Shelfbot Fire Protection

SB-SPEC-FIRE · Version 3.1 · 18 August 2026

1. Introduction

This document defines the fire protection design basis of the Shelfbot Goods-to-Person Automated Storage & Retrieval System (ASRS). It records the fire-relevant properties of the system (storage container construction, storage geometry, flue spaces, shelving, clearances, and fire system interfaces) and the standards framework against which the system has been designed and independently assessed.

It is intended for fire engineers, sprinkler designers, insurers and their risk engineers, building surveyors/certifiers, and fire brigade approvals officers evaluating a Shelfbot installation.

> **Note**
> This document is a design basis statement, not a fire engineering design. Sprinkler system design, hydraulic verification, and regulatory approval for each installation remain the responsibility of a qualified fire engineer and sprinkler designer engaged for that project.

2. Purpose & Scope

2.1 Purpose

To provide, in one document, the fire-relevant parameters of the Shelfbot system that a project fire engineer, insurer, or approving authority requires to assess sprinkler protection, and to state the design pathway under which ceiling-only sprinkler protection (i.e. no in-rack sprinklers) is achievable.

2.2 Scope

This document **covers**:

- The standards framework and ASRS classification of the Shelfbot system
- Storage container (tote) construction and its commodity classification treatment
- Storage geometry, transverse and longitudinal flue spaces
- Shelving openness requirements
- Clearances and height limits
- Ceiling-only sprinkler protection capability by ceiling height and commodity class
- Fire system interfaces (detection shutdown, access gate release, firefighter access)
- Site verification requirements

This document **does not cover**:

- Site-specific sprinkler design, hydraulic calculations, or water supply design
- Fire hydrant, hose reel, and other building fire services (addressed per project under the applicable standards and local brigade guidelines)
- Structural racking requirements: refer to the **Shelfbot Racking Specification**

- Robot mechanical and electrical specifications: refer to the **Shelfbot Technical Data Sheet**

3. Standards Framework & System Classification

3.1 Primary design basis: FM Global

The Shelfbot system is designed to **FM Property Loss Prevention Data Sheet 8-34, Protection for Automatic Storage and Retrieval Systems (April 2026)**, under which it is classified as a **shuttle-type, horizontal-loading ASRS (HL-ASRS)**: totes rest on slatted/mesh shelving free of vertical alignment guides, so the rack structure does not divert sprinkler discharge away from the flue spaces.

FM DS 8-34 was selected as the primary design basis because:

- it is the reference applied by FM-insured facilities and their risk engineers globally;
- it is the most current and complete treatment of shuttle-type ASRS fire protection; and
- it is generally more stringent than the corresponding Australian Standard provisions, so a Shelfbot system designed to FM DS 8-34 also supports compliance under the Australian pathway below.

3.2 Australian regulatory pathway: BCA / AS 2118.1

For Building Code of Australia (BCA) Deemed-to-Satisfy compliance, the applicable standard is **AS 2118.1:2017 Amendment 2**. AS 2118.1 does not yet recognise the shuttle type; under its current categories the Shelfbot system is protected as a **'Rack Structure' type ASRS** (Clause 11.7), with requirements the FM-compliant design meets or exceeds (e.g. AS minimum aisle 600 mm vs Shelfbot 1200 mm; AS transverse flue 150 mm at intervals up to 2.7 m vs Shelfbot 75 mm at intervals up to 1.4 m).

Where a project invokes FM DS 8-34 in lieu of AS 2118.1 tables, this is documented through a project-specific Fire Engineering Report (FER) or equivalent performance pathway, subject to state legislation.

3.3 Independent assessment

The Shelfbot system has been independently assessed by **Omnii Pty Ltd** (Fire Protection Technical Assessment Report, Project 11822101, Revision B, 29 July 2026, Final). The assessment also considered written commentary provided to Shelfbot by FM Global engineers on the treatment of the steel mesh tote. Copies of the assessment are available to customers, their fire engineers, and insurers on request.

4. Storage Containers (Totes)

4.1 Standard tote: steel mesh

Property	Value
Construction	Welded steel mesh: sides, ends, and base
Top	Open
Dimensions	800 mm long × 420 mm wide (standard); length 700-800 mm, height 150-350 mm by configuration

Property	Value
Maximum gross weight	30 kg
Base runners	5 × 25 mm wide plastic strips fitted to the underside to allow the tote to slide on the mesh decks (less than 5% of tote weight)

The steel mesh tote is the key fire protection feature of the Shelfbot system:

- **Minimal fuel contribution.** The tote is steel with only minor plastic slide strips (under 5% of tote weight), and is assessed as a **Class 3 commodity** under FM DS 8-1 and AS 2118.1. The design commodity classification for a given installation is therefore the higher of Class 3 and the classification of the stored product. By contrast, a plastic tote drives the classification to at least uncartoned unexpanded plastic regardless of contents.
- **It does not collect or divert water.** Sprinkler discharge passes through the tote to pre-wet the commodity and lower storage levels, and cannot pool (no added rack load from retained water, no diversion away from flue spaces).

4.2 Classification treatment under FM DS 8-34

Because the steel mesh tote neither contributes materially to fire spread nor collects water, the independent assessment treats the tote as a **closed-top container** under **FM DS 8-34 Section 2.2.3** (shuttle ASRS storage that does not collect water), with the design commodity classification being the higher of the tote (Class 3) and the stored product. This treatment is based on Shelfbot's independent fire engineering assessment and written commentary from FM Global engineers, both of which are documented in the Omnii report. Confirmation of the treatment for a specific project rests with the project fire engineer and, for FM-insured sites, the account's FM engineer.

Products that themselves collect water (e.g. open-top rigid containers stored as the commodity) require assessment on a per-SKU-profile basis.

5. Storage Geometry & Flue Spaces

Parameter	Value	Basis
Aisle width	1200 mm nominal, upright-to-upright	FM DS 8-34 minimum 1.1 m (ceilings up to 9.1 m) / 1.2 m (ceilings over 9.1 m); AS 2118.1 minimum 600 mm
Totes per bay level	5, uniformly spaced	Standard configuration
Transverse flue spaces (TFS)	Minimum 75 mm net between adjacent totes, at intervals of approximately 0.5 m and not more than 1.4 m	FM DS 8-34 Table 2.2.1.4.2.1 (75 mm at intervals up to 1.5 m); AS 2118.1 (75 mm at intervals up to 1.4 m)
TFS alignment	Vertically aligned and unobstructed for the full height of the rack	Tote positions are fixed by the Shelfbot grid and enforced by the control system; totes cannot be placed within a flue space
Longitudinal flue space (double rows)	Minimum 150 mm clear, full height	AS 2118.1 Clause 11 / FM DS 8-34
Mesh crossing flue spaces	Permitted: deck is at least 70% uniformly open	FM DS 8-34 Section 2.2.1.4.1.3; AS 2118.1

6. Shelving

Shelves are standard waterfall wire mesh decks per the Shelfbot Racking Specification (100 × 50 mm aperture, 4-6 mm wire), providing a uniformly open area of **84-89%**, exceeding the 70% minimum required by both FM DS 8-34 and AS 2118.1 for shelving crossing flue spaces and for avoiding solid-shelf in-rack sprinkler triggers. Solid shelves are not permitted in a Shelfbot installation.

7. Clearances & Heights

- Racking frame heights: 4 m to 10 m (per Racking Specification).
- Top of storage is maintained at least **900 mm** below ceiling-level sprinkler deflectors.
- The governing dimension for sprinkler design is the **ceiling height**, not the storage height: subject to the 900 mm clearance, Shelfbot storage may use the full available building height without changing the sprinkler design category.

8. Ceiling-Only Sprinkler Protection Capability

Based on Shelfbot's independent fire engineering assessment and written commentary from FM Global engineers: with the standard configuration (steel mesh totes, 1200 mm aisles, compliant flue spaces, at least 70% open mesh decks) protected by a **wet-pipe sprinkler system**, ceiling-only sprinkler protection with **no in-rack sprinklers** is achievable for all commodity classes at ceiling heights up to **12.2 m**. Commodity classes per FM DS 8-1 / AS 2118.1.

Commodity of stored product	Ceiling up to 9.1 m	Ceiling up to 12.2 m	Ceiling over 12.2 m
Class 1-3	✓ Ceiling-only	✓ Ceiling-only	In-rack sprinklers, or suspended ceiling at 12.2 m or below
Class 4 / cartoned unexpanded plastics	✓ Ceiling-only	✓ Ceiling-only	In-rack sprinklers, or suspended ceiling at 12.2 m or below
Cartoned expanded plastics	✓ Ceiling-only	✓ Ceiling-only	In-rack sprinklers, or suspended ceiling at 12.2 m or below
Uncartoned unexpanded plastics	✓ Ceiling-only	✓ Ceiling-only	In-rack sprinklers, or suspended ceiling at 12.2 m or below
Uncartoned expanded plastics	✓ Ceiling-only	✓ Ceiling-only	In-rack sprinklers, or suspended ceiling at 12.2 m or below

Table applies to wet-pipe ceiling sprinkler systems. Dry-pipe and similar systems (e.g. unheated or refrigerated facilities) have substantially lower ceiling-only height limits and are assessed per site. Under the AS 2118.1 pathway, ceiling heights up to 13.7 m are achievable for Class 1-4 and cartoned unexpanded plastic commodities.

This capability statement is subject to confirmation for each installation through the project's fire engineering report and sprinkler design. The sprinkler design for a given site (number of operating sprinklers, K-factor, operating pressure, hose stream allowance, and water supply duration) is selected and hydraulically verified by the project fire engineer and sprinkler designer from the current FM DS

8-34 tables, or from AS 2118.1 where that pathway applies. Required sprinkler demand increases with commodity class.

> **Note**
> Ceiling-only capability is a property of the building and its water supply as much as of the storage system. See *Site Verification Requirements*.

9. Fire System Interfaces

The Shelfbot system provides the following interfaces and features relevant to fire protection design:

- **Detection shutdown.** The Shelfbot safety control system accepts an external fire trip input (volt-free contact) from the building's fire detection or sprinkler system. On activation, all robot operations shut down automatically, as recommended by FM DS 8-34 Section 2.2.1.7.
- **Aisle access gate release.** Aisle access gates can be configured to release on activation of the fire sprinkler or fire detection systems, providing fire brigade access to the aisles.
- **Firefighter access.** The 1200 mm aisles exceed the 1.0 m minimum width recommended for firefighter access in breathing apparatus.
- **No lithium-ion batteries.** Shelfbot robots are mains-powered via the rail system and contain no lithium-ion batteries; FM DS 7-112 (Lithium-Ion Battery Storage) considerations do not apply to the Shelfbot equipment.
- **Enclosed system.** The rack structure is enclosed with full-height mesh guarding; aisles are not normally occupied spaces.

10. Site Verification Requirements

The following must be verified for each installation by the project fire engineer / sprinkler designer:

1. **Commodity classification** of the customer's product profile per FM DS 8-1 (or AS 2118.1 Appendix A4), including plastic content and any water-collecting products. The design commodity is the higher of the stored product and Class 3 (the standard tote).
2. **Ceiling height and construction** over the storage area (measured to the underside of the roof/ceiling at its highest point over the storage).
3. **Sprinkler system type.** The ceiling-only capability (*Ceiling-Only Sprinkler Protection Capability*) applies to wet-pipe systems; dry-pipe and similar systems are assessed separately.
4. **Existing sprinkler system capability** for retrofit sites: sprinkler type and K-factor, pump duty, and tank capacity against the required design, including hose stream allowance and duration.
5. **Regulatory pathway**: BCA DtS via AS 2118.1, or FM DS 8-34 via Fire Engineering Report / performance solution, per the applicable state legislation and, for insured sites, the insurer's requirements.
6. **Storage of excluded goods.** Flammable liquids, aerosols, and other special hazards are not permitted in the system (refer to the Shelfbot User Manual, Storage of Dangerous or Flammable Products).

11. References

- FM Property Loss Prevention Data Sheet 8-34, *Protection for Automatic Storage and Retrieval Systems* (April 2026)
- FM Property Loss Prevention Data Sheet 8-1, *Commodity Classification*
- FM Property Loss Prevention Data Sheet 8-9, *Storage of Class 1, 2, 3, 4 and Plastic Commodities*
- AS 2118.1:2017 (Amdt 2), *Automatic fire sprinkler systems: General systems*
- AS 2419.1:2021, *Fire hydrant installations: System design, installation and commissioning*
- AS 4084:2023, *Steel storage racking*
- Omnii Pty Ltd, *Fire Protection Technical Assessment Report: Shelfbot*, Project 11822101, Revision B (29 July 2026)
- Shelfbot Racking Specification
- Shelfbot Technical Data Sheet

12. Revision History

Version	Date	Change
3.1	19/08/2026	Published to Web Site