round number for reference purposes. All equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions.

Note: Nominal pressure is designated by the letters PN followed by the appropriate reference number.

2.14 Nominal size (DN)

A numerical designation of size which is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number for reference purposes and is only loosely related to manufacturing dimensions.

Note: Nominal size is designated by the letters DN followed by the appropriate reference number.

2.15 Priming water

Water used as a means to seal a sealing assembly and or to prevent cementation of working parts.

2.16 Product Consistency

It shall be the manufacturer's responsibility to implement a quality plan to ensure that his product continues to meet the requirements of this standard, in the same way as the samples originally tested.

2.17 Ready condition

Condition of a dry pipe valve installed in a pipework system with the downstream pipe filled with air or inert gas at a predetermined pressure, to maintain the dry pipe valve in a closed position and prevent pipework filling with water.

2.18 Sealing assembly

That portion of a valve mechanism on which air pressure acts and which opens to allow flow through the valve when operated.

2.19 Service pressure

Static water pressure at the inlet to a dry pipe valve when the valve is in the ready position.

2.20 System pressure

Static air pressure at the main outlet to a dry pipe valve is in the ready position.

2.21 Trim

Ancillary pipework, fittings and components essential for the correct operation of the alarm valve, such as the alarm line, test line and cocks and alarm drain facilities.

2.22 Trip point

Point at which a dry pipe valve operates, admitting water into the sprinkler system installation, measured in terms of the air pressure and service pressure.

2.23 Water motor alarm

Hydraulically actuated device which provides a local audible alarm as a result of operation of the dry pipe valve.

3 DRY PIPE VALVE SET - REQUIREMENT AND TEST METHODS

3.1 Composition of dry pipe valve set

A dry pipe valve set shall comprise the following items which shall comply with all the requirements and test methods in the relevant section of this standard.

a) Dry pipe valve, to comply with Section 4.
b) Trim, to comply with Section 5.
c) Water motor alarm, to comply with Section 6.
d) Optional items, which include:

   i) Accelerator or exhauster, to comply with Section 7.
   ii) Direct reading flow meter, to LPS1045 (Requirements and Testing Methods for Direct Reading Flow Meters).
   iii) Pressure switch to LPC requirements and testing methods for pressure switches.
   iv) Flow switch to EN12259-5 (Fixed Firefighting Systems. Components for Sprinkler and Water Spray Systems. Water Flow Detectors) and LPCB Scheme Document SD050.

3.2 Examination

The dry pipe valve set and components shall be examined for compliance with the submitted engineering specification, i.e. engineering drawings and trim drawings.

3.3 Maximum working pressure

3.3.1 Requirement

Dry pipe valve sets shall be designed and constructed to withstand a maximum working pressure of not less than 12 bar. An assembled dry pipe valve set shall sustain without leakage, permanent deformation, rupture, or sudden release of pressure, an internal hydrostatic pressure of twice the maximum working pressure applied for a period of five minutes.

Inlet and outlet connections may be machined for a lower working pressure and pressure gauges may be selected for a lower maximum working pressure, in order to match installation conditions and equipment of lower pressure rating.

3.3.2 Test

An assembled dry pipe valve set shall be connected to a hydrostatic pressure supply. The set shall be hydrostatically pressurised to twice the maximum working pressure for a period of five minutes and inspected during this time for signs of leakage. The sealing assembly shall be blocked open for the duration of the test. Care must be taken to vent air from all trim pipes.

3.4 Operational

3.4.1 Requirement

A dry pipe valve set shall operate correctly and provide indication of operation by actuating mechanical and/or electrical alarm devices at any service pressure within the range of 1.4 bar to the maximum working pressure. The alarm devices of non-latched dry pipe valves shall sound for more than 50% of the time for all flow conditions through a tripped valve. At operation the difference between the leak point and the trip point system air pressures shall not exceed 0.2 bar.

A dry pipe valve set shall be capable of providing a pressure of at least 0.5 bar at the alarm port at a service pressure of 1.4 bar, whilst actuating the water motor alarm and any electric alarm device.

A valve of the mechanical type shall operate at air pressures between 0.22 bar and 2 bar for all service pressures from 1.4 bar to the maximum working pressure.

3.4.2 Test

Subject a valve to a series of tests at water service pressures of 1.4 bar, 2 bar, 4 bar, 8 bar and maximum working pressure.

In preparation for each test, clean sealing assembly seat(s) and seat ring(s) and any other operating parts. Seat the main sealing assembly member properly and place the lever mechanism in the set position. Bolt the cover plate into place. Establish the priming water level (if applicable) and system air pressure in accordance with the manufacturer's instructions. Then open the main water supply valve wide, and trip the valve under normal operation conditions.

Record valve leak point pressure, valve trip point pressure and alarm port pressure.

Make observations of the position of the sealing assembly with relation to its anti-reseat latching mechanisms after each operation.

3.5 Differential ratio

3.5.1 Requirement

Valves of the differential type shall have a working differential ratio within the range of 5:1 to 8.5:1 at a service pressure of 1.4 bar and within the range of 5:1 to 6.5:1 at all higher pressures.

A mechanical type valve which is not latched open, or does not have an anti-reseat latch, shall have a differential ratio not exceeding 1.16:1 for a service pressure range between 1.4 bar and the maximum working pressure.

3.5.2 Test

From the operational test data the differential ratio shall be determined.

3.6 Anti-reseat latch

3.6.1 Requirement

A valve shall be provided with an anti-reseat latch which prevents the sealing assembly from resetting automatically and allows drainage until manually reset if:

a) The differential ratio of the valve exceeds 1.16:1 for a service pressure range between 1.4 bar and the maximum working pressure; or
b) The installation drain is upstream of the sealing assembly.

3.6.2 Test

Following operational testing ensure valve is capable of withstanding a reverse flow from a flooded system without damage to the sealing assembly and check system can be completely drained when sealing assembly is in each of the latched positions.

3.7 Pressure on sealing assembly

3.7.1 Mechanical type dry pipe valve

3.7.1.1 Requirement

Mechanical type dry pipe valves shall sustain without leakage or visible permanent distortion an internal hydrostatic pressure of twice the rated working pressure for 2h applied at the upstream end with the sealing assembly closed and the downstream end vented. The valve set shall then meet the operational requirements of Clause 3.4 at a service pressure of 2 bar.

3.7.1.2 Test

Place mechanical type valve set in the set position. Establish a pressure of twice the rated working pressure on the downstream side of the valve and maintain this pressure for 2h. After pressure conditioning, examine the various parts of the valve for any signs of leakage, damage or deformation. Then subject the valve set to an operational test in accordance with Clause 3.4 at a service pressure of 2 bar.

3.7.2 Differential type dry pipe valve

3.7.2.1 Requirement

Differential type dry pipe valves with an anti-reseat latch shall sustain a hydrostatic pressure without leaking across the sealing assembly into the intermediate chamber or alarm port at twice the rated maximum system air pressure for a period of five minutes at the downstream end with the sealing assembly closed and the upstream end vented. The valve set shall then meet the operational requirements of Clause 3.4 at a service pressure of 2 bar.

3.7.2.2 Test

With the sealing assembly in the closed position, fill the valve body with water downstream of the sealing assembly. Apply hydrostatic pressure downstream of the sealing assembly until a pressure of twice the maximum recommended system air pressure is reached. Maintain the hydrostatic pressure for the test duration of five minutes. Observe for leakage across the sealing assembly into the intermediate chamber in alarm port. Then subject the valve set to a operational test in accordance with Clause 3.4 at a service pressure of 2 bar.

3.8 Internal leakage

3.8.1 Requirement

The sealing system shall not show leakage in excess of 3ml/min when the system pressure is 0.7 bar above the trip point at maximum service pressure. Any leakage in excess of 3ml/min shall be automatically drained.

3.8.2 Test

With the sealing assembly in the closed position, prime the valve body in accordance with the manufacturer's instructions. Apply air pressure at a rate not exceeding 1.4 bar/min until a pressure is reached at 0.7 bar above the trip point for the test valve at its maximum service pressure. Apply a hydrostatic

maximum service pressure upstream of the sealing assembly for 2h. During the application of pressure, check the valve for leakage:

a) across the sealing assembly.
b) into the intermediate chamber (differential type).
c) into the alarm port (mechanical type).

3.9 Instructions for use

A set of instructions shall be supplied with each dry pipe valve set, which shall be durable and contain the following details:

a) An illustration(s) of the valve set with trim. The illustration(s) shall include cross-sectional views by which the functioning parts and operating conditions of the valve can be identified.
b) A key of the functioning parts and other major components of the valve set.
c) A description of the operating procedures.
d) Instructions for the alarm and functioning test.
e) Instructions for regular maintenance.
f) Equivalent length data.

4 DRY PIPE VALVE - REQUIREMENTS AND TEST METHODS

4.1 General

These requirements are specific to the dry pipe valve and are additional to the requirements and test methods in Section 3.

4.2 Product consistency

Every valve manufactured shall be subjected to the following tests:

a) a hydrostatic pressure test at twice the rated working pressure for 1 minute.
b) an operational tests at 1.4 bar and confirm flow from the alarm port.
c) leakage test across sealing assembly.
d) flow test from alarm port.

4.3 Sizes

Valve sizes shall refer to the nominal diameter of the alarm valve inlet and outlet connections, i.e. the pipe size for which the connections are designed.

Standard nominal sizes are DN50, DN65, DN80, DN100, DN125, DN150, DN200 and DN250 (See Clause 2.14 for explanation of nominal sizes). The

diameter of the waterway through the clapper seat ring may be smaller than the waterway through the inlet and outlet connections.

4.4 Body pressure strength

4.4.1 Requirement

An assembled valve with the sealing assembly open shall sustain without rupture or sudden release of pressure, an internal hydrostatic pressure of four times the rated working pressure, applied for a period of five minutes.

4.4.2 Test

The pressure strength for bodies and covers as described above is not considered to be applicable for bolting strengths, gaskets or seals. Standard production bolts, gaskets and seals may therefore be replaced by components capable of withstanding the pressure. The valve inlet and outlet connections and all other openings shall be suitably blanked or plugged. There shall be a connection for hydrostatically pressurizing the valve body at the valve inlet connection and a means for venting air and pressurizing fluid at the outlet connection. With the sealing assembly blocked open, the valve body shall be internally hydrostatically pressurized to four times the rated working pressure (but not less than 48 bar) and held for a period of five minutes.

The load on any fastener exclusive of the force required to compress the gasket, shall not exceed the minimum tensile strength specified in ISO 898: Part 2 (Specification for nuts with specified proof load values), when the valve set is pressurized to four times the rated working pressure. The area of application is to be calculated as follows:

i) If a full faced gasket is to be used the area of force application is that extended to a line defined by the inner edge of the bolts.

ii) If an 'O' ring seal or ring gasket is used, the area of the force application is that extending out to the centre line of the 'O' ring or gasket.

4.5 Dry pipe valve connections

The valve inlet and outlet connections shall be compatible for use with LPC approved mechanical couplings or BS4504 (Circular flanges for pipes, valves and fittings (PN designated)) flanges.

The dimensions of connections other than the inlet and outlet connections shall be compatible with tube or fittings screwed to BS21 (Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads), ISO 7/1 (Pipe threads where pressure-tight joints are made on the

threads. Part 1: Designation, dimensions and tolerances) or LPCB approved coupling systems.

4.6 Alarm line connection

An opening not smaller than 15mm normal diameter tube shall be provided for the alarm line connection.

4.7 Drain connection

A tapped opening shall be provided for draining water from the valve body when the valve is installed in any intended position. The minimum opening size shall be DN20. If the drain is also intended for use as an installation drain the size of drain shall comply with Section 5.2.

4.8 Serviceability

Means shall be provided to permit access to working parts of the valve body and allow removal of the sealing assembly where necessary. It shall permit ready maintenance with a minimum of downtime.

If cover plates are fitted, they shall be designed so that they cannot be installed in such a manner as to adversely affect the operation of the valve or improperly reassembled.

Where practical, the design of any component which may normally be disassembled during field servicing shall be such that it cannot be properly reassembled.

The design of movable parts of a valve shall be such that operation cannot be prevented by misuse and the parts shall not damage the sealing elements during valve operation.

With the exception of the valve seat, all parts intended for field servicing shall be capable of being dismantled and assembled with tools normally employed in the trade.

4.9 Clearances

Clearances shall be provided between working parts and stationary parts so that corrosion of deposits of foreign matter within an assembly will not render a valve sluggish in action or inoperative.

The clearances between the sealing assembly including the hinge area radial clearance, and the inside walls of the body castings, in every position except the wide open position shall not be less than 12mm for cast iron and 6mm for non-ferrous and stainless steel castings.

Radial clearances of not less than 3mm shall be provided to prevent contact between inner edges of a seal ring and metal parts of a sealing assembly when the valve is in the closed position. The total diametrical clearance between hinge pins and their bearings shall be not less than 0.125mm. The total axial clearance between the sealing assembly hinge and the body bearing surface shall be not less than 0.25mm (Figure 4).

Any space in which the sealing assembly may trap debris beyond the valve seat shall be not less than 3mm deep.

Any reciprocating guide components in the main valve body, operation of which is essential to allow a valve to open, shall have a minimum diametrical clearance of not less than 0.7mm in that portion over which the moving component enters the fixed component and not less than 0.05mm in that portion of the moving component continuously in contact with the fixed component in the ready position.

Corrosion resistant clapper guide bushings or hinge pin bearings shall project a sufficient distance to maintain not less than 3mm clearance between ferrous metal parts.

4.10 Non-metallic components

Non-metallic parts in contact with water should be acceptable to the Water Research Council for their intended purposes.

4.11 Fire resistance

Non-metallic materials (other than for seals) or metals with a melting point of less than 800°C (other than pipe jointing materials) shall not be used in the pressure retaining components of the valve set, except the water motor alarm.

4.12 Design

A sealing assembly shall be such that it will move towards the seat by gravity when no water is flowing through the valve outlet connection, subject to limitations of anti-reseat latch. The use of springs to assist sealing is acceptable. Springs shall be retained at both ends so that they remain in situ in the event of breakage.

When wide open, the sealing assembly shall bear against a definite stop, the point of contact being so made the impact or the reaction of the water will not permanently twist or bend the parts or crack the body.

Where employed, bearing plugs shall be long enough to extend inside the walls of cast iron bodies to provide an end bearing surface. Pressure fitting of bushes shall conform to the appropriate standards.

4.13 Materials

All interior parts (except the valve body) made of materials other than bronze shall have a corrosion resistance at least equivalent to bronze.

4.14 Hydraulic friction loss

4.14.1 Requirement

Head losses due to hydraulic friction shall not exceed 0.4 bar at a flow rate which gives a velocity of 5m/s in the full size pipe connection to the valve. Parts shall not detach from the valve during the test.

4.14.2 Test

The sample valve shall be installed in its intended mounting position(s). The pressure loss across the valve shall be measured at a flow velocity in the alarm valve full size pipe connection of 5m/s.

5 TRIM - REQUIREMENTS AND TEST METHODS

5.1 Composition

The trim shall comprise the following items:

a) Installation pressure gauges (service water pressure and system air pressure), connections, pipe and fittings. A shut-off valve shall be incorporated to enable removal of any gauge whilst maintaining valve in service.

b) Alarm line, fittings, filter, drain and connection for pipe to alarm motor and gong.

c) Alarm line, fittings, stop cock.

d) Installation drain line and stop cock.

e) Tundish and drain connection for alarm line.

f) Tundish and drain connection for test line.

g) Air supply line restrictor.

h) Instructions, suitably fixed and protected.

Optional items are:

Accelerator/exhauster, pressure switch and flow switch.

5.2 Pipes, fittings, filters and drains

Pipes and fittings used for valve trim purposes shall be in conformance with one of the following:

a) BS 1387:1985 - Medium tube internally galvanized. Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS21 pipe threads.
b) BS 1740:Part 1:1983. Specification for wrought steel pipe fittings.
c) ISO 49:1994. Malleable cast iron fittings threaded to ISO 7/1-1 Second Edition.
d) BS 2051:Part 1:1973. Copper and copper alloys capillary and compression tube fittings for engineering purposes.
e) BS 2871:Part 2:1972. Tubes for general purposes.

Copper pipe may be used where failure of the pipe does not adversely affect the operation of the sealing assembly. Copper pipe may not be used on the alarm line.

A strainer shall be provided in the alarm line immediately upstream of the water motor nozzle and shall be accessible for cleaning. Strainer baskets shall be of corrosion resistant material and shall have openings with the largest dimension 1.5mm less than the smallest orifice in the alarm line pipework. The total area of openings in the strainer shall be not less than 20 times the cross-sectional area of the water motor nozzle.

The alarm line shall be connected to the intermediate chamber, which shall be open to atmosphere and be protected from back pressure. The alarm line and all components between the alarm valve body and water motor connections shall automatically drain when not in operation. The drain shall allow a flow equivalent to that through an orifice with a square entry and exit, 3mm diameter through a section 3mm thick.

The drain restrictor shall be of corrosion resistant material.

An installation drain shall be provided downstream of the sealing assembly. The drain shall be connected at the valve body or the installation pipework immediately downstream of the valve. The connection and drain line shall be at least the minimum size indicated in the following table:

Table 1 Minimum drain line and connection size

Valve size DN	Minimum installation drain line and connection size DN
50	20
65	32
80	32
100	50
125	50
150	50
200	80
250	80

5.3 Trim stop valves

For trim stop valves which are critical to the operation of the alarm valve i.e. main stop valve and alarm control valve, it shall be readily apparent by visual inspection whether they are fully open, partially open, or closed.

It shall be possible to remove the dry pipe valve whilst the main stop valve closes off the water supply.

Trim stop valves shall have the means to be secured open by a padlocked strap. It shall be possible to sever the strap with a sharp knife.

6 WATER MOTOR ALARM - REQUIREMENTS AND TEST METHODS

6.1 Design

A water motor alarm shall be designed so that it may be readily installed and serviced without using specialised tools.

Two or more assemblies intended to be assembled in the field as a unit shall be capable of being joined together without misalignment and without requiring any of the parts to be drilled, welded or otherwise altered except for a part requiring to be cut to length and/or threaded.

Bearings shall be self-lubricating and all moving parts shall require minimum maintenance.

A water motor alarm shall be provided with a device to afford protection to the operating mechanism from weather and to exclude birds and vermin.

Pockets of water shall not be retained within the water motor alarm, when in its normal installation, which may prevent operation of the alarm if frozen.

Nozzles shall have a bore diameter of not less than 3mm and shall be made of corrosion resistant material.

Sumps, strainers or other means of preventing foreign matter entering the nozzle or jet immediately upstream of the water motor nozzle shall be accessible for cleaning. Strainer baskets shall be of corrosion resistant material and have openings with the largest dimension 1.5mm less than the water motor nozzle. The total area of openings shall be at least 20 times the cross-sectional area of the water motor nozzle. The aggregate area of the strainer openings shall be at least 10 times the nozzle port area.

6.2 Connections

A water motor body shall have an inlet connection suitable for pipe in accordance with BS1387, 20mm minimum diameter. There shall also be a body opening for the water drain connection which shall be at least 50 times the cross-sectional area of the water motor nozzle or jet.

6.3 Materials

An assembled water motor and gong complete with all covers and internal fittings shall be corrosion resistant.

Materials shall be resistant to the effects of temperature within the range of -35°C to 60°C and the effects of sunlight where components may be exposed.

6.4 Operation at Minimum operating pressures

6.4.1 Requirement

A water motor and gong shall operate satisfactorily and rotation shall commence at a pressure of 0.35 bar or less, measured at the nozzle entry.

6.4.2 Test

With a suitable water supply connected to the inlet of the water motor alarm and a 1m vertical drain pipe connected to the outlet, the inlet pressure shall be determined for (a) rotation of the motor, (b) sounding of the alarm.

6.5 Audibility

6.5.1 Requirement

The average of three audibility test readings at each of the pressures 2 bar, 3 bar and 10 bar shall not be less than 85 Db(A) at a distance of 3m, with no individual reading less than 80 Db(A).

The average of three audibility test readings at a pressure of 0.5 bar shall not be less than 70 Db(A) at a distance of 3m.

6.5.2 Test

Using the test arrangement in Figure 3 conduct audibility tests outside at 0.5 bar, 2 bar, 3 bar and 10 bar at each location A, B and C. Refer to ISO 3740 (Guide for the use of basic standards and for the preparation of noise test codes) for information on audibility testing.

6.6 Durability

6.6.1 Requirement

A water motor and gong shall be capable of satisfactory operation for the duration of the water motor alarm durability test and shall be capable of meeting the requirements of the minimum operating pressure test before and after the durability test.

6.6.2 Test

A water motor alarm shall be subjected to a continuous endurance run in accordance with the parameters specified in Table 2. Before starting and after completion of the durability test, the minimum operating pressure test and the audibility test shall be carried out. On completion of the tests the water motor alarm shall be examined.

Table 2 Durability test parameters

Sequence	Pressure at alarm inlet	Duration
1	Rated working pressure	5 minutes
2	0.3 x rated working pressure	50 hours
3	Rated working pressure	5 minutes

6.7 Clearances

Clearances shall be provided between water motor impeller and the water motor body so that corrosion or deposits will not render the water motor sluggish or inoperative.

7 ACCELERATOR AND EXHAUSTER

7.1 Design

A quick opening device and any associated anti-flooding component shall be designed to permit cleaning and maintenance without the use of special tools. Where practicable, the design of any component which may be normally disassembled during servicing should be such that it cannot be reassembled wrongly. It should be possible to disassemble all parts intended for field replacement using only tools normally employed by the trade.

A means shall be provided for support of an accelerator.

Orifices shall be protected from clogging and debris shall be prevented from passing through any anti-flooding device.

A connection shall be provided for a suitable pressure gauge which will facilitate the detection of a clogged pressure equalizing orifice.

7.2 Maximum working pressure

7.2.1 Requirement

Quick-opening devices and any associated anti-flooding component shall be designed and constructed to withstand a maximum working pressure of not less than 12 bar.

7.2.2 Test

A quick-opening device and any associated anti-flooding component shall be subjected to an internal hydrostatic pressure of twice the maximum working pressure applied for a period of five minutes without evidence of leakage, permanent deformation, rupture or sudden release of pressure.

7.3 Installation pressure leak resistance

7.3.1 Requirement

Quick-opening devices and any associated anti-flooding component shall be designed and constructed to retain a system air pressure of not less than 7 bar.

7.3.2 Test

A quick-opening device and any associated anti-flooding component shall be subjected to an internal pneumatic pressure of 7 bar $\pm$ 0.1 bar for one minute without evidence of leakage.

7.4 Operational

7.4.1 Requirement

A quick opening device shall operate a specific dry pipe valve within 30 seconds when the rate of system air pressure drop exceeds a specific rate as a result of the operation of one 10mm sprinkler, at all water supply pressures from 1.4 bar to the maximum working pressure, therefore hastening the operating time of the dry pipe valve. If the valve does not trip before the installation pressure reaches 1 bar at 1.4 bar $\pm$0.1 bar service pressure, then the valve shall trip within 5 seconds of reaching 1 bar. The quick opening device shall not respond to an installation pressure drop of less than 0.02 bar/min.

In the event of failure of a quick opening device this should not prevent normal operation of the dry alarm valve.

After inlet of water into the sprinkler installation, the quick opening device shall close and prevent leakage of water other than to alarm devices.

Following drainage of the installation after operation, the quick opening device shall either reset automatically or be readily manually reset with the minimum of down time.

7.4.2 Test

Install the quick opening device and any anti-flooding device in combination with an appropriate dry alarm valve assembly, in accordance with the manufacturer's instructions.

Set up in the ready condition with the maximum recommended downstream air pressure, and on the upstream side a service pressure of the rated working pressure $\pm$ 0.1 bar. Reduce the installation air pressure at a rate between 0.02 bar/min and 0.025 bar/min for a period of 2h + 0.1h/-0h to ensure the quick opening device does not operate. Then apply in turn service pressures of 1.4 bar, 2 bar, 4 bar, 8 bar and maximum working pressure with downstream air pressures in accordance with the manufacturer's recommended maximum pressure for each service pressure. In no case shall the initial air pressure exceed the service pressure. In each test reduce the installation air pressure to check for correct operation.

Ensure that the quick opening device operates the valve within 30 seconds and that after drainage of the installation the device(s) reset automatically or manually in the minimum of down time.

7.5 Connections

All connections should be compatible with pipe or fittings screwed in accordance with ISO 7/1.

7.6 Materials

All components in contact with water made of materials other than bronze should have a corrosion resistance at least equivalent to bronze.

8 PUBLICATIONS REFERRED TO:

BS21:1985	Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads.
BS1387:1985	Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS21 pipe threads.
BS1740:Part 1:1971	Specification for wrought steel pipe fittings.
BS2051:Part 1:1973	Copper and copper alloys capillary and compression tube fittings for engineering purposes.
BS2871:Part 2:1972	Tubes for general purposes.
ISO 3740:1980	Guide for the use of basic standards BS 4196:Part 0:1981 and for the preparation of noise test codes.
BS4504:Section 3.1:1989	Circular flanges for pipes, valves and fittings (PN designated). Part 3. Steel, cast iron and copper alloy flanges. Section 3.1. Specification for steel flanges.
BS EN 1092-2:1997	Circular flanges for pipes, valves, fittings and accessories (PN designated). Part 2. Cast iron flanges.
BS4505:Section 3.3:1989	Circular flanges for pipes, valves and fittings (PN designated). Part 3. Steel, cast iron and copper alloy flanges. Section 3.3. Specification for copper alloy and composite flanges.
ISO 898:Part 2:	Specification for nuts with specified proof BS EN 20898-2:1992 load values.

ISO 7/1:1983	Pipe threads where pressure-tight joints are made on the threads. Part 1: Designation, dimensions and tolerances.
ISO 49:1994	Malleable cast iron fittings threaded to ISO 7/1-1 Second Edition.
BS EN 12259-5	Fixed firefighting systems. Components for sprinkler and water spray systems. Water Flow Detectors.
LPS 1045	Requirements and Test Methods for Direct Reading Flow Meters.

9 FIGURES

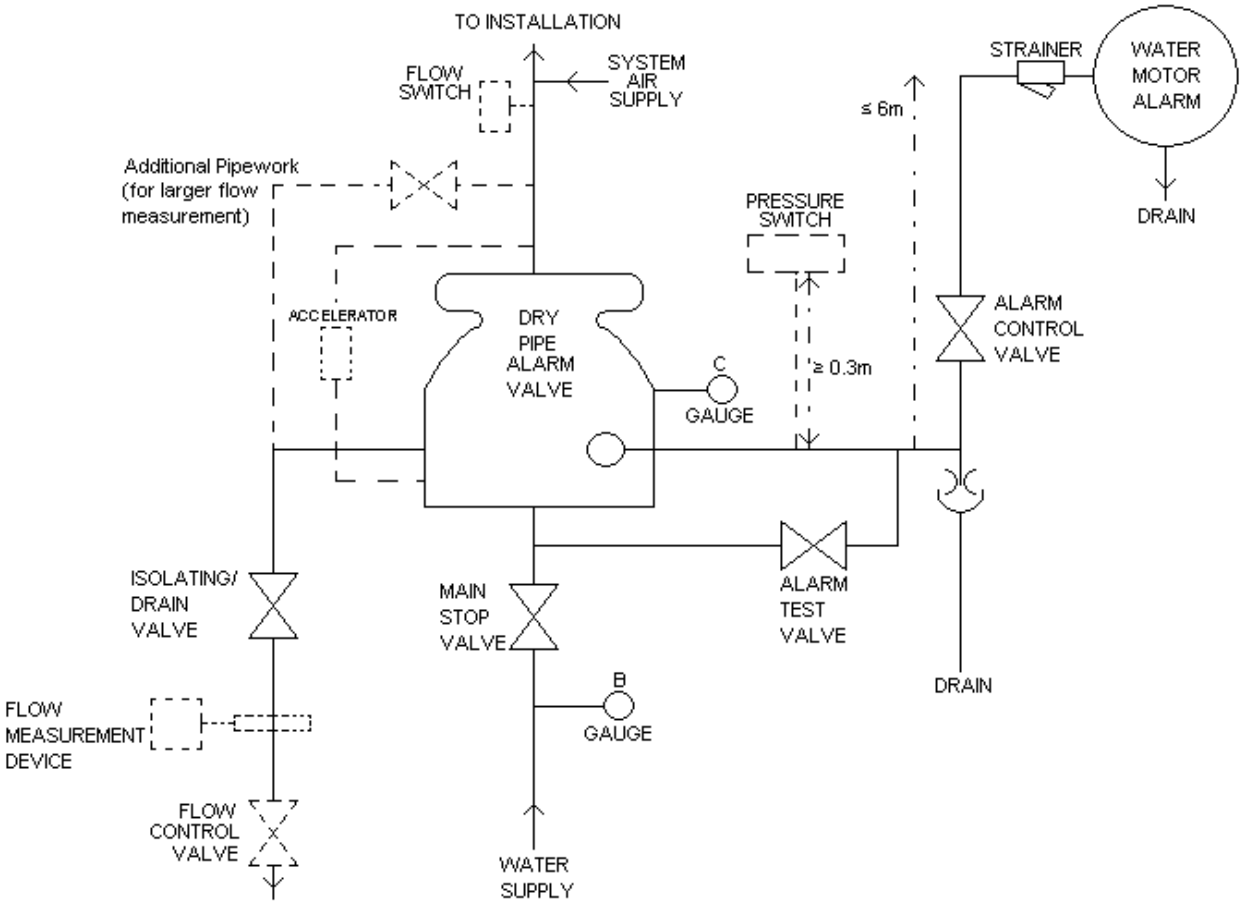


Figure 1 Typical dry pipe alarm valve set

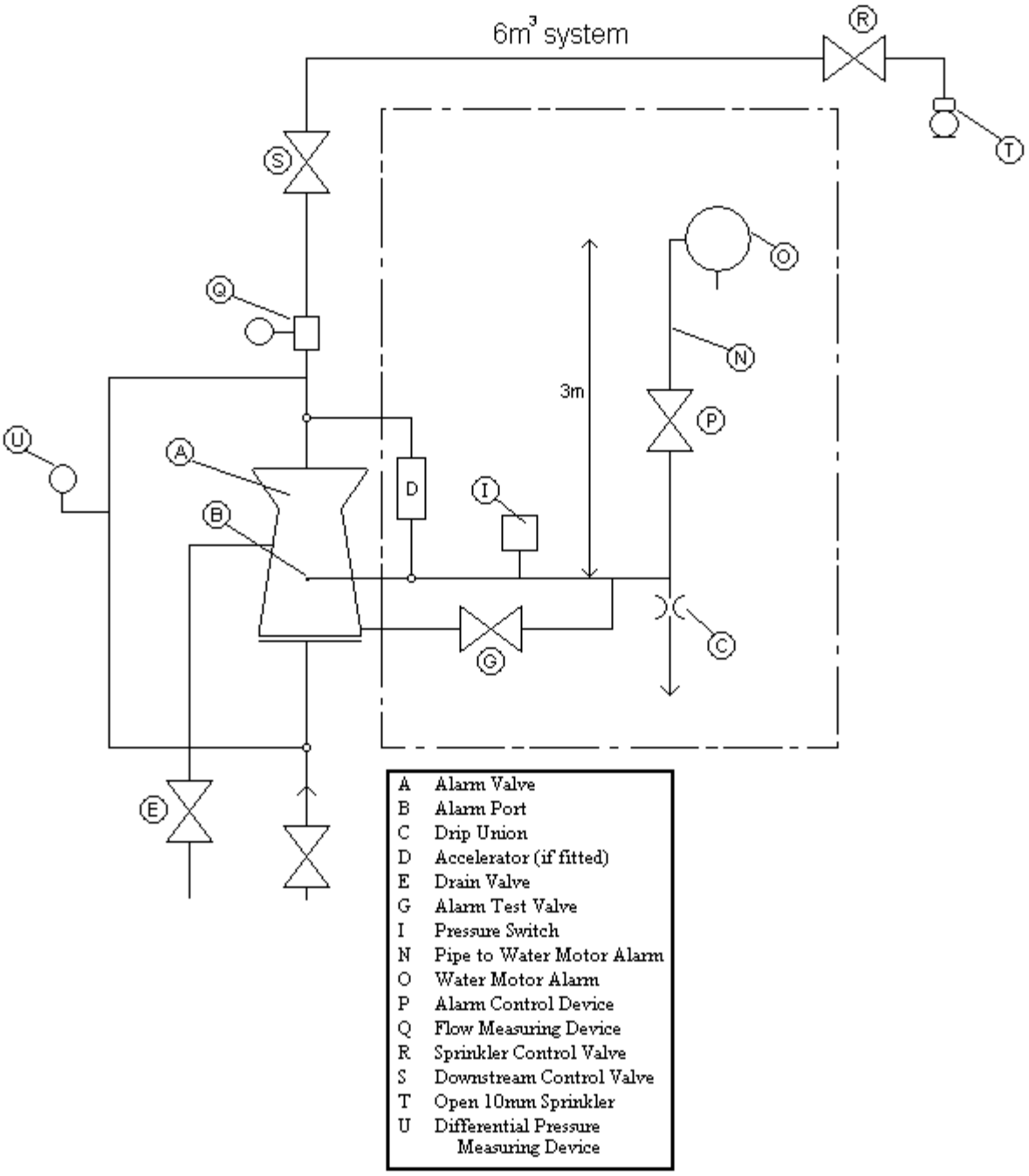
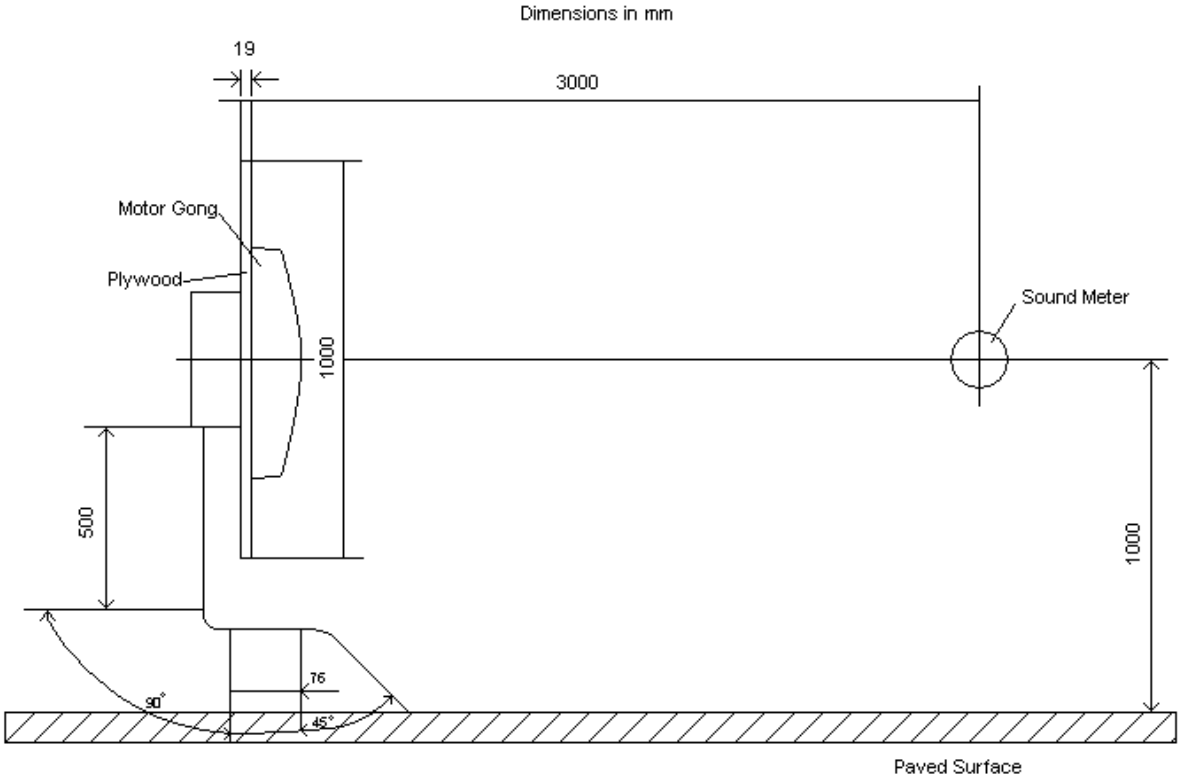
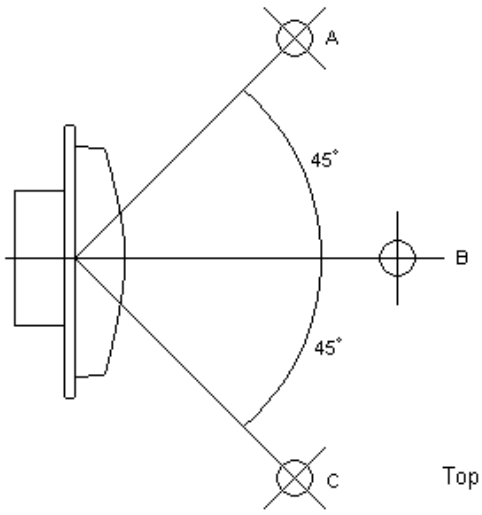


Figure 2 Operational test installation

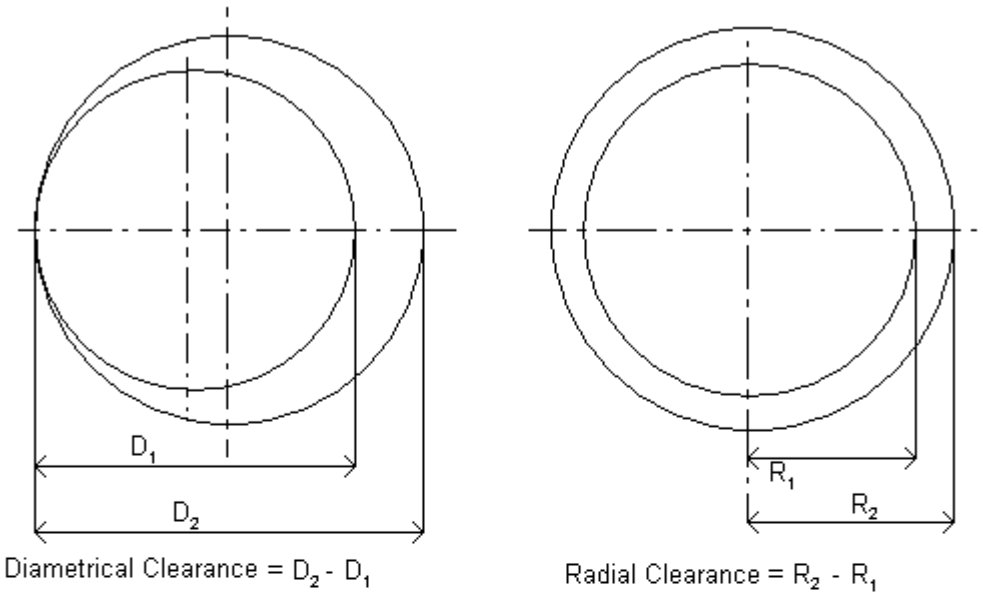


Side View



Top View

Figure 3 Audibility test layout



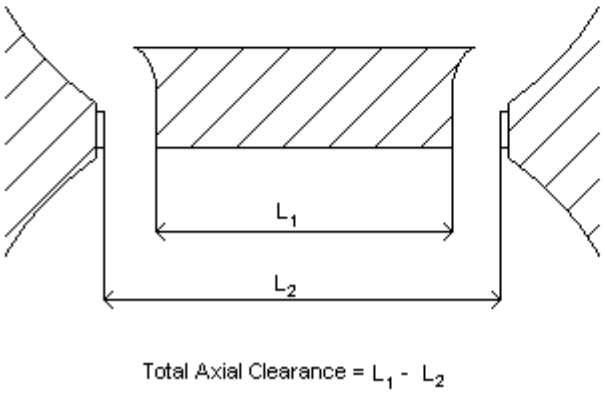


Figure 4 Clearances

Amendments Issued Since Publication

DOCUMENT NO.	AMENDMENT DETAILS	SIGNATURE	DATE
LPS 1041-1.1	Reformatting to standard template	CJA	12/12/03
LPS 1041-1.2	Change to copyright information	CJA	16/09/05
LPS 1041-1.3	1. New front cover 2. Title added to header 3. Contents page moved to Page 1. 4. Notes added on Page 3. 5. Repagination	DC	Jan. 2014