

Australian Standard®

Fire sprinkler systems

Part 1.1: Components— Sprinklers and sprayers

This Australian Standard was prepared by Committee FP/4, Automatic Sprinkler Installations. It was approved on behalf of the Council of Standards Australia on 6 February 1996 and published on 5 June 1996.

The following interests are represented on Committee FP/4:

Asset Services
Australian Building Codes Board
Australian Chamber of Commerce and Industry
Australian Chamber of Manufactures
Australian Fire Authorities Council
Australian Fire Protection Association
Australian Water and Sewerage Authorities
Commonwealth Fire Board
CSIRO—Division of Building, Construction and Engineering
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This Standard was issued in draft form for comment as DR 92183.

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 4118.1.1—1996

Fire sprinkler systems

Part 1.1: Components—Sprinklers and sprayers

RECONFIRMATION NOTICE

Technical Committee FP-004 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 14 June 2013.

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NOTES

Australian Standard[®]

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PREFACE

This Australian Standard was prepared by the Joint Australia/New Zealand Standards Committee FP/4 on Automatic Sprinkler Installations, to supersede in part AS 2118—1982, *Automatic fire sprinkler systems*, and is the result of a consensus among representatives on the Joint Committee to produce it as an Australian Standard.

The revisions to AS 2118 include Standards Australia's requirements to keep product and installation Standards separate. When complete the series will comprise:

AS

- 2118 Automatic fire sprinkler systems
- 2118.1 Part 1: Standard
- 2118.2 Part 2: Wall wetting sprinklers (Drenchers)
- 2118.3 Part 3: Deluge
- 2118.4 Part 4: Residential
- 2118.5 Part 5: Domestic
- 2118.6 Part 6: Combined sprinkler and hydrant
- 2118.8 Part 8: Minor modifications to installed systems
- 2118.9 Part 9: Piping support and installation
- 2118.10 Part 10: Approval documentation
- 4118 Fire sprinkler systems
- 4118.1.1 Part 1.1: Components—Sprinklers and sprayers
- 4118.1.2 Part 1.2: Components—Alarm valves (wet)
- 4118.1.3 Part 1.3: Components—Water motor alarms
- 4118.1.4 Part 1.4: Components—Valve monitors
- 4118.1.5 Part 1.5: Components—Deluge and pre-action valves
- 4118.1.6 Part 1.6: Components—Stop valves and non-return valves
- 4118.1.7 Part 1.7: Components—Alarm valves (dry)
- 4118.1.8 Part 1.8: Components—Pressure reducing valves
- 4118.2.1 Part 2.1: Piping—General

The term 'informative' has been used in this Standard to define the application of the appendix to which it applies. An 'informative' appendix is only for information and guidance.

This Standard is based on but not equivalent to ISO 6182.1:1993, which it is anticipated will replace this Standard at a later date. The assistance obtained from ISO is hereby acknowledged.

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Revised and redesignated in part as AS 4118.1.1— 1996.



STANDARDS AUSTRALIA

Australian Standard
Fire sprinkler systems

Part 1.1: Components—Sprinklers and sprayers

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard specifies the performance and testing of metallic element and frangible glass bulb sprinklers and sprayers, as listed in Table 1.1.

NOTE: Sprinklers and sprayers will be referred to throughout this text as sprinklers.

Whilst this Standard recognizes that there are sprinklers other than those listed in Table 1.1, the acceptance of these sprinklers is dependent on their documented approval and listing by a recognized authority.

Full testing procedures for sprinklers not listed in Table 1.1 are not necessarily included in this Standard.

TABLE 1.1
SPRINKLERS BY NOMINAL SIZE, DEFLECTOR
TYPE AND K FACTOR

Nominal size mm	Nominal thread size, mm	Deflector	K factor
10	10	SP SU	5.7 ±0.3
15	15	SP SU CU/P WU/P	8.0 ±0.4
20	20	SP SU CU/P WH	11.5 ±0.6

1.2 NEW DESIGNS AND INNOVATIONS Any alternative materials, designs, methods of assembly, procedures and similar that do not comply with the specific requirements of this Standard, or are not mentioned in it, but that give equivalent results to those specified, are not necessarily prohibited. Advice on such matters can be sought from Standards Australia, but the specified approval remains the prerogative of the regulatory authority.

1.3 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS

2118 Automatic fire sprinkler systems

2118.1 Part 1: Standard

AS

2484 Fire—Glossary of terms

2484.1 Part 1: Fire tests

2484.2 Part 2: Fire protection and firefighting equipment

2706 Numerical values—Rounding and interpretation of limiting values

4041 Pressure piping

UL (Underwriters Laboratories Inc.)

199 Standard for safety, automatic sprinklers for fire protection

1.4 DEFINITIONS For the purposes of this Standard the definitions given in AS 2484.1, AS 2484.2, AS 2118.1 and those below apply.

1.4.1 Conductivity factor (C)—measure of the conductance between the sprinkler's heat responsive element and the fitting, expressed in $(\text{m/s})^{1/2}$.

1.4.2 Listed—equipment or materials included in a list, published by an organization acceptable to the regulatory authority (see Clause 1.5) and concerned with product evaluation certifying that the equipment or material meets appropriate standards or has been tested and found suitable for use in a specified manner.

NOTE: The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labelled. The 'regulatory authority' should utilize the system employed by the listing organization to identify a listed product.

1.4.3 Response time index (RTI)—measure of sprinkler sensitivity expressed as:

$$\text{RTI} = \tau u^{0.5} \quad \dots (1)$$

where

τ = is the time constant of the heat responsive element, expressed in seconds; and

u = is the gas velocity, expressed in metres per second.

RTI can be used in combination with the conductivity factor (C) to predict the response of a sprinkler in fire environments defined in terms of gas temperature and velocity versus time. RTI is expressed in $(\text{m/s})^{1/2}$.

1.4.4 Sprinkler—thermosensitive device designed to react at a predetermined temperature by automatically releasing a stream of water and distributing it in a specified pattern and quantity over a designated area.

1.4.5 Standard orientation—in the case of symmetrical heat responsive elements, standard orientation is with the airflow perpendicular to both the axis of the waterway and the plane of the frame arms. In the case of non-symmetrical heat responsive elements, standard orientation is with the airflow perpendicular to both the waterway axis and the plane of the frame arms and which produces the shortest response time.

1.4.6 Worst-case orientation—orientation which produces the longest response time with the axis of the sprinkler waterway perpendicular to the airflow.

1.5 DEEMED TO SATISFY Any sprinkler or sprayer that has been listed and approved by an internationally recognized test and approval body such as—

- (a) Factory Mutual (FM);
- (b) Underwriters Laboratories (UL);
- (c) Loss Prevention Council (LPC);

or has been listed by Scientific Services Laboratory (SSL) in —

SSL Register of Accredited Products
Fire Protection Equipment

shall be deemed to satisfy the requirements of this Standard.

1.6 INTERPRETATION OF SPECIFIED LIMITING VALUES For the purpose of assessing compliance with this Standard, the specified limiting values herein shall be interpreted in accordance with the ‘rounding method’ described in AS 2706, i.e. the observed or calculated value shall be rounded to the same number of figures as in the specified limiting values and then compared with the specified limiting value. For example, for specified limiting values of 2.5, 2.50 and 2.500, the observed or calculated value would be rounded respectively to the nearest 0.1, 0.01, 0.001.

SECTION 2 TYPES OF SPRINKLERS

2.1 TYPE OF SPRINKLER ACCORDING TO TYPE OF HEAT RESPONSIVE ELEMENT

2.1.1 Metallic element sprinkler A sprinkler that opens under the influence of heat by the melting of a component.

2.1.2 Frangible glass bulb sprinkler A sprinkler that opens under the influence of heat by the bursting of the glass bulb through pressure caused by the expansion of the enclosed fluid.

2.2 TYPE OF SPRINKLER ACCORDING TO WATER DISTRIBUTION

2.2.1 Conventional sprinkler A sprinkler giving spherical water distribution directed towards the ground and the ceiling for a definite protection area. A conventional sprinkler directs from 40% to 60% of the total water flow initially in a downward direction (see Figure 2.2.1).

Abbreviation: C

2.2.2 Spray-sprinkler A sprinkler giving paraboloid water distribution directed towards the ground for a definite protection area. A spray-sprinkler directs from 80% to 100% of the total water flow initially in a downward direction (see Figure 2.2.2).

Abbreviation: S

2.2.3 Flat spray-sprinkler A sprinkler giving paraboloid water distribution directed towards the ground for a definite protection area. A flat spray-sprinkler directs from 60% to 80% of the total water flow initially in a downward direction.

Abbreviation: F

2.2.4 Sidewall sprinkler A sprinkler giving a one-sided (half-paraboloid) water distribution directed outwards for a definite protection area (see Figures 2.2.3(a) and (b)).

Abbreviation: W

2.2.5 Residential sprinkler A sprinkler giving a nominally spherical water distribution with a higher density cone of discharge vertically below the sprinklers (see Figure 2.2.4).

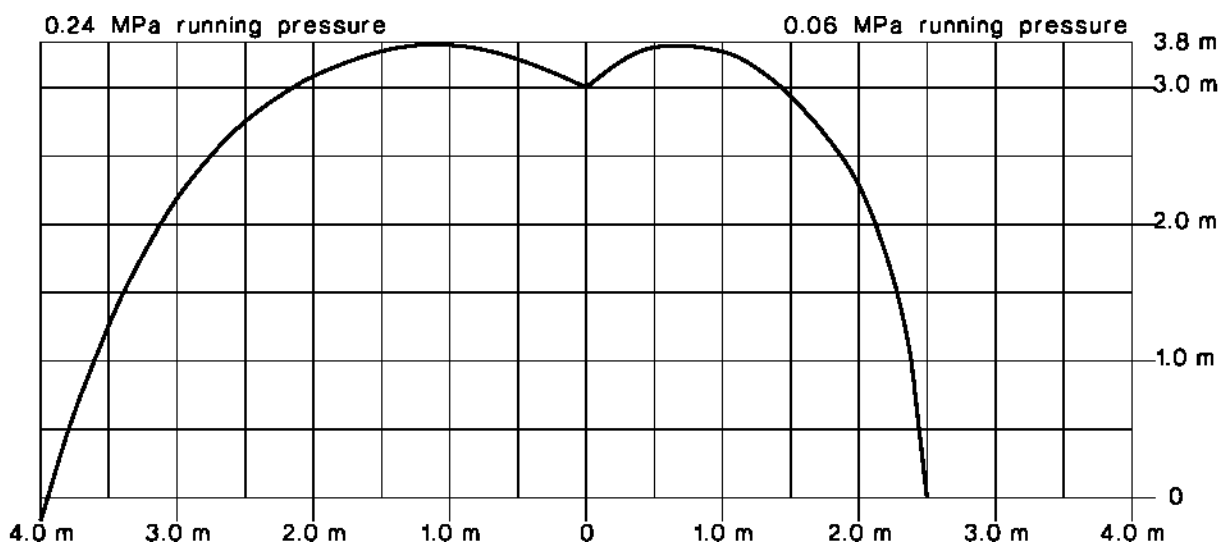


FIGURE 2.2.1 TYPICAL WATER DISTRIBUTION FOR CONVENTIONAL SPRINKLER MOUNTED UPRIGHT OR PENDENT

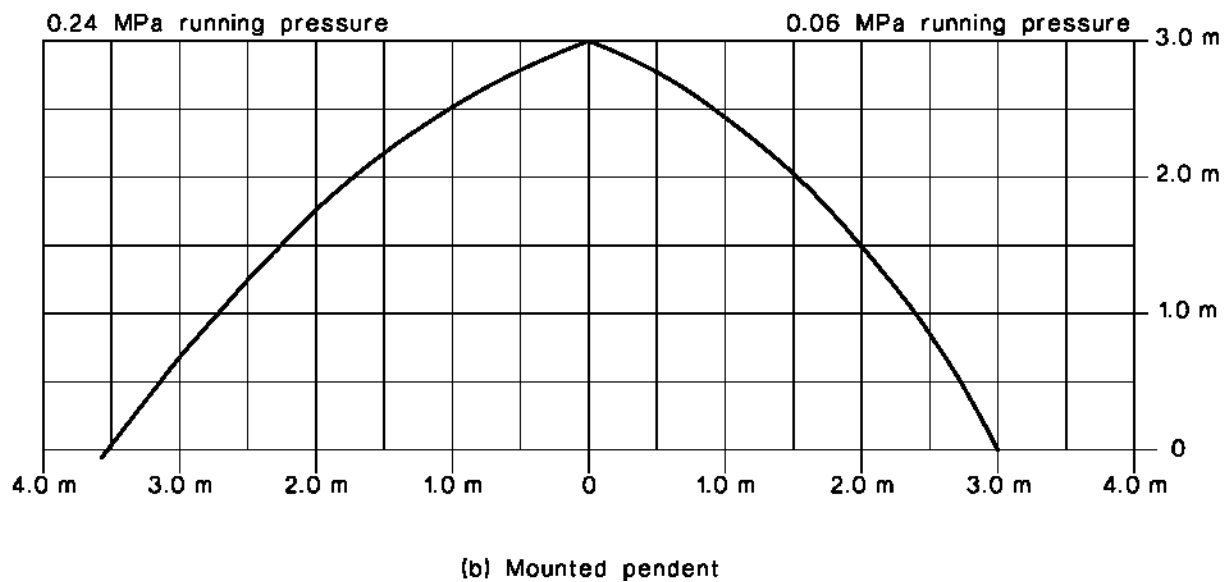
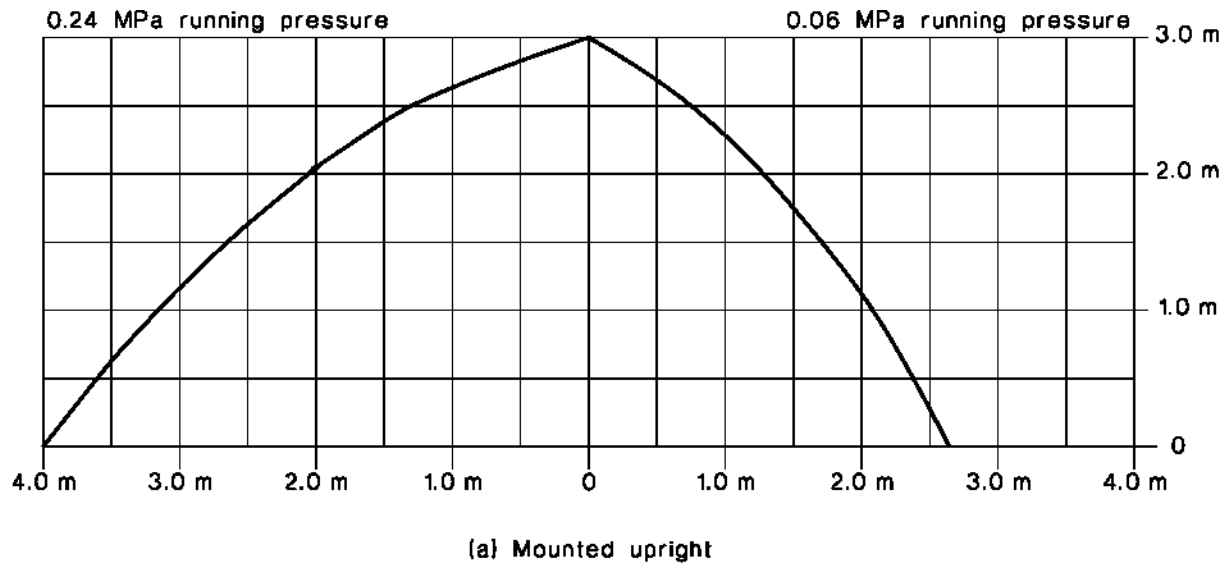


FIGURE 2.2.2 TYPICAL WATER DISTRIBUTION FOR SPRAY SPRINKLER

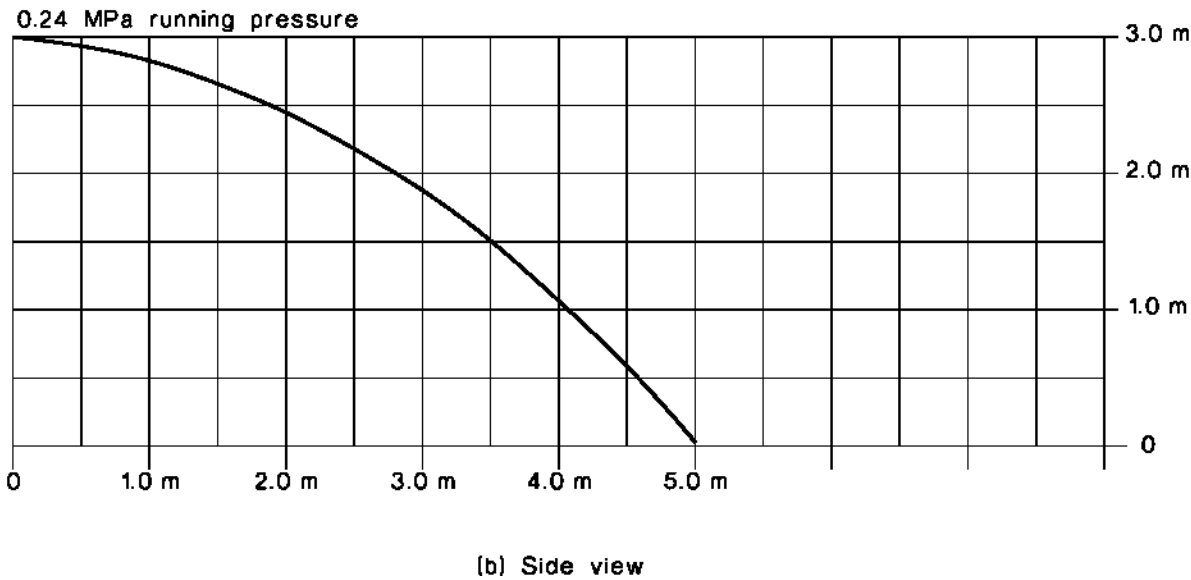
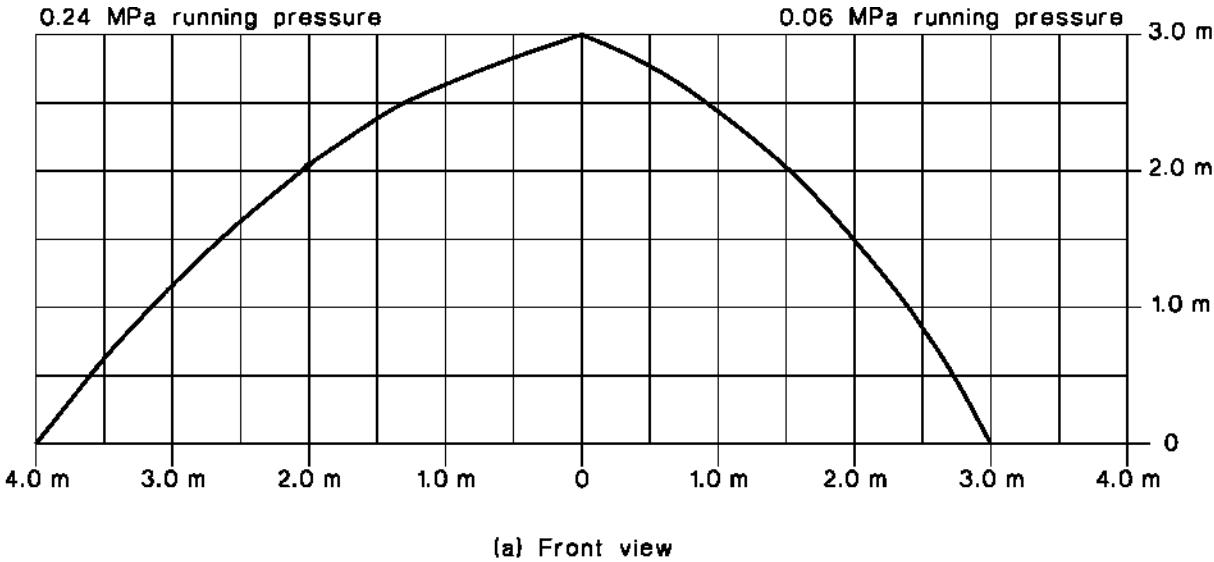
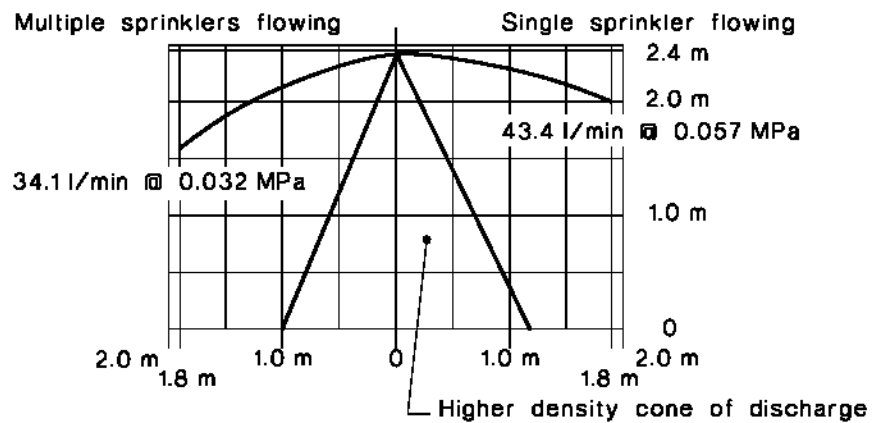
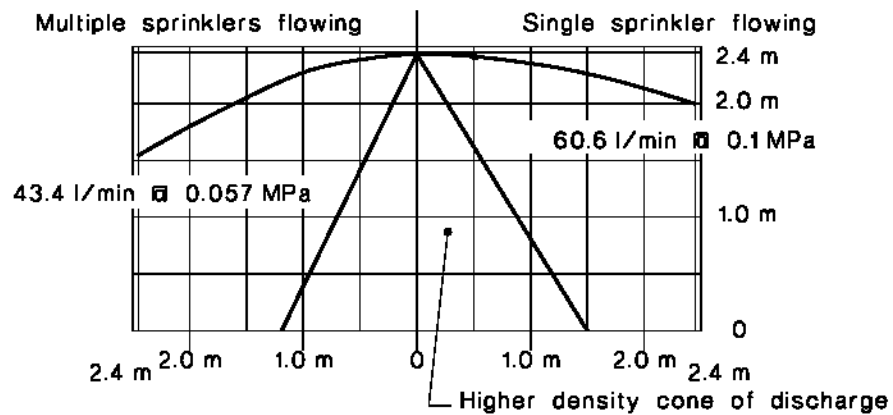


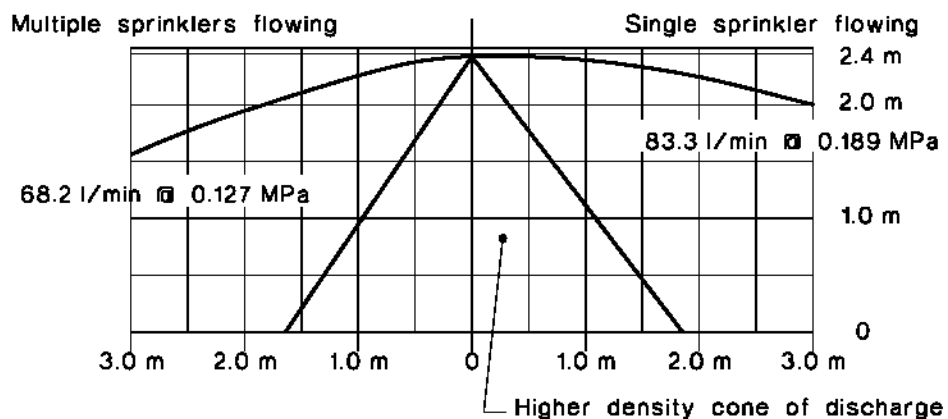
FIGURE 2.2.3 TYPICAL WATER DISTRIBUTION FOR SIDEWALL SPRINKLER MOUNTED UPRIGHT OR PENDENT



(a) 3.6 x 3.6 m enclosure



(b) 4.8 x 4.8 m enclosure



(c) 6.0 x 6.0 m enclosure

FIGURE 2.2.4 TYPICAL WATER DISTRIBUTION FOR RESIDENTIAL SPRINKLER MOUNTED PENDENT

2.3 TYPE OF SPRINKLER ACCORDING TO MOUNTING POSITION

2.3.1 Upright sprinkler A sprinkler that is arranged in such a way that the water stream is directed upwards against the deflector plate.

Abbreviation: U

2.3.2 Pendent sprinkler A sprinkler that is arranged in such a way that the water stream is directed downwards against the deflector plate.

Abbreviation: P

2.3.3 Horizontal sprinkler A sprinkler that is arranged in such a way that the water stream is directed horizontally against the deflector plate.

Abbreviation: H

2.4 SPECIAL TYPES OF SPRINKLER

2.4.1 Dry sprinkler A sprinkler that incorporates a special supply pipe which is kept free from water.

Abbreviation: D

2.4.2 Flush sprinkler A sprinkler of which all or part of the body, including the shank thread, is mounted above the lower plane of the ceiling, but of which part or all of the heat responsive element is below the lower plane of the ceiling.

Abbreviation: L

2.4.3 Recessed sprinkler A sprinkler and housing combination in which part of the body of the sprinkler, other than the shank thread, is mounted within the recessed housing.

Abbreviation: R

2.4.4 Concealed sprinkler A fully-recessed sprinkler and cover plate assembly with the cover plate designed to release at or before the operating temperature of the sprinkler.

Abbreviation: CC

2.4.5 On-off sprinkler A sprinkler which automatically opens and closes at predetermined temperatures.

Abbreviation: OO

2.4.6 Fast-response sprinkler A type of sprinkler that has a high level of thermal sensitivity, enabling it to respond at an early stage of fire development.

2.4.7 Residential sprinkler A type of fast-response sprinkler specifically developed for use against the type of fire hazards typically found in residential occupancies, and having a specific spray pattern.

2.4.8 Extended coverage sprinkler A type of spray sprinkler specifically developed with an extended protection area.

Abbreviation: EC

2.4.9 Large drop sprinkler A type of sprinkler developed to produce large water droplets for use in controlling specific high challenge fires.

Abbreviation: LD

2.4.10 Early suppression fast-response A type of fast-response sprinkler developed for its capability to provide fire suppression for specific high challenge fires.

Abbreviation: ESFR

2.4.11 Large orifice and extra large orifice Types of sprinkler with orifices of increased size to permit high flow rates.

Abbreviation: LO, ELO

2.4.12 Quick response sprinkler A type of sprinkler that is both a fast-response and a spray sprinkler.

Abbreviation: QR

SECTION 3 REQUIREMENTS

3.1 DIMENSIONS Sprinklers shall comply with the dimensional requirements given in Table 3.1 and shall be marked in accordance with Section 5.

TABLE 3.1
DIMENSIONAL REQUIREMENTS

Nominal diameter of orifice	Nominal thread size
mm	mm
10	10
15	15
20	20

Sprinklers shall be constructed so that a sphere of diameter 8 mm can pass through each water passage in the sprinkler.

3.2 UPGRADING OF SPRINKLER INSTALLATIONS Sprinklers having a nominal 20 mm diameter orifice and a nominal 15 mm shank, fitted with a metal rod extension (pintle), may be used for upgrading the density requirements of existing installations.

3.3 NOMINAL RELEASE TEMPERATURES The nominal release temperatures of sprinklers shall be as indicated in Table 3.2 and the operating temperatures shall be within the ranges specified in Table 3.3. They shall be determined as a result of the nominal release temperature test (see Clause 4.6).

The nominal release temperatures of sprinklers shall be specified in advance by the manufacturer and verified in accordance with this Clause.

TABLE 3.2
NOMINAL RELEASE TEMPERATURES

Temperatures °C			
Frangible glass bulb sprinkler		Metallic element sprinkler	
Nominal release temperature	Liquid colour code	Nominal release temperature	Yoke arm colour code
57	Orange	68 to 74	Uncoloured
68	Red	93 to 100	White
79	Yellow	141	Blue
93	Green	182	Yellow
141	Blue	227	Red
182	Mauve		
204 to 260	Black		

3.4 OPERATING TEMPERATURES

3.4.1 Metallic element sprinklers Metallic element sprinklers shall open within a temperature range of:

$$\chi \pm (0.035\chi + 0.62)^{\circ}\text{C}$$

where χ is the nominal release temperature.

3.4.2 Frangible glass bulb sprinklers All frangible glass bulb sprinklers shall open within the temperature range specified in Table 3.3 (according to the nominal release temperature).

TABLE 3.3
FRANGIBLE GLASS BULB OPERATING TEMPERATURE RANGES

Frangible glass bulb nominal release temperature	Lowest operating temperature	Temperatures °C Temperature at, or below, which		
		25 of the 50 specimens operate	40 of the 50 specimens operate	50 of the 50 specimens operate
57	54	63	68	74
68	65	74	79	86
79	76	87	92	99
93	90	101	106	113
141	138	149	155	163
182	179	190	196	206
227	224	235	242	252

3.5 WATER FLOW AND DISTRIBUTION

3.5.1 Flow constant The flow constant, K , for sprinklers is given by the formula —

$$K = \frac{q_v}{\sqrt{p}} \quad \dots (2)$$

where

p = is the pressure, in kPa

q_v = is the flow rate, in L/min.

K shall have the values given in Table 3.4 when determined by the test method of Clause 4.10.

3.5.2 Water distribution To demonstrate the required coverage of the protected area allotted to it, the sprinkler shall pass the test specified in Clause 4.11.

TABLE 3.4
FLOW CONSTANT

Nominal diameter of orifice mm	K	K for dry sprinklers
10	57 ±3	57 ±5
15	80 ±4	80 ±6
20	115 ±6	115 ±9

3.6 FUNCTION

3.6.1 Release temperatures When tested in accordance with Clause 4.5, the sprinkler shall open and not more than 5 s after the release of the heat responsive element, shall operate satisfactorily by complying with the requirement of Clause 3.5.1. Any lodgement (see Clause 4.5.5) of released parts shall be cleared within 60 s of the release of the heat responsive element.