

# LICENCE

for

**DR AS 2118.1:2017 Amd 2:2019, Amendment 2 to AS 2118.1:2017 — Automatic fire sprinkler systems**



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# Draft

## Australian Standard™

Public Comment is invited for:

### **DR AS 2118.1:2017 Amd 2:2019, Amendment 2 to AS 2118.1:2017 — Automatic fire sprinkler systems**

#### **Part 1: General systems**

Public comment period:

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Please provide supporting reasons and suggested wording for each comment. Where you consider that specific content is too simplistic, too complex or too detailed please provide an alternative.

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# STANDARDS AUSTRALIA

Committee FP-004—Automatic Sprinkler Installations

**Draft**

**Australian Standard**

DR AS 2118.1:2017 Amd 2:2019, Amendment 2 to AS 2118.1:2017 —  
Automatic fire sprinkler systems

Part 1: General systems

This document is a draft Australian Standard only and is liable to alteration. It is not to be regarded as an Australian Standard until finally published as such by Standards Australia.

Upon successful conclusion of the Public Comment period, it is proposed to publish this as AS 2118.1:2017 Amd 2:2019.

STANDARDS AUSTRALIA

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**Amendment No. 2**  
to  
**AS 2118.1:2017**  
**Automatic fire sprinkler systems**  
**Part 1: General systems**

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**REVISED TEXT**

The 2017 edition of AS 2118.1 is amended as follows; the amendment(s) should be inserted in the appropriate place(s).

*SUMMARY:* This Amendment applies to Clauses 1.3.32, 1.3.37, 1.3.38, 1.3.40, 1.3.41, 2.2, 2.3.1.5, 3.1.1, 3.2.2, 3.2.4, 3.2.6, 3.3.2.2, 3.4, 4.3.1, 5.5.2, 5.7.7, 5.7.11.2, 5.8.1, 5.8.2, 5.8.3, 5.9.10, 5.9.17, 5.9.21 (new), 6.2, 7.6, 7.8.4.2, 7.8.4.3, 7.8.4.8 (new), 8.1.1, 8.1.3 (new), 8.1.4 (new), 8.2.2, 8.10.1, 8.10.2, 8.13.3, 9.4.1, 9.4.5, 9.5.2, 10.4.1, 10.6.2.3, 10.7 (new), 11.2.18, 11.3.6, 11.5.1.2, 11.5.1.5.3, 11.5.1.7, 11.5.1.9, 11.5.1.11, 11.5.1.12, 11.5.1.13, 11.5.1.19.4, 11.5.1.20.3, 11.5.1.21, 11.5.1.22, 11.5.2.4, 11.5.2.7.2, 11.5.2.9, 11.5.2.9.4, 11.5.2.10 (new), 11.6.1, 11.6.7.3.2, 11.6.7.3.3, 11.6.7.3.4, 11.6.8, 11.7 (new), 12.1.4, 12.1.5.6, 12.1.5.8, 12.2.10, 12.4.5.1, 12.4.7, 12.4.9, 12.4.11.2, 12.4.11.4, 12.6.6.6, 12.6.6.8.2, 12.6.9, 13.5.5.5.1, 13.5.7.2, 13.5.7.3, 13.5.7.4, 13.5.7.5 and Paragraph A4.1, Appendix A.

Tables 3.2.4(A), 3.2.4(B), 6.3, 7.8.4.3 (new), 7.8.4.8 (new), 10.2.3, 11.3.4.3, 11.5.1.4, 11.5.1.5.2, 11.5.2.10(A) (new), 11.5.2.10(B) (new), 11.6.3(A) through 11.6.3(J), 11.6.9, 11.7.3.2(A) through 11.7.3.2(C) (new), 11.7.3.3.3.1 (new), 11.7.3.4.4 (new), 11.7.3.4.5 (new), 11.7.3.4.6(A) (new), 11.7.3.4.6(B) (new), 11.7.4 (new), 12.1.5.3(A), 12.1.5.3(C), 12.1.5.3(D), 12.2.14.1, 12.2.15.1, 12.2.16.1, 12.4.10.3(A), 12.4.10.3(B), 12.5.3, 12.6.6.4(A) through 12.6.6.4(F), 13.5.5.1, 13.5.5.2(A), 13.5.5.2(B), 13.5.5.3(A), 13.5.5.3(B), 13.5.5.4(A) through 13.5.5.4(D), 13.5.5.5.1(A), 13.5.5.6, 13.5.5.7(A) through 13.5.5.7(E).

Figures 3.2.4(A) through 3.2.4(C), 5.9.10, 8.13.2, 11.5.1.5.3(C), 11.5.1.12, 11.5.1.13(A), 11.5.1.13(B), 11.5.2.10(A) through 11.5.2.10(F) (new), 11.7.3.3.3.2(A) (new), 11.7.3.3.3.3(A) through 11.7.3.3.3.3(D) (new), 11.7.3.3.3.4(A) through 11.7.3.3.3.4(D) (new), 13.5.6(J), 13.5.6(K).

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**Clause 1.3.32**

Third line, *delete* ‘retractors deflectors’ and *replace* with ‘retracted deflector’.

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**Clause 1.3.37**

1 After first line, *add* the following:

There are two main variants of sidewall sprinkler:

- (a) Vertical sidewall; suitable for use in two positions:
  - (i) Pendent; suitable for use in the pendant position.
  - (ii) Upright; suitable for use in the upright position.
- (b) Horizontal sidewall; suitable for use in the horizontal position, usually extending through and fitted off a vertical wall surface.

2 *Delete* Note 2 and renumber Note 3 as Note 2.

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**Clause 1.3.38**

1 After second line, *add* the following:

There are two variants of the spray sprinkler:

- (a) Spray pendant; suitable for use in the pendant position.

- (b) Spray upright; suitable for use in the upright position.

2 Delete Note.

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#### Clause 1.3.40

Delete list Item (d) and *replace* with the following:

- (d) *Pre-action system* A combination of a sprinkler system that is permanently charged with air or inert gas above the alarm valve and an independent fire detection system installed throughout the same area.

NOTE: Operation of detectors allows the pre-action alarm valve to open and water to flow into the sprinkler piping, although this water flow can be controlled in various ways depending on how the pre-action sprinkler system is configured.

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#### Clause 1.3.41

Delete clause including note and *replace* with the following:

##### 1.3.41 Sprinkler thermal sensitivity

Sensitivity as a measure of response as follows:

- (a) *Standard response* A sprinkler assembly with a response time index (RTI) greater than  $80 \text{ (m.s)}^{0.5}$  up to  $350 \text{ (m.s)}^{0.5}$  and a conductivity factor (C) not exceeding  $2.0 \text{ (m/s)}^{0.5}$ .
- (b) *Quick response* A sprinkler assembly with a response time index (RTI) of  $50 \text{ (m.s)}^{0.5}$  or less and a conductivity factor (C) of  $1.0 \text{ (m/s)}^{0.5}$  or less with specific design and installation requirements as established by its listing and specified by its data sheet.

NOTE: There are sprinkler assemblies that are termed 'special response' with  $50 < \text{RTI} < 80$ ; however, there are no applications within this Standard that call for them to be used and hence these sprinkler assemblies shall be treated the same as standard response.

**C1.3.41** *Thermal sensitivity is a measure of how quickly the thermal (heat responsive) element of a sprinkler assembly reaches the temperature at which it actuates (operating temperature). Many other factors such as ceiling height, spacing, ambient temperature and distance below ceiling, affect the time of response of sprinklers.*

*The RTI (response time index) is a measure of the sprinkler thermal sensitivity established under laboratory conditions through testing.*

*The conductivity factor (C), is a measure of the heat conductance between the thermal (heat responsive) element of a sprinkler and the sprinkler assembly.*

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#### Clause 2.2

After the first paragraph, *add* the following:

**C2.2** *Occupancy classifications define the minimum required level of protection. This Standard recognizes that it is acceptable to provide higher levels of protection than those specified. For example, an Ordinary Hazard or High Hazard system installed in a ceiling space exceeds the Light Hazard requirements and is considered acceptable.*

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**Clause 2.3.1.5**

Delete clause text and *replace* with the following:

**2.3.1.5.1 General**

Where a pre-action sprinkler system is installed, the following shall apply:

- (a) The floor area controlled by one sprinkler control assembly shall not exceed that prescribed in Clause 2.3.1.2 for wet systems.
- (b) The pre-action valve (see Clause 8.12.2) shall be provided with means of manual operation that is independent of the detection system and the sprinklers.
- (c) Where protecting areas exceeding 200 m<sup>2</sup>, the system shall be permanently charged above the alarm valve with air or inert gas under pressure.
- (d) Where protecting areas up to 200 m<sup>2</sup> the system may remain dry with air at atmospheric pressure above the alarm valve.
- (e) A fire detection system shall be installed throughout the protected area according to the requirements of Clause 2.3.1.5.3.
- (f) Operation of the pre-action fire detection system shall initiate an audible alarm at the FDCIE.
- (f) Loss of pressure in the pre-action system shall initiate an audible alarm at the FDCIE.
- (g) The water transit time from valve trip to discharge of water at the most remote sprinkler shall not exceed 60 seconds.
- (h) The piping shall be galvanized and installed in accordance with the requirements of Clause 7.5.2.
- (i) Where installed in areas subject to freezing, upright sprinklers shall be installed above the line of pipe or listed dry sprinklers shall be installed.
- (j) Grooved couplings shall be listed for use on dry pipe installations.

**2.3.1.5.2 Pre-action sprinkler system configurations**

A pre-action sprinkler system shall be arranged so that piping downstream of the pre-action valve is charged with water by one of the following alternatives:

- (a) *Non-interlock*—Where either a fire detection system, complying with Clause 2.3.1.5.3, activates or a sprinkler activates.  
*or*
- (b) *Single-interlock*—Only where a fire detection system, complying with Clause 2.3.1.5.3, activates.  
*or*
- (c) *Double-interlock*—Only where both a fire detection system, complying with Clause 2.3.1.5.3, activates and a sprinkler activates.

**C2.3.1.5.2** *The different configurations of pre-action systems suit different applications:*

- (a) *A non-interlock system is essentially a dry-pipe sprinkler system that may be pre-charged should the fire detection system activate before a sprinkler activates, but it will not prevent pipework being charged should a sprinkler activate.*
- (b) *A single-interlock system becomes a wet system following operation of the fire detection system. The objective being to prevent a discharge of water from piping or sprinklers that may have suffered mechanical damage.*
- (c) *A double-interlock system offers the greatest safeguard against inadvertent water discharge by requiring that both the sprinkler system and the fire detection system be activated before water is admitted to the installation piping.*

### 2.3.1.5.3 *Pre-action detection system*

The pre-action system shall utilize a fire detection system installed throughout the protected area, except where electrical supply is to be avoided and pilot sprinklers are installed, in accordance with the following:

- (a) The fire detection system shall—
  - (i) conform to all applicable aspects of AS 1670.1;
  - (ii) automatically initiate an alarm on the FDCIE;
  - (iii) have thermal detectors installed with lower activating temperature than the pre-action sprinklers; and
  - (iv) operate a solenoid valve, or trip mechanism, to release the pre-action alarm valve. The solenoid valve wiring system elements shall be rated as WS5XW as defined in AS/NZS 3013 and supervised for faults that prevent the transmission of signals on any path to the FDCIE in accordance with Clause 3.5 when the solenoid is not continuously energized as ‘fail-safe’, that is, set to release when de-energized.
- (b) The pilot sprinklers shall—
  - (i) be fitted to piping charged with air or water;
  - (ii) located according to the requirements for the hazard;
  - (iii) automatically initiate an alarm on the FDCIE;
  - (iv) have sprinklers with lower activating temperature than the pre-action sprinklers; and
  - (v) operate a trip mechanism to release the pre-action alarm valve.

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#### **Clause 3.1.1**

Paragraph 2, line 1, after ‘non-fire-separated’ *add* ‘roofed area,’.

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#### **Clause 3.2.2**

*Delete* clause text and *replace* with the following:

All sealed sprinklers used for exposure protection shall—

- (a) be rated as quick response, as defined in AS 4118.1.1;
- (b) have a temperature rating of 68°C;
- (c) be 15 mm or  $K_m8.0$  nominal size sprinklers; or



- (d) be of a type where the thermal element is visible (directly exposed) to the radiant heat source and not shielded by the body or arms of the sprinkler.

Sprinklers shall be any of the following types and orientation:

- (i) *Pendant or upright sidewall (WP)*—mounted vertically with the deflector pointing towards the window or wall (spray directed at the window or wall).
- (ii) Sprinklers specifically designed for the purpose (e.g. window protection).

NOTE: Sprinklers specifically designed for the purpose are designed and installed in accordance with their listings and data sheets.

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#### Clause 3.2.4

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- 1 Second paragraph, line 2, *delete* ‘1.25 m’ and *replace* with ‘half the design spacing’.
- 2 Third paragraph, line 4, *delete* ‘1.25 m’ and *replace* with ‘half the design spacing’.
- 3 After the fourth paragraph, *add* the following:

Where exposure sprinklers are installed as drenchers for internal glass walls and obstruct swing opening doors, only the obstructing sprinklers may be installed at the ceiling with standard escutcheons or semi-recessed escutcheons, provided the sensing element is directly exposed to the radiant heat source.

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#### Table 3.2.4(A)

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- 1 Column 3, row 1, after ‘2.5 m’ *add* ‘for windows. 3.0 m for walls’.
- 2 Column 3, row 2, *delete* ‘4.0’ and *replace* with ‘4.6’.

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#### Table 3.2.4(B)

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*Delete* table and *replace* with the following:

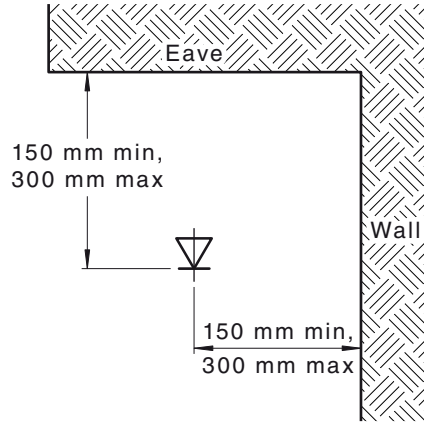
Orientation	Measured	Measurement, mm		Point of measurement
		Max.	Min.	
WP vertical (spray towards wall)	Vertically below top of eave or overhang	200	150	Centre of sprinkler
WP vertical (spray towards wall)	Horizontal from wall	300	150	Sprinkler deflector
Sprinklers specifically designed for window protection	Per their listing and data sheet	—	—	

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**Figure 3.2.4(A)**

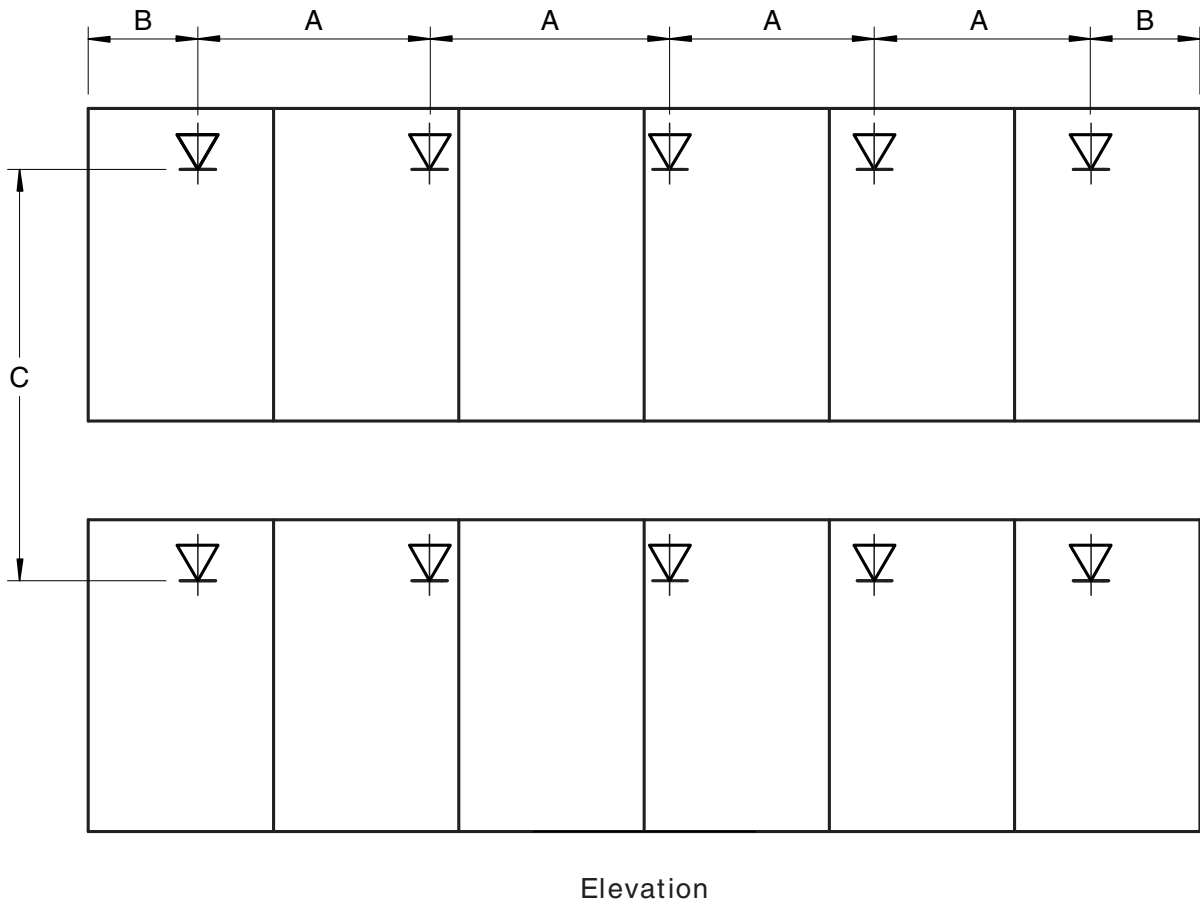
Delete figure and replace with the following:



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**Figure 3.2.4(B)**

Delete figure and replace with the following:



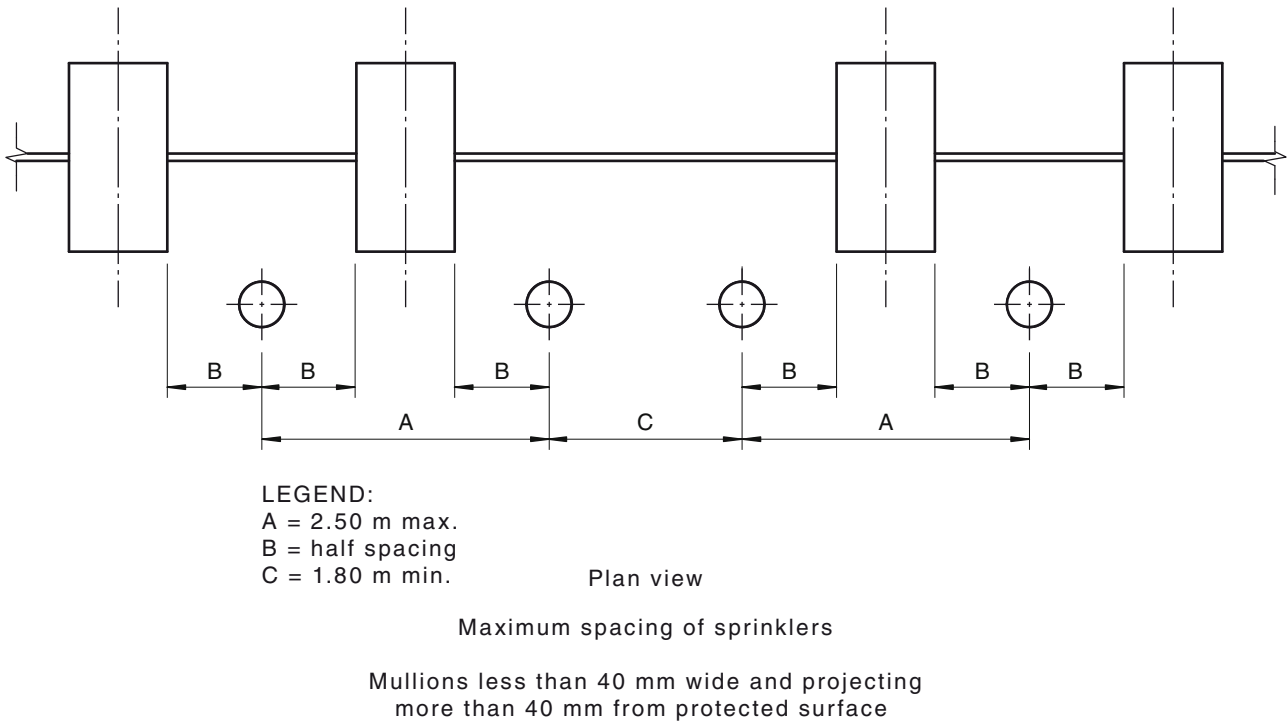
**LEGEND:**

- A = 2.50 m max. and 1.80 min.
- B = half spacing
- C = 4.60 m max.

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**Figure 3.2.4(C)**

Delete figure and replace with the following:



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**Clause 3.2.6**

Paragraph 2, line 2, delete ‘subject to a minimum end head pressure of 70 kPa’ and replace with ‘but no less than 50 L/min’.

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**Clause 3.3.2.2**

Delete “and each is fitted with a manually resettable ‘system operated’ indicating device,”.

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**Clause 3.4**

- 1 At the end of line 1, add the following:  
 Where alarm valves are grouped, an externally mounted alarm indicator shall serve all installations in any one location (see also Clauses 8.1.1 and 8.13.3).
- 2 Delete Notes and replace with the following:  
 NOTE: Acceptable types of alarm indicator are as follows:
  - (a) An audible warning device.
  - (b) A water motor alarm in accordance with AS 4118.1.3.

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**Clause 4.3.1**

In list Item (e), line 3, delete ‘applying’ and replace with ‘supplying’.

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**Clause 5.5.2**

Delete Paragraph 3.

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**Clause 5.7.7**

*Delete* Item (d) and *replace* with the following:

- (d) in other cases, 500 mm, except in rooms not higher than 3 m where—
- (i) bookcases, cupboards and moveable furniture may be positioned against a wall, provided sprinklers are not located directly above the furniture and are spaced to spray to the wall; and
  - (ii) bookcases, cupboards and other moveable furniture may be positioned within a room, provided sprinklers are not located directly above the furniture and sprinklers are positioned on either side of the furniture within half the design spacing.
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**Clause 5.7.11.2**

In list Item (f), *delete* 'Fast' and *replace* with 'Quick'.

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**Clause 5.8.1**

1 *Delete* first sentence and *replace* with the following:

Concealed spaces between ceilings and roofs or floors above, and below false floors, shall be fitted with sprinklers.

2 *Delete* second paragraph and list and *replace* with:

- (c) Concealed spaces exceeding 200 mm but not greater than 800 mm in depth and not qualifying under Clause 5.8.1(b). These spaces shall be fitted with—
- (i) fire and draft stops provided at intervals not exceeding 15 m in each direction; or
  - (ii) as a minimum, 42 m<sup>2</sup> skeleton spacing of quick response Light Hazard spray sprinklers spaced at maximum of 6.0 m × 7.0 m.
- (d) Any space exceeding 200 mm in depth not requiring protection and which contains electrical motors (including ceiling exhaust fans), electric heating coils or other heat-producing equipment, or ducting from heat producing equipment, e.g. clothes dryers. These spaces shall have a sprinkler installed within 1.5 m of such equipment.
- (e) Where heat producing equipment discharges into the ceiling space. In this case, a sprinkler shall be installed adjacent to the discharge within the concealed space.
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**Clause 5.8.2**

*Delete* second and third paragraphs.

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**Clause 5.8.3**

1 First paragraph, line 1 after 'shall be' *add* 'a minimum,'.

2 After first paragraph, *add* the following:

Sprinklers shall be a minimum 15 mm or  $K_m 8.0$  nominal size sprinklers to a maximum coverage of 21 m<sup>2</sup> per sprinkler and spaced not more than 4.8 m apart and not more than 2.4 m from compartmental boundaries.

Any space not requiring protection and which contains electrical motors, electric heating coils or other heat-producing equipment shall have a sprinkler installed within 1.5 m of such equipment.

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**Clause 5.9.10**

Delete Paragraph 1 and *replace* with the following:

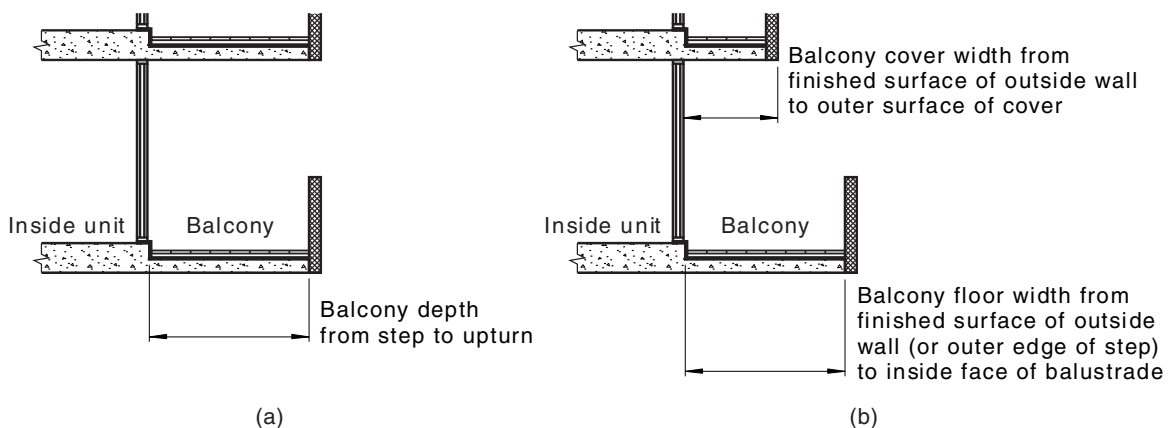
Where all of the following cases apply, a covered balcony shall be sprinkler protected throughout the covered area:

- (a) The balcony (covered and part uncovered) exceeds either the floor area in Item (i) or depth defined in Item (ii):
  - (i) 6 m<sup>2</sup> floor area measured within the finished surface of the external wall—
    - (A) to the internal surface of the step for the balustrade(s); or
    - (B) where a step is not provided, to the nearest part of the balustrade.
  - (ii) A depth of more than 2 m measured perpendicularly from the finished surface of the external wall—
    - (A) to the internal surface of the step for the balustrade(s); or
    - (B) where a step is not provided, to the nearest part of the balustrade.
- (b) A roof overhang, balcony cover, or the like is located less than 4 m above the finished floor level of the balcony.
- (c) The roof overhang, balcony cover, or the like is greater than—
  - (i) 300 mm in depth if constructed of combustible material as defined by the NCC; or
  - (ii) 800 mm in all other cases.

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**Figure 5.9.10**

Delete Figure 5.9.10 and *replace* with the following:



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**Clause 5.9.17**

1 Delete clause title and *replace* with the following:

**Cupboards and wardrobes, showers and toilet cubicles**

- 2 *Delete* introductory sentence and *replace* with the following:  
 Sprinklers are not required within built-in service cupboards, cupboards and wardrobes, or shower and toilet cubicles in protected bathrooms, for Light Hazard and Ordinary Hazard occupancies, provided—
- 3 In list Item (b), after ‘are lined’ *add* ‘or backed’.
- 4 *Delete* list Item (d) and *replace* with the following:  
 (d) sprinklers in the adjoining area are positioned such that they would cover the unprotected area. Obstructions caused by lintels or bulkheads are not considered in this case.

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### Clause 5.9.21 (new)

After Clause 5.9.20.2, *add* the following:

#### 5.9.21 Impulse (jet) fans

Where impulse (jet) fans are installed in sprinkler protected buildings, the following shall apply:

- (a) The impulse (jet) fan outlet shall be located such that the direction of air flow is centred between sprinklers for a distance not less than 9 m.
- (b) The impulse (jet) fans shall be arranged to shut down on activation of the sprinkler system or detection system in a fire situation.

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### Clause 6.2

- 1 From list Item (k), *delete* the following:  
 , non-storage sprinklers or special protection sprinklers, identified by *K* factors, other than extended coverage and large drop sprinklers.
- 2 After list Item (n), *add* the following:  
 (o) Medium- and high-velocity sprayers.
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AMDT  
No. 2**Table 6.3***Delete table and notes and replace with the following:*

	<b>K factor</b> $K = Q/\sqrt{P}$ (see Note 1)	<b>Minimum characteristics</b>	
		<b>Flow</b> L/min	<b>Pressure</b> kPa
Light Hazard Standard coverage sprinkler	≥8.0	(See Note 2)	70
Residential or extended coverage sprinkler	As determined and selected by hydraulic analysis	(See Note 4)	(See Note 3)
Ordinary Hazard Standard coverage sprinkler	≥8.0	>60	(See Note 3)
Extended coverage sprinkler	As determined and selected by hydraulic analysis	(See Note 4)	(See Note 3)
High Hazard	As determined and selected by hydraulic analysis but not less than 8.0 ±5%	(See Note 5)	(See Note 5)

## NOTES:

- 1 For sprinkler *K* factor, see Clause 1.3.14.
- 2 Flow as determined by pressure.
- 3 Pressure corresponding to flow and *K* factor and subject to minimum pressure as per the data sheet.
- 4 See Clause 9.2 for Light Hazard design data and 10.2 for Ordinary Hazard design data.
- 5 See Sections 11, 12 and 13 for design data.

AMDT  
No. 2**Clause 7.6***Delete list Item (a) and replace with the following:*

- (a) The size shall be a minimum 25 mm ID (internal diameter).

AMDT  
No. 2**Clause 7.8.4.2**

- 1 In clause title, after 'U-bolts', *add* 'and bolts'.
- 2 Paragraph 1, line 1, after 'U-bolts', *add* 'and bolts'.
- 3 In table heading, after 'U-BOLTS', *add* 'AND BOLTS'.

AMDT  
No. 2**Clause 7.8.4.3 and Table 7.8.4.3***Delete entire clause including Table 7.8.4.3 and replace with the following:***7.8.4.3 U-bolts and rods clamping up, bolts and studs**

U-bolts and rods clamping up, bolts and studs shall be in accordance with the dimensions given in Table 7.8.4.3.

**TABLE 7.8.4.3**  
**U-BOLTS AND ROD CLAMPING UP,**  
**BOLTS AND STUDS**

Pipe size	Minimum nominal diameter of material, mm
≤DN 50	8
>DN 50 ≤DN 150	12
>DN 150 ≤DN 250	15
>DN 250 ≤DN 350	20

NOTE: Bolts that clamp down pipe support components may be sized in accordance with Clause 7.8.4.2.

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**Clause 7.8.4.8 and Table 7.8.4.8 (new)**

After Clause 7.8.4.7, *add* the following:

**7.8.4.8 Threaded rod**

**7.8.4.8.1 Threaded rod in suspension**

Threaded rod used in suspension shall be in accordance with the dimensions given in Table 7.8.4.8.

**TABLE 7.8.4.8**  
**THREADED ROD USED IN SUSPENSION**

Pipe size	Minimum nominal diameter of rod, mm
≤DN 100	10
>DN 100 ≤DN 200	12
>DN 250 ≤DN 300	16

**7.8.4.8.2 Threaded rod in other orientations**

Where a threaded rod is used to transmit the load of a pipe support assembly in any mode other than in suspension:

- (a) The pipe shall be ≤DN 50.
- (b) The rod shall be no longer than 150 mm in length (see Note 2).

NOTES:

- 1 Fasteners, including bolts and screws, used in conjunction with pipe support components are not considered single rods and therefore need not conform to this Clause.
- 2 Specified rod length is that which is exposed only. It does not include the rod length engaged within its receiving support element.

AMDT  
No. 2

**Clause 8.1.1**

After list Item (l), *add* the following:

- (m) Where installations are grouped, a manually resettable ‘system operated’ indicating device (pop up) (see Clause 3.3.2.2).



---

AMDT  
No. 2

**Clauses 8.1.3 and 8.1.4 (new)**

After Clause 8.1.2, *add* the following:

**8.1.3 Control assembly accessibility and clearance**

A clear space shall be provided immediately in front of the control assembly and shall be no less than 1 m deep. The space shall remain completely unobstructed spanning the width of all serviceable and visually indicating control assembly components.

**8.1.4 Component accessibility and clearance**

Operable, serviceable and visually indicating components, including ball valves, strainers, gauges, valve position indicators and the like, shall have a clear area around the component of no less than 75 mm in all directions and be visually unobstructed as viewed from the front of the assembly.

NOTE: It is important that the visibility of indicating components and valves remains unobstructed, so equipment is less likely to be inadvertently left in the wrong condition.

---

AMDT  
No. 2

**Clause 8.2.2**

At the end of the first paragraph, *add* the following:

The main stop valve's hand wheel height shall be not less than 600 mm above the floor.

---

AMDT  
No. 2

**Clause 8.10.1**

At the end of the first paragraph, *add* the following:

Alarm valves (wet) shall be installed such that any serviceable part is not higher than 1400 mm from the floor. The alarm valve face shall be oriented toward the clear space in front of the control assembly.

---

AMDT  
No. 2

**Clause 8.10.2**

At the end of the first paragraph, *add* the following:

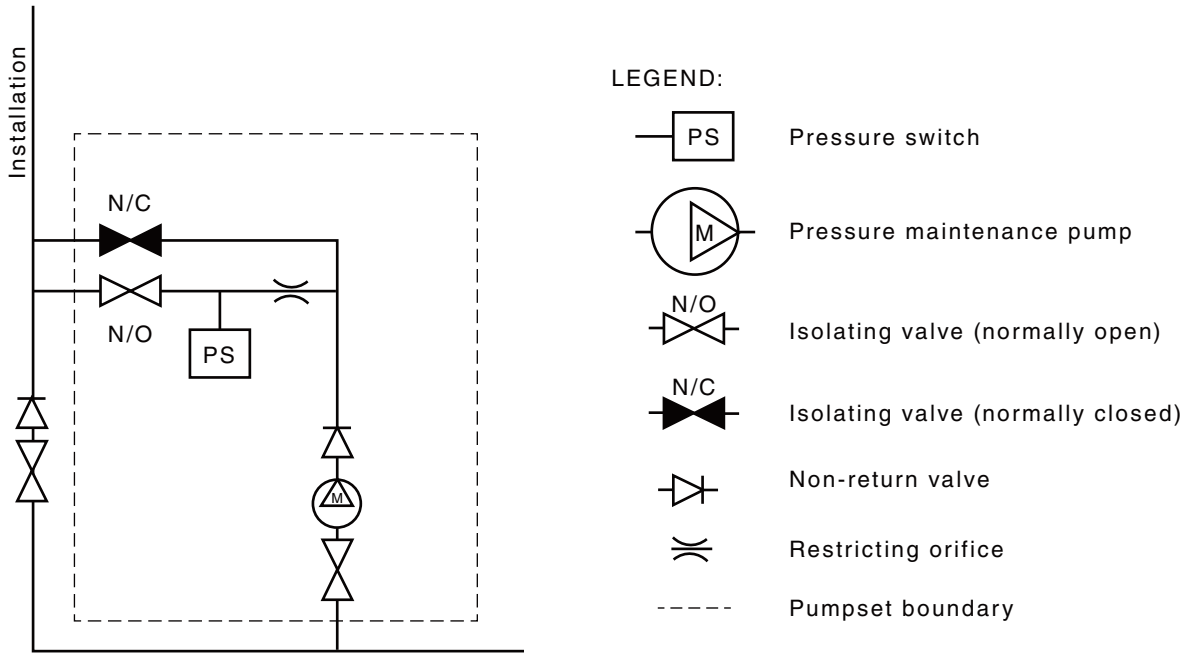
Alarm valves (dry) shall be installed such that any serviceable part is not higher than 1400 mm from the floor. The alarm valve face shall be oriented toward the clear space in front of the control assembly.

---

AMDT No. 2

**Figure 8.13.2**

Delete the figure and replace with the following:



AMDT No. 2

**Clause 8.13.3**

Delete clause title and replace with ‘Local alarms’.

AMDT No. 2

**Clause 9.4.1**

- 1 List Item (b), delete ‘fast’ and replace with ‘quick’.
- 2 List Item (d), delete ‘, be quick response’ and replace with ‘and residential sprinklers, be installed in a manner to maintain their quick response rating’.

AMDT No. 2

**Clause 9.4.5**

- 1 Under the main clause title add ‘9.4.5.1 General’.
- 2 From the introductory sentence delete ‘shall be installed in accordance with the requirements of AS 2118.4 and’.
- 3 Renumber Clause 9.4.5.1 as 9.4.5.2.

AMDT No. 2

**Clause 9.5.2**

Delete Paragraph 2 and replace with the following:

The pipe sizes shall be a minimum of DN 25, except—

- (a) where a pipe supplies a single sprinkler protecting an external balcony, canopy or carport, or supplies a single exposure sprinkler, a minimum of DN 20 may be used; or
- (b) 15 mm adaptors are permitted providing they have been allowed for in the hydraulic calculation and are used for an adjustment of no greater than 50 mm.

AMDT  
No. 2

---

### Table 10.2.3

Delete column 6 from table.

---

AMDT  
No. 2

### Clause 10.4.1

- 1 List Item (b), *delete* ‘fast’ and *replace* with ‘quick’.
  - 2 Paragraph 2, line 2, *delete* ‘fast’ and *replace* with ‘quick’.
  - 3 Paragraph 2, line 2, *delete* ‘, special response’.
- 

AMDT  
No. 2

### Clause 10.6.2.3

List Item (b), *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2

### Clause 10.7 (new)

After Figure 10.6.2.2.4, *add* the following:

## 10.7 INCIDENTAL RESIDENTIAL STORAGE FOR CLASS 2 OR 3 BUILDINGS

### 10.7.1 General

The provisions in this Clause define the hazard classifications that shall be used as the basis of the sprinkler system design for incidental storage related to Class 2 and Class 3 (residential) building use.

*C10.7.1 Residential buildings may have incidental storage areas for individual apartment occupant use. Incidental storage areas are typically lockable cages in basement or carpark areas. This does not apply to storage for commercial occupancies.*

### 10.7.2 OH2 hazard classification

An OH2 hazard classification shall be applied to an incidental residential storage area where—

- (a) the storage area is not more than 100 m<sup>2</sup>; and
- (b) the storage height is not more than 2.6 m; and
- (c) a separation distance of not less than 2.4 m is provided between each incidental residential storage area.

### 10.7.3 OH3 hazard classification

Where the provisions of Clause 10.7.1 have not been met, an OH3 hazard classification shall be applied to the incidental residential storage area.

---

AMDT  
No. 2

### Clause 11.2.18

Commentary C11.2.18, second paragraph, fourth line, *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2

### Table 11.3.4.3

- 1 Table title, *delete* ‘OCCUPANCIES<sup>(Note 1)</sup>’ and *replace* with ‘OCCUPANCIES (see Notes 1 and 3)’.
- 2 Column 1, row 14, *add* the following to the end of the sentence:  
‘including plastics waste sorting and recycling’

- 3 After Note 2, *add* the following Note 3:
- 3 Water supply shall have a minimum duration of 90 minutes (see also Clause 11.6.6 for on-site water storage capacity).

AMDT  
No. 2**Clauses 11.3.6**

- 1 *Delete* list Item (b), including note, and *replace* with the following:
- (b) the height of the High Hazard storage area is not more than that specified in either Tables A4.2.2(A), A4.2.2(B) of Appendix A as applicable; and
- 2 At the end of clause, *add* the following:
- NOTE: For incidental residential storage in Class 2 or 3 buildings, refer to Clause 10.7.

AMDT  
No. 2**Clause 11.5.1.2**

Paragraph 3, line 1, *delete* ‘fast’ and *replace* with ‘quick’.

AMDT  
No. 2**Table 11.5.1.4**

Column 1, row 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

AMDT  
No. 2**Table 11.5.1.5.2**

*Delete* ‘Fast’ and *replace* with ‘Quick’ in all instances (including Note 2).

AMDT  
No. 2**Clause 11.5.1.5.3**

List Item (a), line 1, *delete* ‘Fast’ and *replace* with ‘Quick’ in both instances.

AMDT  
No. 2**Figure 11.5.1.5.3(C)**

Figure title, *delete* ‘FAST’ and *replace* with ‘QUICK’.

AMDT  
No. 2**Clause 11.5.1.7**

- 1 List Item (b)(ii), *delete* ‘Fast’ and *replace* with ‘Quick’.
- 2 List Item (b)(iii), *delete* ‘Fast’ and *replace* with ‘Quick’.

AMDT  
No. 2**Clause 11.5.1.9**

- 1 Paragraph 2, line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 2 Paragraph 2, line 3, *delete* ‘fast’ and *replace* with ‘quick’.
- 3 Paragraph 2, line 4, *delete* ‘fast’ and *replace* with ‘quick’.
- 4 List Item (b)(ii), *delete* ‘fast’ and *replace* with ‘quick’.

AMDT  
No. 2**Clause 11.5.1.11**

Paragraph 1, line 1, *delete* ‘fast’ and *replace* with ‘quick’.

AMDT  
No. 2**Clause 11.5.1.12**

List Item (b), line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

- 
- AMDT  
No. 2      **Figure 11.5.1.12**  
Figure title, *delete* 'FAST' and *replace* with 'QUICK'.
- 
- AMDT  
No. 2      **Clause 11.5.1.13**  
List Item (b), line 1, *delete* 'Fast' and *replace* with 'Quick'.
- 
- AMDT  
No. 2      **Figure 11.5.1.13(A)**  
Figure title, *delete* 'FAST' and *replace* with 'QUICK'.
- 
- AMDT  
No. 2      **Figure 11.5.1.13(B)**  
Figure title, *delete* 'FAST' and *replace* with 'QUICK'.
- 
- AMDT  
No. 2      **Clause 11.5.1.19.4**  
List Item (e), line 1, *delete* 'fast' and *replace* with 'quick'.
- 
- AMDT  
No. 2      **Clause 11.5.1.20.3**  
List Item (i), line 1, *delete* 'fast' and *replace* with 'quick'.
- 
- AMDT  
No. 2      **Clause 11.5.1.21**  
Paragraph 1, *delete* 'Fast' and *replace* with 'Quick'.
- 
- AMDT  
No. 2      **Clause 11.5.1.22**  
1      Paragraph 1, line 1, *delete* 'Fast' and *replace* with 'Quick'  
2      Paragraph 2, line 1, *delete* 'fast' and *replace* with 'quick'.  
3      Paragraph 3, line 1, *delete* 'fast' and *replace* with 'quick'.
- 
- AMDT  
No. 2      **Clause 11.5.2.4**  
1      List Item (c), *delete* 'fast' and *replace* with 'quick'.  
2      Note, line 2, *delete* 'fast' and *replace* with 'quick'.
- 
- AMDT  
No. 2      **Clause 11.5.2.7.2**  
List Item (ii)(B), *delete* 'fast' and *replace* with 'quick'.
- 
- AMDT  
No. 2      **Clause 11.5.2.9**  
Paragraph 1, line 3, *delete* 'fast' and *replace* with 'quick'.
- 
- AMDT  
No. 2      **Clause 11.5.2.9.4**  
Paragraph 1, line 1, *delete* 'fast' and *replace* with 'quick'.
-

AMDT  
No. 2

**Clause 11.5.2.10, Tables 11.5.2.10(A) and 11.5.2.10(B) and Figures 11.5.2.10(A) through 11.5.2.10(F) (new)**

After Figure 11.5.2.9.4(C), *add* the following:

**11.5.2.10** *Alternative in-rack sprinkler design*

**11.5.2.10.1** *General*

The in-rack sprinkler designs provided in this Clause are alternatives to the in-rack sprinkler designs derived from Clauses 11.5.2.3, 11.5.2.4, 11.5.2.5, 11.5.2.6, 11.5.2.7 and 11.5.2.8 and associated Figures. The only exception is the positioning of in-rack sprinkler within racking in Clause 11.5.2.4 and Figure 11.5.2.5, also Clauses 11.5.2.8.4, 11.5.2.8.5 and 11.5.2.8.6 which shall apply.

The in-rack sprinkler designs provided in this Clause apply to all categorized commodities in open-frame racks for wet pipe sprinkler systems, with the exception of open top containers.

**11.5.2.10.2** *Type, temperature rating, K factor, RTI, coverage and orientation*

Sprinklers within racking shall—

- (a) be storage sprinklers;
- (b) have a nominal temperature rating of 68°C;
- (c) have a minimum  $K$  factor of  $K_m20.2$  (K14.0 US imp); and
- (d) be quick response, standard coverage and upright.

**11.5.2.10.3** *Horizontal location of in-rack sprinklers*

In-rack sprinklers shall be positioned as shown in Figures 11.5.2.10(A), 11.5.2.10(B) and 11.5.2.10(C) for single-row racks, Figure 11.5.2.10(D) and 11.5.2.10(E) for double-row racks, and 11.5.2.10(F) for multiple-row racks, and as follows:

- (a) The minimum horizontal distance between in-rack sprinklers shall be 700 mm.
- (b) The maximum horizontal distance between in-rack sprinklers shall be 1.4 m (between transverse flue) and 2.6 m (between face sprinklers) as shown in the Figures.
- (c) Face sprinklers (located in transverse flues) shall be not more than 450 mm from the face of the storage rack or the outer edge of a pallet load if it protrudes into the aisle.
- (d) All in-rack sprinklers shall be located within the footprint of the rack structure except where a single row rack is within 300 mm of a wall, the arrangement shown in Figure 11.5.2.10(C) is also allowed.
- (e) A minimum clearance between the top of storage and the sprinkler deflector shall be 150 mm.
- (f) The in-rack sprinklers shall be installed with their deflectors at or just below (maximum 10 mm), the bottom of the racks horizontal support member.

**11.5.2.10.4** *Vertical location of in-rack sprinklers*

The maximum vertical distance between in-rack sprinkler levels shall be—

- (a) 9.0 m for cartoned Category 6 goods (expanded plastics) and uncartoned Category 5 and 6 goods (unexpanded and expanded plastics); and
- (b) 12.2 m for Category 1 to 4 goods and cartoned Category 5 goods (unexpanded plastics).

### 11.5.2.10.5 *In-rack sprinkler design*

The in-rack sprinkler design shall be based on the single hydraulically most remote in-rack sprinkler level as required in Table 11.5.2.10(A).

The minimum in-rack sprinkler design flow out of the most remote in-rack sprinkler shall be as required in Table 11.5.2.10(B).

**TABLE 11.5.2.10(A)**  
**NUMBER OF SPRINKLERS IN THE IN-RACK SPRINKLER DESIGN**

In-rack sprinkler Figure	Number of sprinklers in the design	
	Category 1 to 4 and cartoned Category 5 and 6 goods	Uncartoned Category 5 and 6 goods
Single row racks up to 0.9 m deep Figure 11.5.2.10(A)	4	4
Single row racks up to 1.8 m deep Figure 11.5.2.10(B)	5	5
Single row racks up to 1.8 m deep against wall Figure 11.5.2.10(C)	5	5
Double row racks up to 2.7 m deep Figure 11.5.2.10(D)	6	5 and 5 (see Note)
Double row racks up to 3.6 m deep Figure 11.5.2.10(E)	6	5 and 5 (see Note)
Multiple row racks Figure 11.5.2.10(F)	6	5 and 5 (see Note)

NOTE: The number of sprinklers is based on the most remote 5 in-rack sprinklers in the most remote storage rack as well as the most remote 5 in-rack sprinklers in the adjacent storage rack.

**TABLE 11.5.2.10(B)**  
**MINIMUM FLOW IN THE IN-RACK DESIGN**

Maximum vertical in-rack sprinkler level spacing m	Category of goods	Minimum <i>K</i> factor sprinkler	Min. flow most remote in-rack sprinkler L/min
9.0	Category 1 to 4 and cartoned Category 5	20.2 (K 14)	250
	Cartoned Category 6	20.2 (K 14)	380
	Uncartoned Category 5 and 6	32 (K 22.4)	455
12.2	Category 1 to 4 and cartoned Category 5	32 (K 22.4)	455

### 11.5.2.10.6 *Ceiling sprinkler system design*

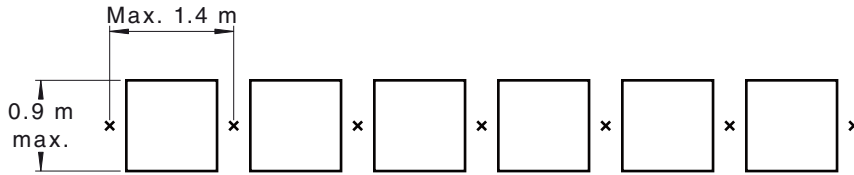
The ceiling sprinkler system shall be designed in accordance with Clause 11.6 for the category of goods involved and the height from the top level of in-rack sprinklers to the actual ceiling above.

NOTE: The top level of in-rack sprinklers can be considered a virtual floor in this alternative in-rack sprinkler design.

If there is no storage above the top level of in-rack sprinklers, the ceiling sprinklers shall be designed for the minimum ceiling height provided in the applicable table.

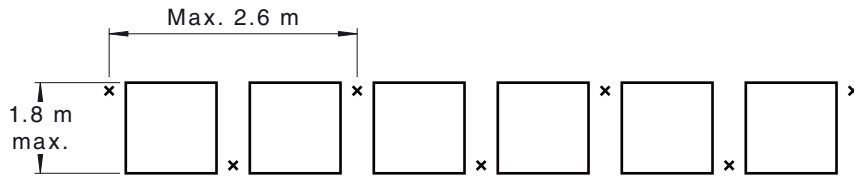
The in-rack sprinkler system design shall be considered as totally independent of the ceiling sprinkler system. Combining flows and balancing are not required.

The system duration for water storage capacity calculations, shall be a minimum of 60 minutes.



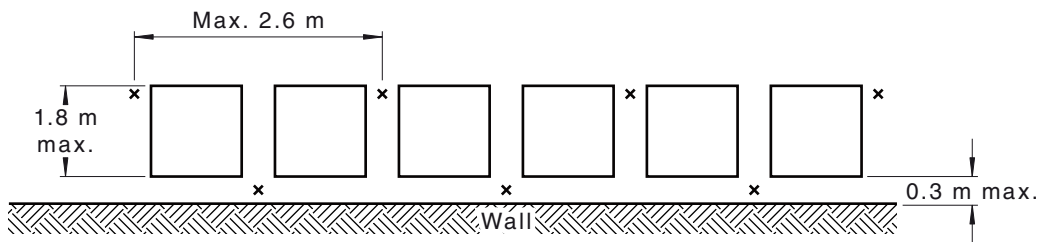
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FIGURE 11.5.2.10(A) PLAN VIEW SINGLE ROW RACKS UP TO 0.9 m DEEP



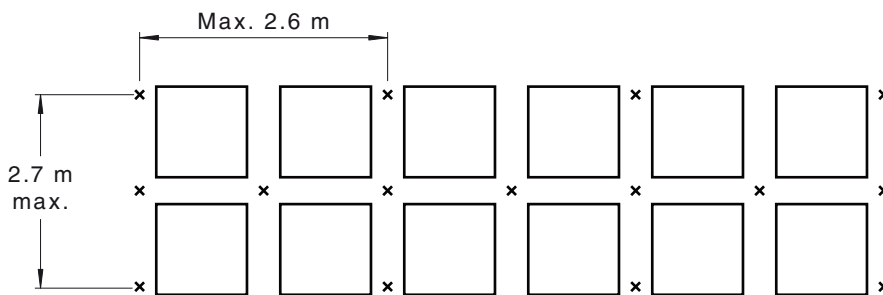
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FIGURE 11.5.2.10(B) PLAN VIEW SINGLE ROW RACKS UP TO 1.8 m DEEP



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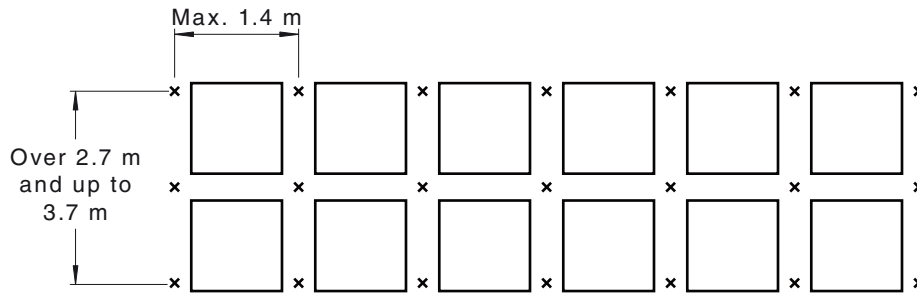
FIGURE 11.5.2.10(C) PLAN VIEW SINGLE ROW RACKS UP TO 1.8 m DEEP LOCATED AGAINST A WALL



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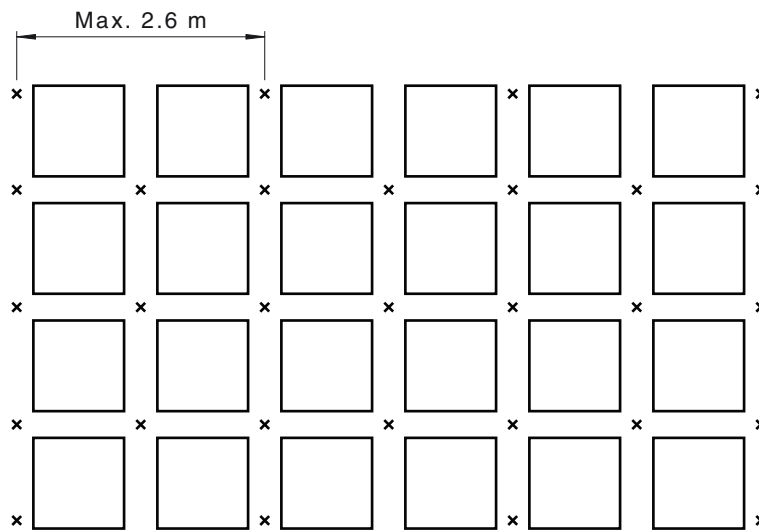
FIGURE 11.5.2.10(D) DOUBLE ROW RACKS UP TO 2.7 m DEEP





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FIGURE 11.5.2.10(E) DOUBLE ROW TACKS UP TO 3.7 m DEEP



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FIGURE 11.5.2.10(F) MULTIPLE ROW RACKS

AMDT No. 2

**Clause 11.6.1**

Commentary C11.6.1, list Item (d), *delete* ‘fast’ and *replace* with ‘quick’.

AMDT No. 2

**Table 11.6.3(A)**

*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.

AMDT No. 2

**Table 11.6.3(B)**

*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.

AMDT No. 2

**Table 11.6.3(C)**

*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.

AMDT No. 2

**Table 11.6.3(D)**

*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.

AMDT  
No. 2      **Table 11.6.3(E)**  
*Delete 'fast' and replace with 'quick' in all instances.*

---

AMDT  
No. 2      **Table 11.6.3(F)**  
*Delete 'fast' and replace with 'quick' in all instances.*

---

AMDT  
No. 2      **Table 11.6.3(G)**  
*Delete 'fast' and replace with 'quick' in all instances.*

---

AMDT  
No. 2      **Table 11.6.3(H)**  
*Delete 'fast' and replace with 'quick' in all instances.*

---

AMDT  
No. 2      **Table 11.6.3(I)**  
*Delete 'fast' and replace with 'quick' in all instances.*

---

AMDT  
No. 2      **Table 11.6.3(J)**  
*Delete table, and replace with the following:*

Number of activating sprinklers @ kPa																					
Ceiling height	Wet systems										Wet systems				Dry systems						
	Pendent sprinklers—68°C										Upright sprinklers—68°C				Upright sprinklers—141°C						
	Quick response					Standard response					Quick response				Standard response			Standard response			
	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 32.0	<i>K<sub>m</sub></i> 36.3	<i>K<sub>m</sub></i> 36.3EC	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 28.3	<i>K<sub>m</sub></i> 36.3	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 36.3EC	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 36.3	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 28.3	<i>K<sub>m</sub></i> 36.3
K11.2	K14.0	K16.8	K22.4	K25.2	K25.2EC	K11.2	K14.0	K19.6	K25.2	K11.2	K14.0	K16.8	K25.2EC	K11.2	K16.8	K25.2	K11.2	K16.8	K19.6	K25.2	
1.5	20 @ 50	12 @ 520	12 @ 350	12 @ 350	12 @ 210	10 @ 50	20 @ 50	20 @ 50	20 @ 110	20 @ 50	20 @ 50	20 @ 50	20 @ 50	10 @ 50	20 @ 50	20 @ 50	20 @ 50	25 @ 50	25 @ 50	25 @ 210	25 @ 50
2.4	20 @ 110	12 @ 520	12 @ 350	12 @ 350	12 @ 210	10 @ 80	20 @ 110	20 @ 70	20 @ 110	20 @ 50	20 @ 110	20 @ 70	20 @ 50	10 @ 80	20 @ 110	20 @ 50	20 @ 50	25 @ 110	25 @ 50	25 @ 210	25 @ 50
3.0	20 @ 210	12 @ 520	12 @ 350	12 @ 350	12 @ 210	10 @ 150	20 @ 210	20 @ 140	20 @ 110	20 @ 50	20 @ 210	20 @ 140	20 @ 90	10 @ 150	20 @ 210	20 @ 90	20 @ 50	25 @ 210	25 @ 90	25 @ 210	25 @ 50
3.6	20 @ 350	12 @ 520	12 @ 350	12 @ 350	12 @ 210	10 @ 280	20 @ 350	20 @ 240	20 @ 110	20 @ 70	20 @ 350	20 @ 240	20 @ 170	10 @ 280	20 @ 350	20 @ 170	20 @ 70	25 @ 350	25 @ 170	25 @ 210	25 @ 70
4.5	25 @ 350	12 @ 520	12 @ 350	12 @ 350	12 @ 210	12 @ 280	25 @ 350	25 @ 240	25 @ 110	25 @ 70	25 @ 350	25 @ 240	25 @ 170	12 @ 280	25 @ 350	25 @ 170	25 @ 70	35 @ 350	35 @ 170	35 @ 210	35 @ 70
6.1		12 @ 520	12 @ 350	12 @ 350	12 @ 210																
7.6		12 @ 520	12 @ 350	12 @ 350	12 @ 350 <sup>(1)</sup>																
9.1		12 @ 690	12 @ 480	12 @ 480	12 @ 480 <sup>(1)</sup>																
10.7					20 @ 520 <sup>(2)</sup>																
12.2					20 @ 520 <sup>(2)</sup>																

## NOTES:

- The operating pressure may be reduced if the sprinkler is listed for protection of uncartoned Category 6 commodities in 7.6 and 9.1 m buildings, at a lower pressure and the sprinkler is installed according to its listing.
- The sprinkler should be listed for protection of uncartoned Category 6 commodity in 10.7 m or 12.2 m buildings, as appropriate, and the sprinkler should be installed according to its listing.
- The shaded fields denote design criteria only requiring a 60 min water supply duration.
- The ceiling-level protection options highlighted in grey represent those for which the water supply duration is at least 1 h. These highlighted options have the potential to result in less fire, smoke and water damage than other options and thus may, from a sustainability standpoint, be preferable.

---

AMDT  
No. 2      **Clause 11.6.7.3.2**  
List Item (f), line 1, *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2      **Clause 11.6.7.3.3**  
List Item (c), line 1, *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2      **Clause 11.6.7.3.4**  
List Item (d), line 1, *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2      **Clause 11.6.8**  
1      Clause title, line 2, *delete* ‘fast’ and *replace* with ‘quick’.  
2      List Item (a), line 1, *delete* ‘fast’ and *replace* with ‘quick’.

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AMDT  
No. 2      **Table 11.6.9**  
Column 6, heading, *delete* ‘fast’ and *replace* with ‘quick’.

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AMDT  
No. 2      **Clause 11.7, Tables 11.7.3.2(A) through 11.7.3.2(C), 11.7.3.3.3.1, 11.7.3.4.4, 11.7.3.4.5, 11.7.3.4.6(A), 11.7.3.4.6(B) and 11.7.4, and Figures 11.7.3.3.3.2(A), 11.7.3.3.3.2(B), 11.7.3.3.3.3(A) through 11.7.3.3.3.3(D) and 11.7.3.3.3.4(A) through 11.7.3.3.3.4(D) (new)**

After Clause 11.6.9, *add* the following:

## **11.7 AUTOMATIC STORAGE AND RETRIEVAL SYSTEMS (ASRS)**

### **11.7.1 General**

This Clause specifies requirements for the design of sprinkler protection for automatic storage and retrieval systems (ASRS) that comprise a racking structure or multi-level storage fixture configured or incorporating devices that automate stacking and picking of storage placed in the storage fixture.

NOTE: Systems that incorporate manual loading and picking but use other methods to move pallets placed in the rack, such as push-through multiple-row racks (that do not meet the definition of open-frame racks), fall within the criteria described in this Clause (see Clause 11.7.2).

Automatic storage and retrieval systems are classified as follows:

- (a) *Rack structure ASRS*—where storage on standard pallets is loaded by crane or vertical lift and the rack is configured with uprights between each pallet load and where supports for pallet loads are oriented perpendicular to the loading aisle—typically a push-through configuration (refer Clause 11.7.2).
- (b) *Mini-load ASRS*—where individual cartons or items of storage are placed in trays or containers that are loaded by automated processes on to a multiple level storage fixture where typical spacing of uprights is up to 600 mm and tier heights up to 400 mm and angle sections are used for tray or container support (refer Clause 11.7.3).
- (c) *Enclosed ASRS*—which are package units within a metal enclosure that comprise either a lift or carousel to move storage and retrieve storage (refer Clause 11.7.4).

## 11.7.2 Rack structure ASRS, storage on standard pallets

### 11.7.2.1 Rack structure ASRS with unobstructed flues

Rack structure ASRS shall be considered open-frame racking if transverse flue spaces are in accordance with Clause 11.6.2, and protected as either of the following:

- (a) Where applicable (based on commodity classification, storage height and type of ceiling sprinkler), protection at roof level only shall be installed in accordance with Clauses 11.6.3 and 11.5.1.
- (b) Ceiling level and in-rack sprinklers shall be installed in accordance with Clause 11.5.2.8 or 11.5.2.10.

NOTE: For the above requirements to apply, the pallet loads are supported by horizontal members, rollers or some other means that do not divert water away from the transverse flue space.

### 11.7.2.2 Rack structure ASRS with obstructed flues

Rack structure ASRS having transverse flue spaces that do not satisfy the requirements of Clause 11.6.2 shall be protected by ceiling level and in-rack sprinklers as follows:

- (a) In-rack sprinklers shall be installed every 3.0 m vertically using the horizontal arrangement in Figures 11.5.2.6.3(A), 11.5.2.6.3(B), 11.5.2.6.3(C) or 11.5.2.6.3(D) as applicable.
- (b) A minimum flow of 230 L/m per in-rack sprinkler shall apply for the appropriate number of sprinklers operating as specified in Table 11.5.2.8.2.
- (c) In-rack sprinklers shall satisfy the requirements of Clauses 11.5.2.4, 11.5.2.5, 11.5.2.8.2, 11.5.2.8.4, 11.5.2.8.5 and 11.5.2.8.6.
- (d) Ceiling level sprinklers shall be installed in accordance with Clauses 11.5.1 and 11.5.2.8.

## 11.7.3 Mini-load ASRS storage arrangements

### 11.7.3.1 Flue spaces and rack depth in mini-load ASRS

Transverse flue spaces shall be provided throughout the vertical height of the storage as follows:

- (a) For non-combustible open top containers—a minimum net width 25 mm wide transverse flue space at maximum 3.0 m horizontally.
- (b) For other non-combustible and all other types of containers—
  - (i) a minimum gross width of 38 mm wide transverse flue space at maximum 0.6 m horizontally; or
  - (ii) a minimum gross width of 75 mm wide transverse flue space at maximum 1.5 m horizontally; or
  - (iii) 0.7 mm sheet metal or 19 mm plywood vertical barriers shall be provided perpendicular to the aisle through the rack structure from aisle to aisle. The barrier spacing shall be located so the number of in-rack sprinklers between the barriers does not exceed the total number of in-rack sprinklers in the design per level specified in Table 11.7.3.4.5.

Longitudinal flue spaces are not specifically required; however, where provided they do serve as the preferred location for in-rack sprinklers for racks exceeding 1.8 m depth [e.g. as shown in Figure 11.7.3.3.3(B)]. Any flue space running parallel to the loading aisle, having a minimum width of 75 mm, is considered a longitudinal flue space. Any longitudinal flue with width greater than 600 mm shall be treated as an aisle. The rack depth is the distance between aisles.

NOTE: It is recognized that in mini-load ASRS systems, the net width of transverse flue spaces can typically be zero because of bracing and the rails the totes sit on. The intent of this Clause is that there is space for water to flow down of a minimum gross size and spacing for the sprinkler to be effective.

### **11.7.3.2** *Ceiling-only sprinklers for mini-load ASRS storage arrangements*

Ceiling-only sprinkler protection for mini-load ASRS storage arrangements shall—

- (a) only be permitted when the conditions in Table 11.7.3.2(A) are complied with;
- (b) be designed in accordance with Table 11.7.3.2(B) for non-combustible containers;
- (c) be designed in accordance with Table 11.7.3.2(C) for trays and combustible containers;
- (d) be in accordance with Clause 11.5.1; and
- (e) be provided a water supply calculated in accordance with Clause 11.6.6 for the minimum duration indicated in Table 11.7.3.2(B) or 11.7.3.2(C) for the storage arrangement.

For excessive storage and ceiling heights, or where there are no design criteria provided in Tables 11.7.3.3(B) and 11.7.3.3(C), ceiling level and in-rack sprinklers shall be provided as specified in Clause 11.7.3.4.

For water supply duration requirements, see Clause 11.6.6.

**TABLE 11.7.3.2(A)**  
**ACCEPTABLE CONDITIONS FOR CEILING ONLY SPRINKLER PROTECTION**  
**OF MINI-LOAD ASRS**

Maximum storage height m	Maximum ceiling height m	Material handling	Material handling composition (see Note)	Container arrangement	If open-top, vented or solid-walled	Commodity stored
3.0	4.5	Containers	Unexpanded plastic	Open-top	Solid-walled	Categories 1 to 5 and, cartoned Category 6
3.0	6.1	Trays	Non-combustible, cellulosic or unexpanded plastic	DNA	DNA	Categories 1 to 5 and cartoned Category 6
		Containers	Non-combustible	Closed-top	DNA	Category 1 to 6
				Open-top	Any	Category 1 to 6
				Mesh	DNA	Categories 1 to 5 and cartoned Category 6
		Cellulosic	Closed-top	DNA	Category 1 to 6	
			Open-top	Any	Categories 1 to 5 and cartoned Category 6	
		Unexpanded plastic	Closed-top	DNA	Categories 1 to 5 and cartoned Category 6	
			Open-top	Vented	Categories 1 to 5 and cartoned Category 6	
4.5	9.1	Containers	Non-combustible	Closed-top or open-top	Any	Category 1 to 6

NOTE: Material handling composition includes non-combustible, cellulosic, unexpanded plastic, corrugated and expanded plastic. The latter two are unsuitable for ceiling only protection.

**TABLE 11.7.3.2(B)**  
**CEILING SPRINKLER DESIGNS FOR NON-COMBUSTIBLE**  
**CONTAINERS IN MINI LOAD ASRS**

Max storage height m	Max. ceiling height m	Wet system, pendant sprinklers										Wet system, upright sprinklers						
		Quick-response					Standard-response					Quick-response				Standard-response		
		<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 20.2 K14.0	<i>K<sub>m</sub></i> 24.2 K16.8	<i>K<sub>m</sub></i> 32.0 K22.4	<i>K<sub>m</sub></i> 36.3 K25.2	<i>K<sub>m</sub></i> 36.3EC K25.2EC	<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 20.2 K14.0	<i>K<sub>m</sub></i> 28.3 K19.6	<i>K<sub>m</sub></i> 36.3 K25.2	<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 20.2 K14.0	<i>K<sub>m</sub></i> 24.2 K16.8	<i>K<sub>m</sub></i> 36.3EC K25.2EC	<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 24.2 K16.8	<i>K<sub>m</sub></i> 36.3 K25.2
3.0	9.1	20 @ 50	12 @ 170	12 @ 120	10 @ 100	10 @ 100	6 @ 140	20 @ 50	20 @ 50	12 @ 110	12 @ 50	20 @ 50	12 @ 170	12 @ 120	6 @ 140	20 @ 50	20 @ 50	20 @ 50
4.5	6.1	20 @ 50	12 @ 170	12 @ 120	12 @ 100	12 @ 100	6 @ 140	20 @ 50	20 @ 50	12 @ 110	12 @ 50	20 @ 50	12 @ 170	12 @ 120	6 @ 140	20 @ 50	20 @ 50	20 @ 50
	9.1	20 @ 210	12 @ 170	12 @ 120	12 @ 100	12 @ 100	6 @ 210	20 @ 210	20 @ 120	12 @ 110	12 @ 50	20 @ 210	12 @ 170	12 @ 120	6 @ 210	20 @ 210	20 @ 90	12 @ 140

NOTE: The shaded fields denote design criteria requiring a 60 min water supply duration.

**TABLE 11.7.3.2(C)**  
**CEILING SPRINKLER DESIGNS FOR TRAYS AND COMBUSTIBLE CONTAINERS IN MINI LOAD ASRS**

Max storage height m	Max. ceiling height m	Wet system, pendant sprinklers										Wet system, upright sprinklers						
		Quick-response					Standard-response					Quick-response				Standard-response		
		<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 20.2 K14.0	<i>K<sub>m</sub></i> 24.2 K16.8	<i>K<sub>m</sub></i> 32.0 K22.4	<i>K<sub>m</sub></i> 36.3 K25.2	<i>K<sub>m</sub></i> 36.3EC K25.2EC	<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 20.2 K14.0	<i>K<sub>m</sub></i> 28.3 K19.6	<i>K<sub>m</sub></i> 36.3 K25.2	<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 20.2 K14.0	<i>K<sub>m</sub></i> 24.2 K16.8	<i>K<sub>m</sub></i> 36.3EC K25.2EC	<i>K<sub>m</sub></i> 16.0 K11.2	<i>K<sub>m</sub></i> 24.2 K16.8	<i>K<sub>m</sub></i> 36.3 K25.2
1.5	3.0	20 @ 210	12 @ 170	12 @ @120	10 @ 100	10 @ 100	10 @ 150	20 @ 210	20 @ 120	20 @ 110	20 @ 50	20 @ 210	20 @ 120	20 @ 90	10 @ 150	20 @ 210	20 @ 90	20 @ 50
	4.5	25 @ 350	10 @ 240	10 @ 170	10 @ 100	10 @ 100	12 @ 260	25 @ 350	25 @ 220	25 @ 110	25 @ 70	25 @ 350	25 @ 220	25 @ 150	12 @ 260	25 @ 350	25 @ 150	25 @ 70
3.0	4.5	25 @ 350	10 @ 240	10 @ 170	10 @ 100	10 @ 100	12 @ 260	25 @ 350	25 @ 220	25 @ 110	25 @ 70	25 @ 350	25 @ 220	25 @ 150	12 @ 260	25 @ 350	25 @ 150	25 @ 70
	6.1		12 @ 350	12 @ 249	12 @ 140	12 @ 140												

NOTE: The shaded fields denote design criteria requiring a 60 min water supply duration.



### **11.7.3.3** *In-rack automatic sprinkler (IRAS) protection for mini-load ASRS storage arrangements*

#### **11.7.3.3.1** *In-rack sprinklers*

Sprinklers within racking shall—

- (a) be quick response;
- (b) have a nominal temperature rating of 68°C;
- (c) have a minimum  $K$  factor of  $K_m 16.0$  (K11.2US imp);
- (d) be provided with a minimum design pressure at any in-rack sprinkler of 50 kPa;
- (e) have a minimum design flow based on the requirements in Table 11.7.3.4.5.

#### **11.7.3.3.2** *Location and positioning of in-rack sprinklers*

All in-rack sprinklers shall be located within the rack storage array.

In-rack sprinklers shall be located—

- (a) within the flue spaces they are intended to protect;
- (b) be a minimum of 75 mm horizontally away from rack uprights; and
- (c) be positioned such that their deflectors are located at or below the bottom of rack horizontal support members.

In-rack sprinklers and their associated piping shall be arranged to avoid mechanical damage while at the same time allowing for proper in-rack sprinkler spray distribution.

In-rack sprinklers shall be located as shown in Figures 11.7.3.4.3.2(A) through to 11.7.3.4.3.4(D).

#### **11.7.3.3.3** *In-rack sprinkler horizontal arrangement*

##### **11.7.3.3.3.1** *General*

Determination of horizontal in-rack sprinkler arrangement shall be determined by the following ASRS parameters:

- (a) Tray or container composition (non-combustible, cellulosic or unexpanded plastic).
- (b) Container type (solid-walled, open-top or vented open-top).
- (c) Commodity being stored.
- (d) Depth of the ASRS row.
- (e) Horizontal distance between transverse flue spaces.
- (f) Longitudinal flue spaces, if provided.

Horizontal spacing of in-rack sprinklers is outlined, according to the depth of the ASRS rack, in Clauses 11.7.3.3.3.2 to 11.7.3.3.3.4. Greater maximum horizontal spacing is permitted for trays, containers and commodities detailed in Table 11.7.3.3.3.1.

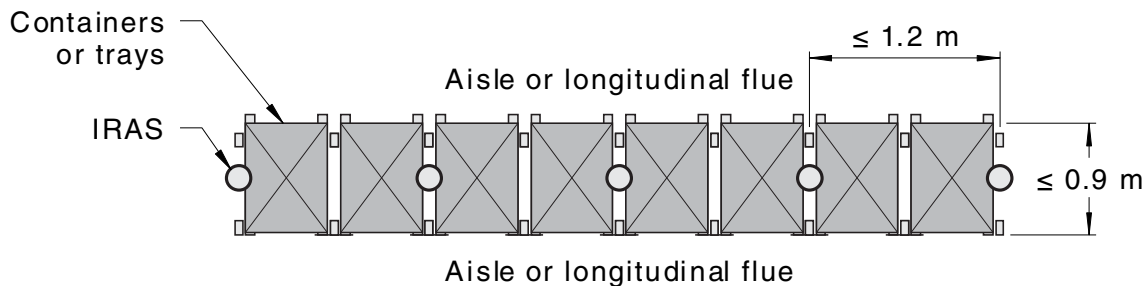
**TABLE 11.7.3.3.1  
FAVOURABLE PARAMETERS FOR MINI-LOAD ASRS  
HORIZONTAL IN-RACK SPACING**

Tray composition	Container composition	Container type	Commodity
Non-combustible	DNA	DNA	Category 1 to 5 and cartoned Category 6
Unexpanded plastic	DNA	DNA	Category 1 to 5 and cartoned Category 6
DNA	Non-combustible	Closed-top	Category 1 to 6
DNA	Non-combustible	Open-top	Category 1 to 6
DNA	Non-combustible	Mesh	Category 1 to 5 and cartoned Category 6
DNA	Cellulosic	Closed-top	Category 1 to 6
DNA	Unexpanded plastic	Closed-top	Category 1 to 6
DNA	Unexpanded plastic	Open-top	Category 1 to 5 and cartoned Category 6

**11.7.3.3.3.2 Mini-load rack row depths up to 0.9 m**

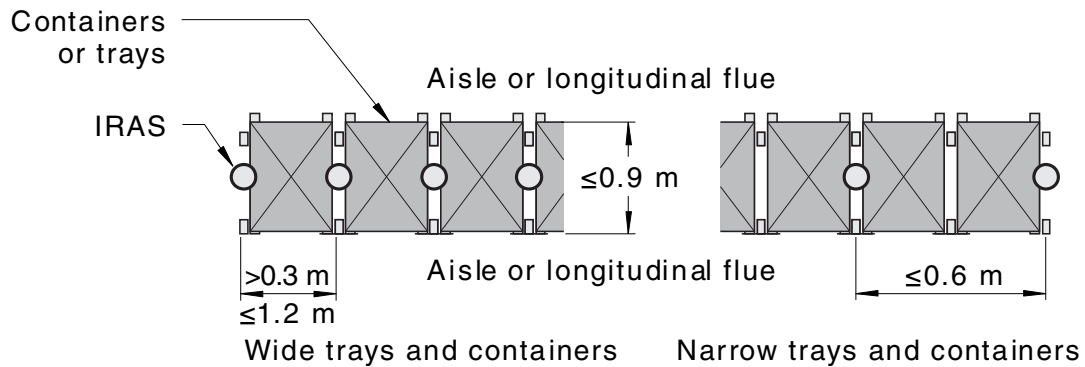
For mini-load rack depths up to 0.9 m:

- (a) In-rack sprinklers shall be installed down the centre of the rack, as shown in Figures 11.7.3.3.3.2(A) and 11.7.3.3.3.2(B).
- (b) Where favourable ASRS parameters are identified in Table 11.7.3.3.3.1 in-rack sprinklers shall be located over every alternate transverse flue subject to a maximum of 1.2 m as shown in Figure 11.7.3.3.3.2(A).
- (c) Where tray or container composition, container type and commodity are not listed in Table 11.7.3.3.3.1 in-rack sprinklers shall be located—
  - (i) over every transverse flue where they are spaced greater than 300 mm apart, subject to a maximum of 1.2 m as shown in Figure 11.7.3.3.3.2(B); or
  - (ii) over every alternate transverse flue where they are spaced closer than 300 mm apart, subject to a maximum of 1.2 m as shown in Figure 11.7.3.3.3.2(B).



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**FIGURE 11.7.3.3.3.2(A) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENT  
FOR MINI-LOAD ASRS RACKS UP TO 0.9 m DEPTH  
(HAVING FAVOURABLE PARAMETERS LISTED IN TABLE 11.7.3.3.3.1)**



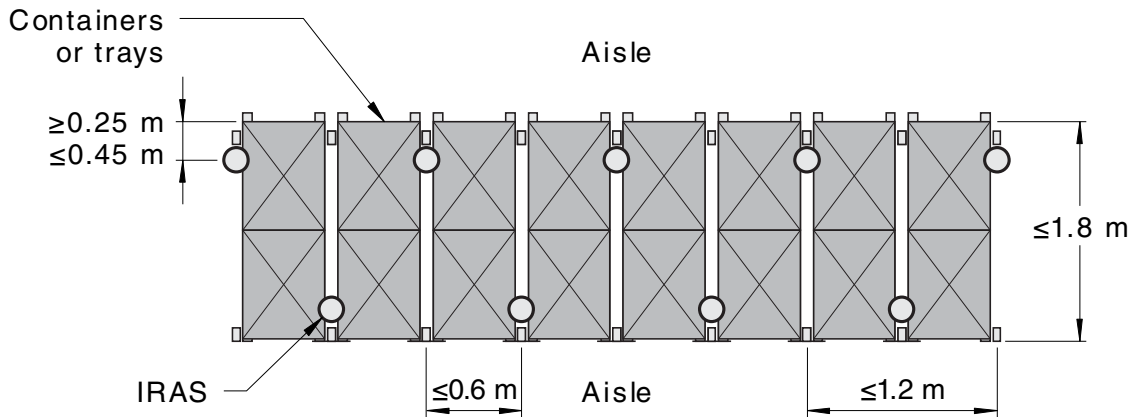
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FIGURE 11.7.3.3.2(B) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENTS FOR MINI-LOAD ASRS RACKS UP TO 0.9 m DEPTH (PARAMETERS NOT LISTED IN TABLE 11.7.3.3.3.1)

### 11.7.3.3.3.3 Mini-load rack row depths over 0.9 m and up to 1.8 m

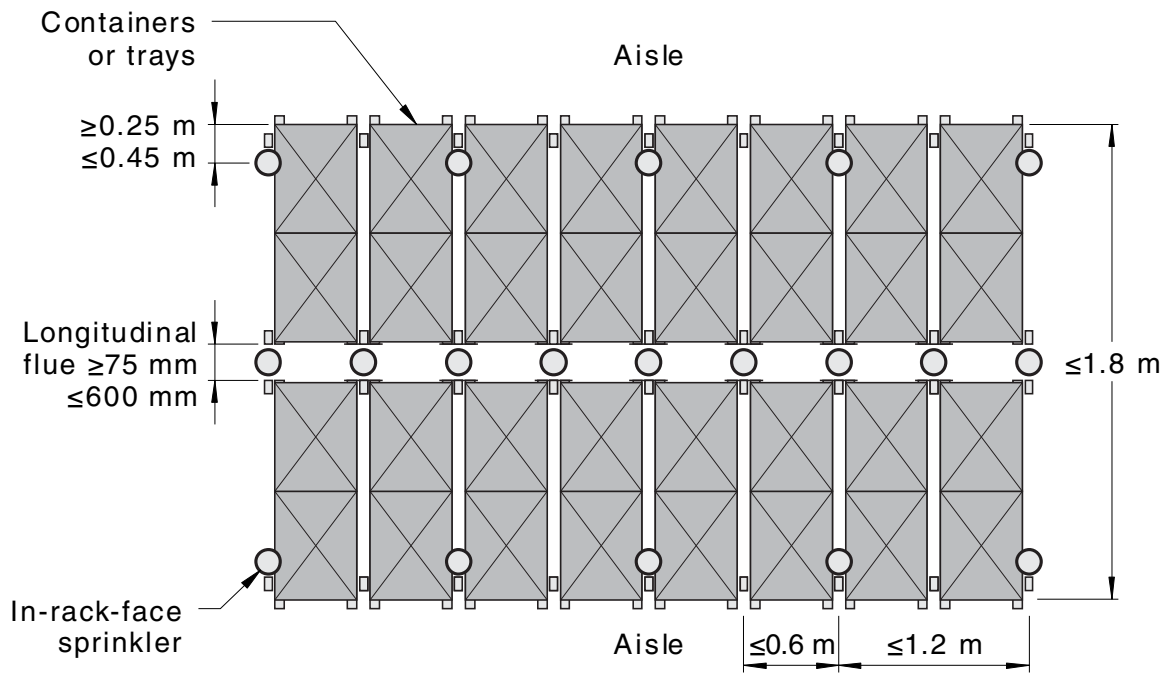
For mini-load rack row depths over 0.9 m and up to 1.8 m:

- (a) In-rack-face sprinklers shall be installed a minimum of 250 mm and a maximum of 450 mm from the face of storage at aisles, as shown in Figures 11.7.3.3.3.3(A) to 11.7.3.3.3.2(D).
- (b) In-rack sprinklers shall be installed in longitudinal flue spaces, if provided, over every transverse flue space as shown in Figures 11.7.3.3.3.3(B) and 11.7.3.3.3.3(D).
- (c) Where favourable ASRS parameters are identified in Table 11.7.3.3.3.1 in-rack-face sprinklers adjacent aisles shall be located over every alternate transverse flue subject to a maximum of 1.2 m, as shown in Figures 11.7.3.3.3.3(A) and 11.7.3.3.3.3(B).
- (d) Where tray or container composition, container type and commodity are not listed in Table 11.7.3.3.3.1 in-rack-face sprinklers adjacent aisles shall be located—
  - (i) over every transverse flue where they are spaced greater than 300 mm apart, subject to a maximum of 1.2 m as shown in Figures 11.7.3.3.3.3(C) and 11.7.3.3.3.3(D); or
  - (ii) over every alternate transverse flue where they are spaced closer than 300 mm apart, subject to a maximum of 1.2 m as shown in Figure 11.7.3.3.3.2(C) and 11.7.3.3.3.3(D); or
  - (iii) over every alternate transverse flue where a solid horizontal barrier is provided above each level of in-rack sprinklers, subject to a maximum of 1.2 m between in-rack sprinklers as shown in Figures 11.7.3.3.3.3(A) and 11.7.3.3.3.3(B). Horizontal barriers shall span from transverse flue to transverse flue and from aisle to aisle, including over any longitudinal flue space.



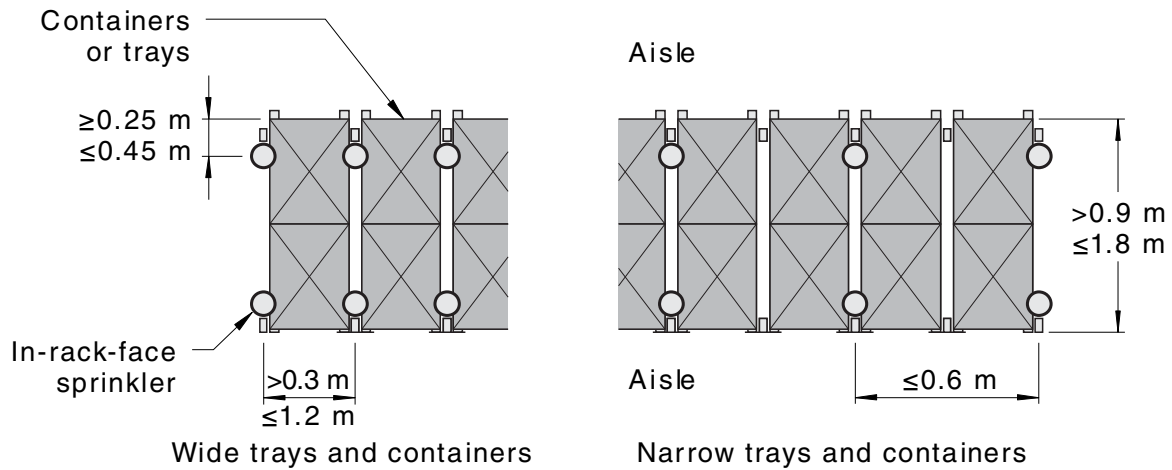
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FIGURE 11.7.3.3.3(A) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENT FOR ASRS RACKS OVER 0.9 m AND UP TO 1.8 m WITHOUT LONGITUDINAL FLUE SPACES (HAVING FAVOURABLE PARAMETERS LISTED IN TABLE 11.7.3.3.3.1)



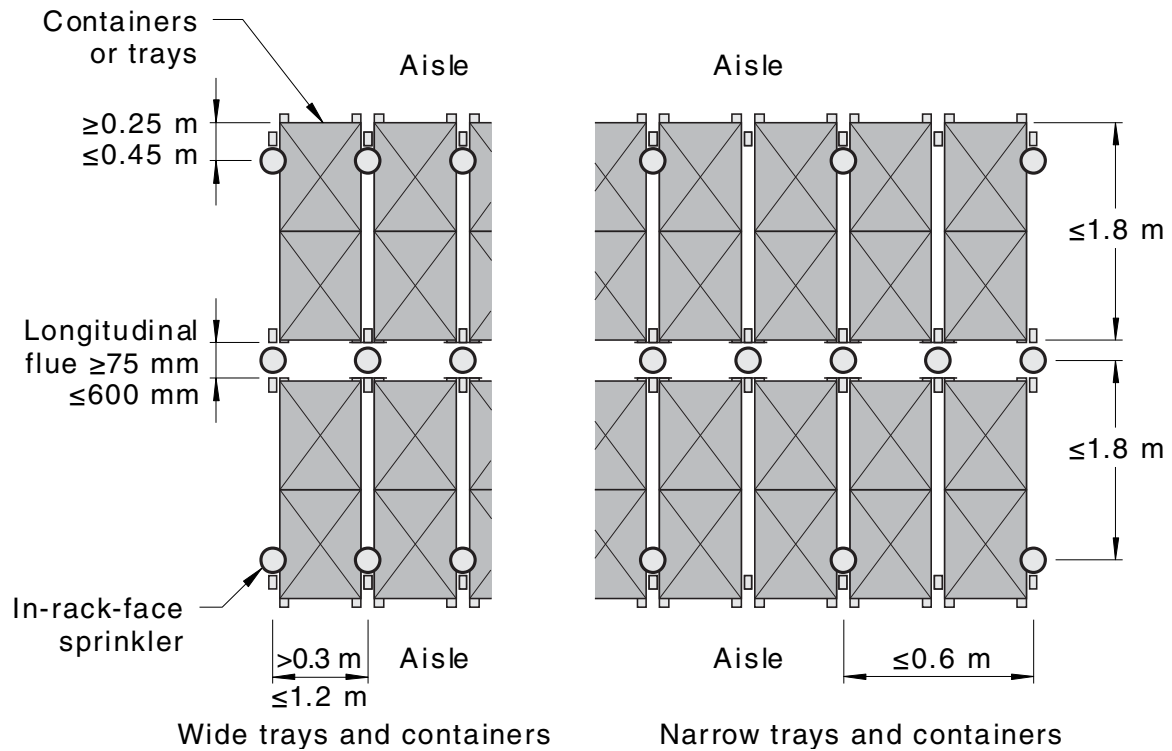
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FIGURE 11.7.3.3.3(B) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENT FOR MINI-LOAD ASRS RACKS OVER 0.9 m AND UP TO 1.8 m DEPTH HAVING TRANSVERSE FLUE SPACE (HAVING FAVOURABLE PARAMETERS LISTED IN TABLE 11.7.3.3.3.1)



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FIGURE 11.7.3.3.3(C) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENTS FOR MINI-LOAD ASRS RACKS OVER 0.9 m AND UP TO 1.8 m DEPTH WITHOUT LONGITUDINAL FLUE SPACES (PARAMETERS NOT LISTED IN TABLE 11.7.3.3.3.1)



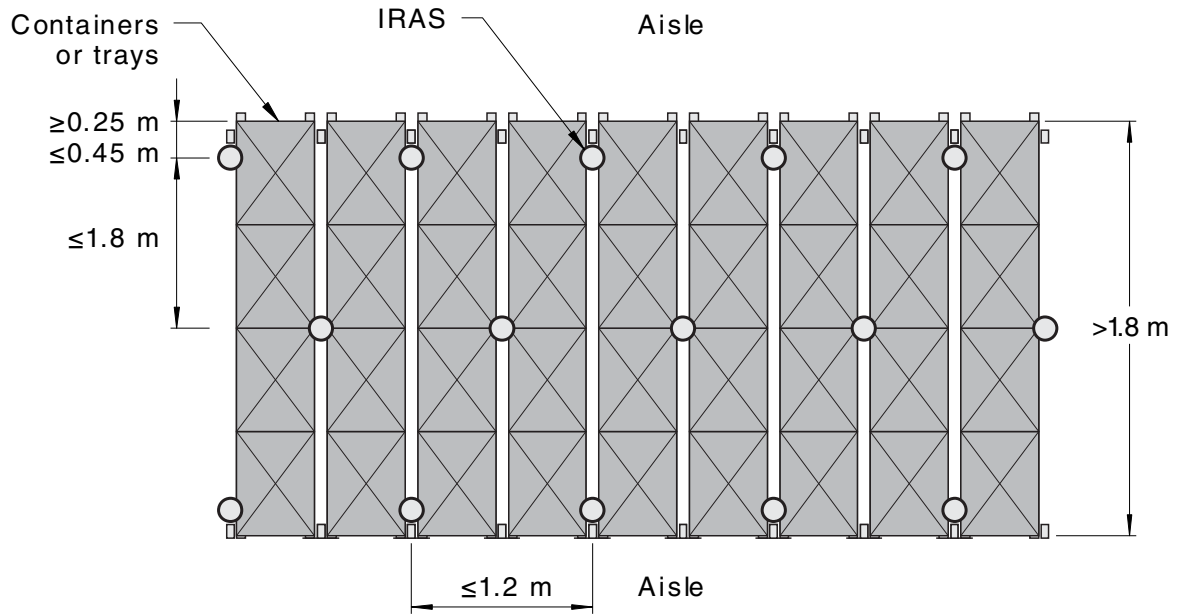
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FIGURE 11.7.3.3.3(D) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENTS FOR MINI-LOAD ASRS RACKS OVER 0.9 m AND UP TO 1.8 m DEPTH HAVING LONGITUDINAL FLUE SPACES (PARAMETERS NOT LISTED IN TABLE 11.7.3.3.3.1)

**11.7.3.4.3.4 Mini-load rack row depths over 1.8 m**

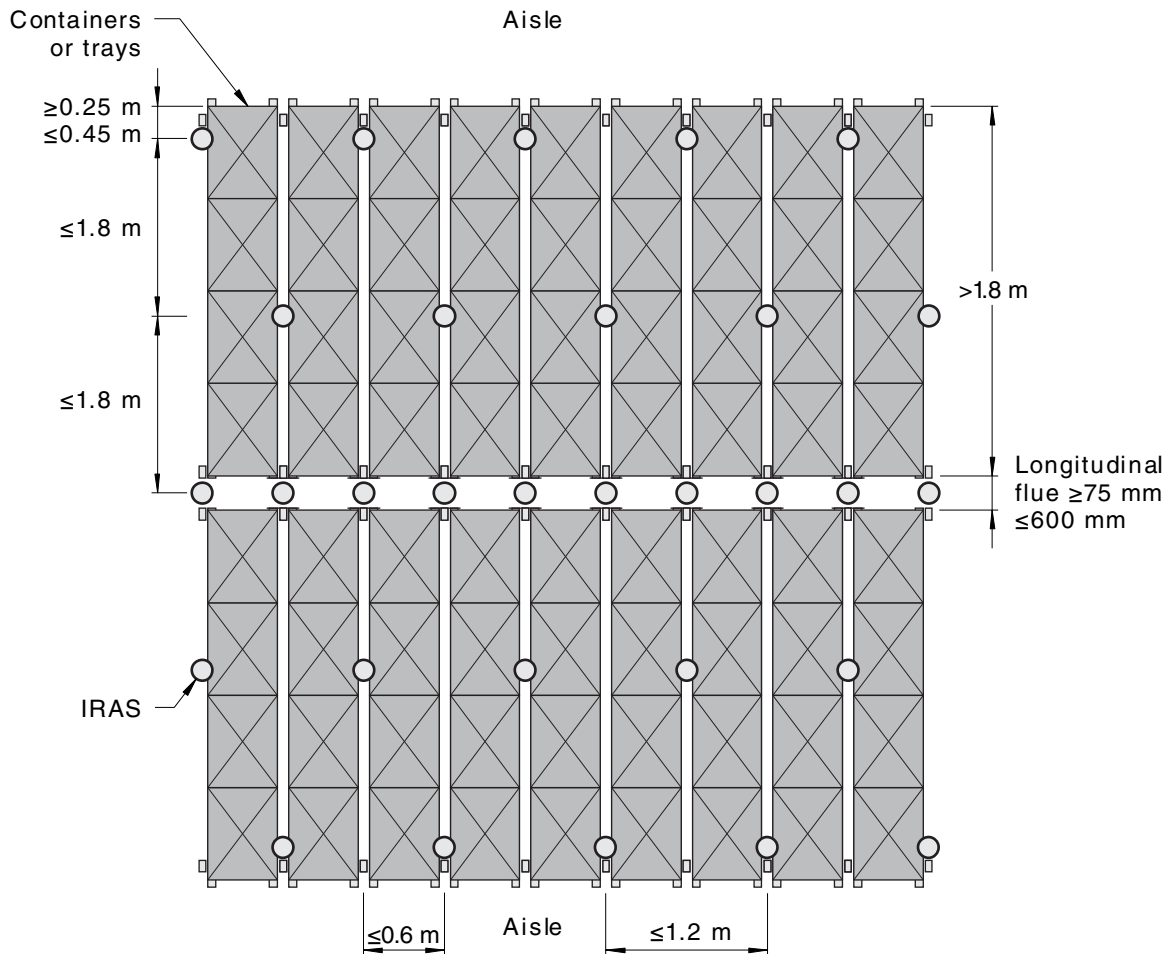
For mini-load rack row depths over 1.8 m:

- (a) In-rack-face sprinklers shall be installed a minimum of 250 mm and a maximum of 450 mm from the face of storage at aisles, as shown in Figures 11.7.3.3.3.4(A) to 11.7.3.4.3.4(D).
- (b) In-rack sprinklers shall be installed in longitudinal flue spaces, if provided, over every transverse flue space as shown in Figures 11.7.3.3.3.4(B) and 11.7.3.3.3.4(D).
- (c) Where favourable ASRS parameters are identified in Table 11.7.3.3.3.1:
  - (i) In-rack-face sprinklers shall be located over every alternate transverse flue subject to a maximum of 1.2 m, as shown in Figures 11.7.3.3.3.4(A) and 11.7.3.3.3.4(B).
  - (ii) In-rack sprinklers shall be located over every transverse flue not provided with in-rack-face sprinklers. These shall be located not further than 1.8 m from in-rack-face and from in-rack sprinklers in longitudinal flue spaces, as shown in Figures 11.7.3.3.3.4(A) and 11.7.3.3.3.4(B).
- (d) Where tray or container composition, container type and commodity are not listed in Table 11.7.3.3.3.1 in-rack-face sprinklers adjacent aisles shall be located—
  - (i) over every transverse flue where they are spaced greater than 300 mm apart, subject to a maximum of 1.2 m as shown in Figures 11.7.3.3.3.4(A) and 11.7.3.3.4(B);
  - (ii) over every alternate transverse flue where they are spaced closer than 300 mm apart, subject to a maximum of 1.2 m as shown in Figures 11.7.3.3.3.4(A) and 11.7.3.3.3.4(B); or
  - (iii) over every alternate transverse flue where a solid horizontal barrier is provided above each level of in-rack sprinklers, subject to a maximum of 1.2 m between in-rack sprinklers as shown in Figures 11.7.3.3.3.4(A) and 11.7.3.3.3.4(B). Horizontal barriers shall span from transverse flue to transverse flue and from aisle to aisle, including over any longitudinal flue space.
- (e) Where tray or container composition, container type and commodity are not listed in Table 11.7.3.3.3.1 in-rack sprinklers adjacent aisles shall be located—
  - (i) over every transverse flue not provided with in-rack-face sprinklers. These shall be located not further than 1.8 m from in-rack-face and from in-rack sprinklers in longitudinal flue spaces, as shown in Figures 11.7.3.3.3.4(A) and 11.7.3.3.3.4(B).



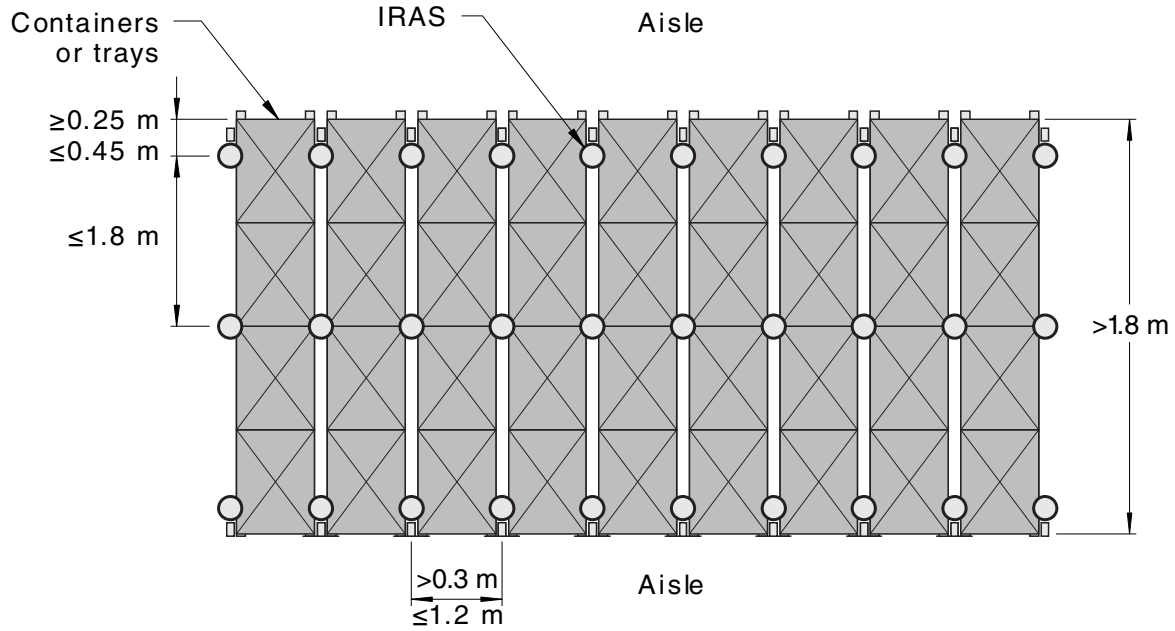
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FIGURE 11.7.3.4.3.4(A) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENT FOR MINI-LOAD ASRS RACKS OVER 1.8 m DEPTH WITHOUT LONGITUDINAL FLUE SPACES (HAVING FAVOURABLE PARAMETERS LISTED IN TABLE 11.7.3.3.3.1)



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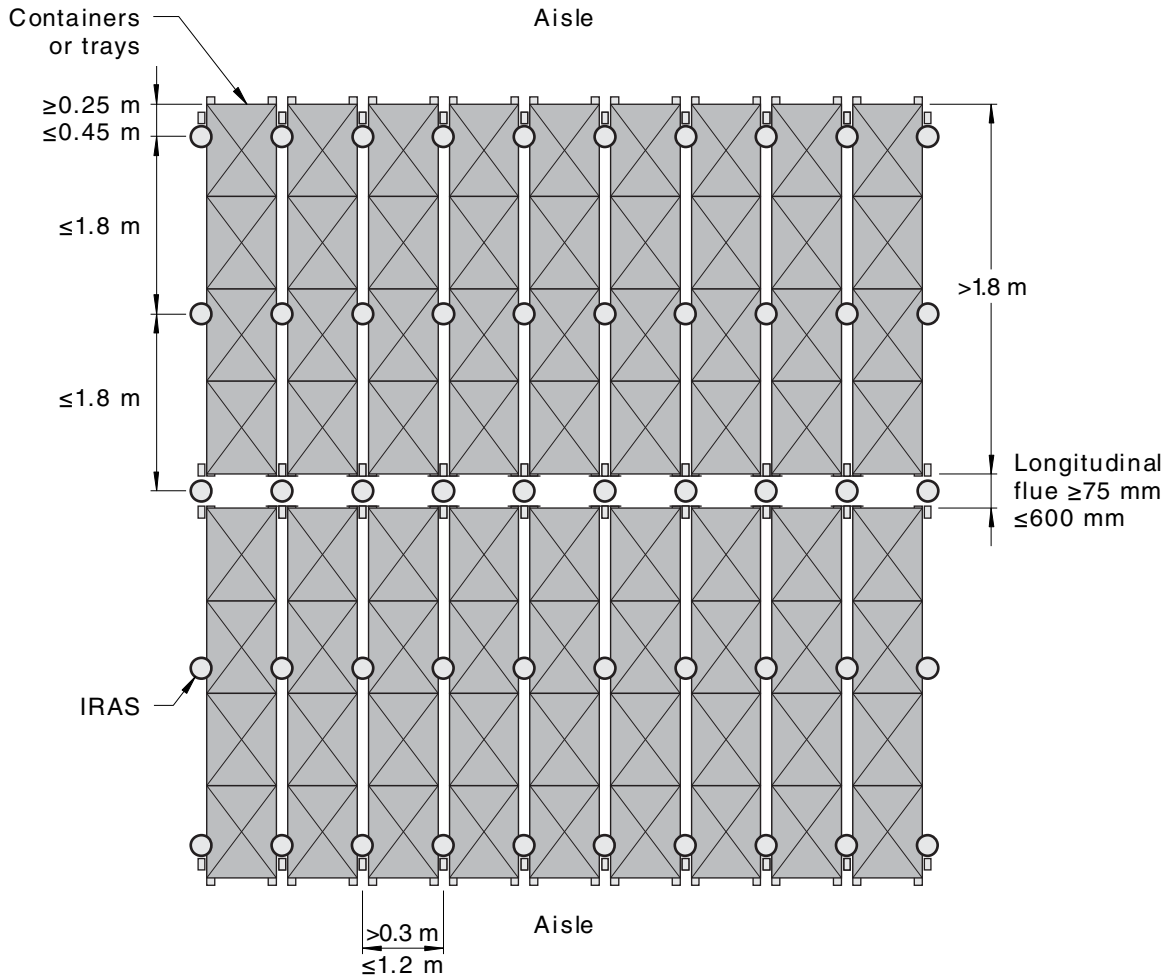
FIGURE 11.7.3.4.3.4(B) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENT FOR MINI-LOAD ASRS RACKS OVER 1.8 m DEPTH WITH LONGITUDINAL FLUE SPACES (HAVING FAVOURABLE PARAMETERS LISTED IN TABLE 11.7.3.3.3.1)



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FIGURE 11.7.3.4.3.4(C) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENT FOR MINI-LOAD ASRS RACKS OVER 1.8 m DEPTH WITHOUT LONGITUDINAL FLUE SPACES (PARAMETERS NOT LISTED IN TABLE 11.7.3.3.3.1)





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FIGURE 11.7.3.4.3.4(D) HORIZONTAL IN-RACK SPRINKLER ARRANGEMENT FOR MINI-LOAD ASRS RACKS OVER 1.8 m WITH LONGITUDINAL FLUE SPACES (PARAMETERS NOT LISTED IN TABLE 11.7.3.3.3.1)

**11.7.3.4.4 In-rack sprinkler vertical arrangement**

**11.7.3.4.4.1 Vertical spacing of in-rack sprinklers**

Where the specific conditions of material handling, composition, arrangement and commodity in Table 11.7.3.4.4 apply, in-rack sprinklers shall be spaced vertically at maximum 4.5 m. For all other arrangements, in-rack sprinklers shall be spaced vertically at maximum 3.0 m.

**11.7.3.4.4.2 Storage height above top level of in-rack sprinklers**

The maximum height of storage above the top level of in-rack sprinklers shall be 3.0 m.

**TABLE 11.7.3.4.4**  
**SPECIFIC CONDITIONS FOR 4.5 m VERTICAL SPACING**

Material handling	Material handling composition	Container arrangement	Commodity category
Trays	Non-combustible, cellulosic or unexpanded plastic	DNA	Category 1 to 5 and cartoned Category 6
Containers	Non-combustible	Closed-top or open-top	Category 1 to 6
		Mesh	Category 1 to 5 and cartoned Category 6
	Cellulosic	Closed-top	Category 1 to 6
		Vented open-top	Category 1 to 5 and cartoned Category 6
	Unexpanded plastic	Closed-top	Category 1 to 5 and cartoned Category 6
		Vented open-top	Category 1 to 5 and cartoned Category 6

#### 11.7.3.4.5 *In-rack sprinkler design*

The in-rack sprinkler system design shall be as follows:

- (a) The design of the in-rack sprinkler system shall be based on most remote sprinklers on any level operating as specified in Table 11.7.3.4.5.
- (b) Calculation of simultaneous flow to both ceiling sprinklers and in-rack sprinklers is not required.
- (c) Where more than one row of in-rack sprinklers are installed on a tier level, the design shall be split between two adjacent rows, either evenly or with one additional sprinkler on a row. When in-rack sprinklers are spaced at 0.6 m or closer, the design can be based on every other in-rack sprinkler operating.
- (d) Water supply duration shall be in accordance with Clause 11.6.6.

**TABLE 11.7.3.4.5  
IN-RACK SPRINKLER DESIGN CRITERIA**

Depth of ASRS row	Tray or container material composition	Maximum vertical distance between in-rack sprinklers m	No. of IRAS in design	Design flow from most remote IRAS, L/min	
				Vertical distances between tier levels $\geq 225$ mm	Vertical distances between tier levels $< 225$ mm
Up to 0.9 m	Non-combustible closed-top containers	3.0	4	115	190
		4.5	6	230	300
	Corrugated or expanded plastic trays or containers	3.0	6	230	300
	Everything else	3.0	4	230	300
		4.5	6	380	455
Over 0.9 m and up to 1.8 m	Non-combustible closed-top containers	3.0	6	115	190
		4.5	9	230	300
	Corrugated or expanded plastic trays or containers	3.0	8	230	300
	Everything else	3.0	6	230	300
		4.5	9	380	455
Over 1.8 m	Non-combustible closed-top containers	3.0	8	115	190
		4.5	12	230	300
	Corrugated or expanded plastic trays or containers	3.0	10	230	300
	Everything else	3.0	8	230	300
		4.5	12	380	455

**11.7.3.4.6 Ceiling level sprinkler system design where in-rack sprinklers are installed**

Ceiling sprinkler designs shall be as specified for—

- (a) non-combustible closed-top and open-top containers per Table 11.7.3.4.6(A); or
- (b) trays and combustible containers per Table 11.7.3.4.6(B).

For water supply duration requirements, see Clause 11.6.6.

**TABLE 11.7.3.4.6(A)**  
**CEILING SPRINKLER DESIGN FOR NON-COMBUSTIBLE CLOSED-TOP AND OPEN-TOP CONTAINERS IN MINI-LOAD ASRS**  
**RACKING PROTECTED BY IN-RACK SPRINKLERS**

Max. storage height above top level of in-rack sprinklers m	Max. vertical distance between top in-rack sprinkler level and the ceiling m	Wet system, pendant sprinklers										Wet system, upright sprinklers						
		Quick-response						Standard-response				Quick-response				Standard-response		
		<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 32.0	<i>K<sub>m</sub></i> 36.3	<i>K<sub>m</sub></i> 36.3EC	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 28.3	<i>K<sub>m</sub></i> 36.3	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 36.3EC	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 36.3
K11.2	K14.0	K16.8	K22.4	K25.2	K25.2EC	K11.2	K14.0	K19.6	K25.2	K11.2	K14.0	K16.8	K25.2EC	K11.2	K16.8	K25.2		
0	Any	20 @ 50	12 @ 170	12 @ 120	10 @ 100	10 @ 100	6 @ 140	20 @ 50	20 @ 50	12 @ 110	12 @ 50	20 @ 50	12 @ 170	12 @ 120	6 @ 140	20 @ 50	20 @ 50	20 @ 50
3.0	9.0	20 @ 50	12 @ 170	12 @ 120	10 @ 100	10 @ 100	6 @ 140	20 @ 50	20 @ 50	12 @ 110	12 @ 50	20 @ 50	12 @ 170	12 @ 120	6 @ 140	20 @ 50	20 @ 50	20 @ 50

NOTE: The shaded fields denote design criteria requiring a 60 min water supply duration.

**TABLE 11.7.3.4.6(B)**  
**CEILING SPRINKLER DESIGN FOR TRAYS AND COMBUSTIBLE CONTAINERS IN MINI-LOAD ASRS**  
**RACKING PROTECTED BY IN-RACK SPRINKLERS**

Max. storage height above top level of in-rack sprinklers m	Max. vertical distance between top in-rack sprinkler level and the ceiling m	Wet system, pendant sprinklers										Wet system, upright sprinklers						
		Quick-response						Standard-response				Quick-response				Standard-response		
		<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 32.0	<i>K<sub>m</sub></i> 36.3	<i>K<sub>m</sub></i> 36.3EC	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 28.3	<i>K<sub>m</sub></i> 36.3	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 20.2	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 36.3EC	<i>K<sub>m</sub></i> 16.0	<i>K<sub>m</sub></i> 24.2	<i>K<sub>m</sub></i> 36.3
K11.2	K14.0	K16.8	K22.4	K25.2	K25.2EC	K11.2	K14.0	K19.6	K25.2	K11.2	K14.0	K16.8	K25.2EC	K11.2	K16.8	K25.2		
0	Any	20 @ 50	12 @ 170	12 @ 120	10 @ 100	10 @ 100	6 @ 140	20 @ 50	20 @ 50	12 @ 110	12 @ 50	20 @ 50	12 @ 170	12 @ 120	6 @ 140	20 @ 50	20 @ 50	20 @ 50
1.5	3.0	20 @ 210	12 @ 170	12 @ 120	10 @ 100	10 @ 100	10 @ 150	20 @ 210	20 @ 120	20 @ 110	20 @ 50	20 @ 210	20 @ 120	20 @ 90	10 @ 150	20 @ 210	20 @ 90	20 @ 50
	4.5	25 @ 350	10 @ 240	12 @ 170	10 @ 100	10 @ 100	12 @ 260	25 @ 350	25 @ 220	25 @ 110	25 @ 70	25 @ 350	25 @ 220	25 @ 150	12 @ 260	25 @ 350	25 @ 150	25 @ 70
3.0	4.5	25 @ 350	10 @ 240	12 @ 170	10 @ 100	10 @ 100	12 @ 260	25 @ 350	25 @ 220	25 @ 110	25 @ 70	25 @ 350	25 @ 220	25 @ 150	12 @ 260	25 @ 350	25 @ 150	25 @ 70
	6.0		12 @ 350	12 @ 240	12 @ 140	12 @ 140												

NOTE: The shaded fields denote design criteria requiring a 60 min water supply duration.

#### 11.7.4 Enclosed ASRS storage arrangements

Enclosed ASRS storage arrangements shall be protected as follows:

- (a) Ceiling level sprinklers shall be installed over an enclosed ASRS based on the occupancy characteristics of adjacent areas.
- (b) Sprinklers shall be installed at the top of all enclosed ASRS storage units. Sprinklers shall be—
  - (i) quick response;
  - (ii) standard coverage;
  - (iii) 68°C rated;
  - (iv) minimum  $K_m 16.0$  (K11.2 US imp);
  - (v) pendant;
  - (vi) positioned at maximum linear spacing of 2.4 m;
  - (vii) positioned at maximum area coverage of 6.0 m<sup>2</sup>; and
  - (viii) designed on the basis all sprinklers inside the storage unit operate at the minimum flow or pressure specified in Table 11.7.4.
- (c) Enclosed ASRS storage units greater than 7.6 m high shall be protected as follows:
  - (i) Sprinklers at the top of enclosed ASRS shall be quick response storage sprinklers with each sprinkler meeting the minimum pressure specified in Table 11.6.3(G) based on the overall height of the Enclosed ASR unit.
  - (ii) Sprinklers are installed at the top and at intermediate levels of the enclosed ASRS are installed according to the requirements of Table 11.7.4.
  - (iii) Sprinklers shall be designed on the basis all sprinklers inside the storage unit operate at the minimum flow or pressure specified in Table 11.7.4.
- (d) Where intermediate level sprinklers are provided in an enclosed ASRS the intermediate level sprinklers shall be—
  - (i) quick response;
  - (ii) standard or extended coverage;
  - (iii) sidewall;
  - (iv) minimum  $K_m 11.5$  (K8.0 US imp);
  - (v) 68°C rated;
  - (vi) positioned at each end of the ASRS at maximum vertical spacing of 3.0 m; and
  - (vii) maximum storage above the top level of intermediate sprinklers 4.5 m.

**TABLE 11.7.4  
PROTECTION REQUIREMENTS FOR ENCLOSED ASRS  
STORAGE ARRANGEMENTS**

Internal height of enclosed ASRS m	Criteria1 for sprinklers at top of enclosed ASRS	Criteria1 for intermediate level sprinklers in enclosed ASRS	Minimum water supply duration minutes
Not greater than 7.6	Minimum flow 115 L/min	Not required	60
Over 7.6	Minimum pressure specified in Table 11.6.3(G) for the internal height of the ASRS and the sprinkler K factor	Not required	60
	Minimum flow 115 L/min	Minimum flow 115 L/min	60

NOTE: All sprinklers in the enclosed ASRS unit shall operate simultaneously at the minimum flow or pressure specified.

AMDT No. 2

**Clauses 12.1.4**

Paragraph 2, line 2, *delete* ‘Clauses 2.3.1.4, 2.3.1.5’ and *replace* with ‘Clauses 2.3.4, 2.3.5’.

AMDT No. 2

**Table 12.1.5.3(A)**

- 1 Column 5, row 9, *delete* ‘EO’ and *replace* with ‘N/A’.
- 2 Column 5, row 10, *delete* ‘N/A’ and *replace* with ‘EO’.
- 3 Column 5, row 11, *delete* ‘EO’ and *replace* with ‘N/A’.
- 4 Column 5, row 12, *delete* ‘N/A’ and *replace* with ‘EO’.
- 5 Column 5, row 13, *delete* ‘EO’ and *replace* with ‘N/A’.
- 6 Column 5, row 14, *delete* ‘N/A’ and *replace* with ‘EO’.

AMDT No. 2

**Table 12.1.5.3(C)**

Note 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

AMDT No. 2

**Table 12.1.5.3(D)**

- 1 Table title, *delete* ‘FAST’ and *replace* with ‘QUICK’.
- 2 *Delete* column title ‘Ceiling sprinkler protection criteria<sup>(1)</sup>’ and *replace* with ‘Ceiling sprinkler protection criteria (see Note)’.
- 3 Column 1, *delete* the row for storage arrangement ‘On-side<sup>(2)</sup>’ and *replace* with the following:

On-side in palletized portable racks	12.2	7.6	24.2	16.8	Pendent	12 @ 360	N/A
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AMDT No. 2

**Clause 12.1.5.6**

List Item (iii), *delete* ‘Fast’ and *replace* with ‘Quick’.

AMDT No. 2

**Clause 12.1.5.8**

List Item (iii), *delete* ‘Fast’ and *replace* with ‘Quick’.

- 
- AMDT  
No. 2     **Clause 12.2.10**  
1     Commentary C12.2.10, line 1, *delete* ‘fast’ and *replace* with ‘quick’.  
2     Commentary C12.2.10, line 5, *delete* ‘fast’ and *replace* with ‘quick’.
- 

- AMDT  
No. 2     **Table 12.2.14.1**  
*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.
- 

- AMDT  
No. 2     **Table 12.2.15.1**  
*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.
- 

- AMDT  
No. 2     **Table 12.2.16.1**  
*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.
- 

- AMDT  
No. 2     **Clause 12.4.5.1**  
List Item (b), line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 

- AMDT  
No. 2     **Clause 12.4.7**  
1     Paragraph 1, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.  
2     Paragraph 2, line 1, *delete* ‘fast’ and *replace* with ‘quick’.  
3     Paragraph 3, line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 

- AMDT  
No. 2     **Clause 12.4.9**  
Paragraph 1, line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 

- AMDT  
No. 2     **Table 12.4.10.3(A)**  
*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.
- 

- AMDT  
No. 2     **Table 12.4.10.3(B)**  
Column 3, heading, *delete* ‘Fast’ and *replace* with ‘Quick’.
- 

- AMDT  
No. 2     **Clause 12.4.11.2**  
1     List Item (b), line 1, *delete* ‘fast’ and *replace* with ‘quick’.  
2     List Item (b), line 3, *delete* ‘fast’ and *replace* with ‘quick’.
- 

- AMDT  
No. 2     **Clause 12.4.11.4**  
List Item (c)(i)(B), line 3, *delete* ‘fast’ and *replace* with ‘quick’.
- 

- AMDT  
No. 2     **Table 12.5.3**  
*Delete* ‘fast’ and *replace* with ‘quick’ in all instances.
-



AMDT  
No. 2 **Table 12.6.6.4(A)**  
LEGEND, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Table 12.6.6.4(B)**  
LEGEND, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Table 12.6.6.4(C)**  
LEGEND, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Table 12.6.6.4(D)**  
LEGEND, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Table 12.6.6.4(E)**  
LEGEND, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Table 12.6.6.4(F)**  
LEGEND, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Clause 12.6.6.6**  
List Item (a), line 1, *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2 **Clause 12.6.6.8.2**  
Paragraph 2, line 1, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Clause 12.6.9**  
List Item (a), line 2, *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2 **Table 13.5.5.1**

1	Column 2, row 1, <i>delete</i> ‘—’ and <i>replace</i> with ‘Yes’.
2	Column 2, row 4, <i>delete</i> ‘—’ and <i>replace</i> with ‘Yes and No’.
3	Column 2, row 7, <i>delete</i> ‘No’ and <i>replace</i> with ‘—’.
4	Column 2, row 8, <i>delete</i> ‘No’ and <i>replace</i> with ‘—’.

---

AMDT  
No. 2 **Table 13.5.5.2(A)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Table 13.5.5.2(B)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2 **Table 13.5.5.3(A)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.3(B)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.4(A)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.4(B)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.4(C)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.4(D)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Clause 13.5.5.5.1**  
1      List Item (a), line 2, *delete* ‘fast’ and *replace* with ‘quick’.  
2      List Item (b), line 2, *delete* ‘fast’ and *replace* with ‘quick’.

---

AMDT  
No. 2      **Table 13.5.5.5.1(A)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.6**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.7(A)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.7(B)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.7(C)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.7(D)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Table 13.5.5.7(E)**  
LEGEND, line 2, *delete* ‘Fast’ and *replace* with ‘Quick’.

---

AMDT  
No. 2      **Figure 13.5.6(J)**  
Figure title, *delete* ‘FAST’ and *replace* with ‘QUICK’.

---

- 
- AMDT  
No. 2      **Figure 13.5.6(K)**  
Figure title, *delete* ‘FAST’ and *replace* with ‘QUICK’.
- 
- AMDT  
No. 2      **Clause 13.5.7.2**  
List Item (b), line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 
- AMDT  
No. 2      **Clause 13.5.7.3**  
List Item (b), line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 
- AMDT  
No. 2      **Clause 13.5.7.4**  
List Item (b), line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 
- AMDT  
No. 2      **Clause 13.5.7.5**  
List Item (b), line 1, *delete* ‘fast’ and *replace* with ‘quick’.
- 
- AMDT  
No. 2      **Paragraph A4.1, Appendix A**
- 1      List Item (m), *add* the following to the end of the sentence:  
        ‘including recycling and sorting waste plastics’.
  - 2      *Delete* list Item (n).
-

## Preparation of Australian Standards

Australian Standards are prepared by a consensus process involving representatives nominated by organizations drawn from all major interests associated with the subject. Australian Standards may be derived from existing industry Standards, from established international Standards and practices or may be developed within a Standards Australia technical committee.

The following interests are represented on the committee responsible for this draft Australian Standard:

Association of Hydraulic Services Consultants Australia  
Australasian Fire and Emergency Service Authorities Council  
Australian Building Codes Board  
Australian Chamber of Commerce and Industry  
Australian Institute of Building Surveyors  
Bulky Goods Retailers Association  
CSIRO  
Department of Health and Human Services, Vic.  
Engineers Australia  
Fire Protection Association Australia  
Insurance Council of Australia Limited  
National Fire Industry Association

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