



## 1. SCOPE

The current Australian Standard AS 4487:2013+A1:2017 specifies the requirements for condensed aerosol fire extinguishing systems. It was first published in 1997<sup>1</sup> and was amended in 2017. All references to AS 4487 or “the Standard” in this document exclusively refers to AS 4487:2013 +A1:2017.

There are additional international standards in use for the testing and certification of aerosol fire extinguishing systems by various testing, certifying and/or approval agencies.

This document specifies evaluation (testing) and recognition requirements and pathways for CSIRO’s ActivFire® Scheme operating as a recognised testing and approval body under Clause 6.1 of AS 4487.

## 2. REFERENCED DOCUMENTS

Details of the documents referenced by this technical specification are detailed in Table 1.

**Table 1 List of documents referenced by this technical specification.**

<b>AS 4487-2013 + A1:2017</b>	Condensed aerosol fire extinguishing systems – Requirements for system design, installation and commissioning and test method for components
<b>UL 2775:2022A</b>	Standard for Fixed Condensed Aerosol Extinguishing System Units
<b>ISO 15779:2011</b>	Condensed aerosol fire extinguishing systems – Requirements and tests methods for components and system design, installation and maintenance – General requirements
<b>AS ISO/IEC 17025:2018</b>	General requirements for the competence of testing and calibration laboratories

## 3. LISTING AND RECOGNITION

Clause 6.1 of AS 4487 requires that condensed aerosol generators shall be tested and listed by a listing organisation which includes CSIRO’s ActivFire scheme (as defined by Clause 3.20 and 3.21). The test methods that shall be used to evaluate the performance of condensed aerosol generators are detailed in Appendices D and E of AS 4487. Where acceptable to the listing organisation, alternative internationally recognised equivalent test protocols can be used.

## 4. TEST PROTOCOL SELECTION

Clause 6 of AS 4487 sets out the testing methods and performance requirements used to evaluate the performance of condensed aerosol generators and is detailed in Table 2:

**Table 2 AS 4487 test methods and performance requirements**

<b>Appendix D of AS 4487</b>	Test methods
<b>Appendix E of AS 4487</b>	Extinguishing application density / coverage test procedure
<b>Clause 6.2 of AS 4487</b>	Design application densities
<b>Clause 6.3 of AS 4487</b>	Aerosol generator performance requirements
<b>UL 2775</b>	ActivFire internationally recognized test protocol as permitted by Clause 6.1 of AS 4487.
<b>ISO 15779</b>	ActivFire internationally recognized test protocol as permitted by Clause 6.1 of AS 4487.

<sup>1</sup> As AS/NZS 4487-1997

Where AS 4487 requires a test for the determination of extinguishing application densities and area coverage in accordance with Appendix E (or any other internationally recognised standard listed in Table 2 above), it is a requirement of CSIRO's ActivFire Scheme, that such tests are witnessed and validated by a representative of CSIRO's Fire Systems Laboratory and/or CSIRO's ActivFire Scheme. A smaller test program may be agreed, upon presentation of evidence.

A comparison of the requirements of the design application densities of AS 4487 and UL 2775 is provided in Table 5.

## 5. TECHNICAL VERIFICATION PROCEDURE

It is a requirement of this procedure that a proportion of the documentation submitted as evidence of conformity to AS 4487 shall be records and reports from recognised testing agencies in accordance with suitable and relevant protocols, standards, or specifications.

Verification of conformity of a condensed aerosol fire extinguishing systems, for the purposes of a CSIRO product certification scheme, requires the following activities detailed in Table 3.

**Table 3 Activities required by TS-016 to verify conformity of condensed aerosol fire extinguishing systems for the purposes of certification.**

Activity	Description
1	On site witnessing of extinguishing application density tests and distribution coverage in accordance with AS 4487 or UL 2775 or ISO 15779.
2	Verification that the aerosol generators meet the performance requirements of AS 4487:2013 through the test methods of AS 4487 or UL 2775 or ISO 15779.
3	The nameplate or other permanent marking meet the requirements of AS 4487:2013.
4	Review of the design and installation manual(s).
5	Identification of system and component limitations.
6	Prescription of ongoing constancy of conformity activities required for certification.

Evidence for conformity may be provided through validated external test, compliance, technical evaluation (or similar) reports from recognised external agencies and/or laboratories.

A Verification of Conformity report is required, as prepared by CSIRO's Fire System Laboratory, and shall contain the evidence of conformity addressing the review of system documentation, system limitations and any requirements for the constancy of conformity program detailed in the relevant clauses of AS 4487.

## 6. EVALUATION

### 6.1. Evaluation schedule

To meet the requirements of AS 4487, the registrant of the product shall:

- supply evidence of conformity covering the requirements as described in Table 4, or;
- test report(s) and Certificate of Conformity by Underwriters Laboratory (UL) covering the clauses described in Table 5, or
- test report(s) by an ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility covering the clauses described in Table 6.

**Table 4 Evaluation schedule required to demonstrate conformity to AS 4487 using the test methods of AS 4487.**

Clause	Title	Evidence of conformity required	Comments
6.2.2	Class B fires	Yes	<ul style="list-style-type: none"> <li>If relevant to the system, on site witnessing to Appendix E of AS 4487 or Clause 49.3 of UL 2775 or Clause 6.2.2 of ISO 15779.</li> <li>Test report by Underwriters Laboratory (UL) to be provided for UL 2775 or ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility for ISO 15779.</li> </ul>
6.2.3	Class A fires	Yes	<ul style="list-style-type: none"> <li>If relevant to the system, on site witnessing to Appendix E of AS 4487 or Clause 49.3 of UL 2775 or Clause 6.2.3 of ISO 15779.</li> <li>Test report by UL to be provided for UL 2775 or ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility for ISO 15779.</li> </ul>
6.2.4	Higher Hazard Class A fires	Yes	<ul style="list-style-type: none"> <li>If relevant to the system, on site witnessing to Appendix E of AS 4487 or Clause 6.2.4 of ISO 15779.</li> <li>Test report to be provided by ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility for ISO 15779.</li> </ul>
6.3.2	Distribution coverage – Condensed aerosol generators	Yes	<ul style="list-style-type: none"> <li>To be specified by manufacturer.</li> <li>On site witnessing to Appendix E of AS 4487, or Clause 50 or 51 of UL 2775 or Clause 6.3.2 of ISO 15779.</li> <li>Test report by UL to be provided for UL 2775 or ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility for ISO 15779.</li> </ul>
6.3.3	Discharge time	Yes	<ul style="list-style-type: none"> <li>To be specified by manufacturer.</li> <li>Verified by test procedures described in Appendix E of AS 4487.</li> </ul>
6.3.4	Ambient temperature and humidity operation range	Yes	<ul style="list-style-type: none"> <li>Specified by the manufacturer.</li> <li>Verified by test procedure described in Appendix D8 for accelerated aging test and Appendix D7 for temperature and humidity operation range.</li> </ul>
6.3.5	Service life	Yes	<ul style="list-style-type: none"> <li>Specified by the manufacturer.</li> <li>Verified by the accelerated aging test procedure of Appendix D8</li> </ul>
6.3.6	Vibration and shock resistance	Yes	The aerosol generator and mounting bracket shall withstand the vibration and shock resistance test as described in Appendix D, Paragraph D11.
6.3.7	Corrosion	Yes	The aerosol generator and mounting bracket shall withstand the corrosion test as described in Appendix D, Paragraph D9.
6.3.8	Impact	Yes	The aerosol generator and mounting bracket shall not be a disposal hazard after the impact (drop) test as described in Appendix D, Paragraph D13.
6.3.9	Actuation element	Yes	Specified by the manufacturer for all types of actuation devices incorporated in the aerosol generator.
6.3.10	Exposure to fire	Yes	For aerosol generators intended to be installed inside the protected enclosure shall be tested under the heat exposure conditions by the test procedures as described in Appendix D, Paragraph D17.

**Table 5 Evaluation schedule required to demonstrate conformity to AS 4487 using the test protocols of UL 2775.**

Clause	Title	Evidence of conformity required	Comments
21	Discharge test	Yes	-
22	Temperature measurement test	Yes	-
23	Mounting device test	Yes	-
24	Rough usage test	Yes	-

## CONFORMITY VERIFICATION OF CONDENSED AEROSOL FIRE EXTINGUISHING SYSTEMS

Clause	Title	Evidence of conformity required	Comments
25	Vibration test	Yes	-
26	Pyrotechnic reaction containment test	Yes	-
27	Fire exposure test	Yes	-
28	High humidity test	Yes	-
29	Moist hydrogen sulphide air mixture corrosion test	Yes	-
30	Moist carbon dioxide-sulphur dioxide air mixture corrosion test	Yes	-
31	Salt spray corrosion test	Yes	-
32	Thirty-day elevated temperature test	Yes	May be covered by clause 28, high humidity test.
33	Temperature cycling test	Yes	-
34	One-year time leakage test	Yes	If relevant to the system.
35	Hydrostatic pressure test	Yes	If relevant to the system.
36	Pressure relief test	Yes	If relevant to the system.
37	Flexible hose assembly low temperature test	Yes	If relevant to the system.
38	Calibration test – gauges	Yes	If relevant to the system.
39	Burst strength test – gauges	Yes	If relevant to the system.
40	Overpressure test – gauges	Yes	If relevant to the system.
41	Impulse test – gauges	Yes	If relevant to the system.
42	Pressure relief test – gauges	Yes	If relevant to the system.
43	Water resistance test – gauges	Yes	If relevant to the system.
44	Pneumatic operation test	Yes	If relevant to the system.
45	Pneumatic time delay verification test	Yes	If relevant to the system.
46	Pressure-operated alarm test	Yes	If relevant to the system.
47	Operation test of manual actuators and manual pull stations	Yes	If relevant to the system.
48	500 cycle operation test	Yes	-
49	Class A and B Fire Extinguishment test	Yes	On-site witnessing by a CSIRO representative is required.
50	Distribution verification extinguishment tests with extinguishing system unit	Yes	<ul style="list-style-type: none"> <li>If relevant to the system.</li> <li>On-site witnessing of the test by a CSIRO representative may be required.</li> </ul>
51	Distribution verification extinguishment tests with automatic extinguisher unit	Yes	<ul style="list-style-type: none"> <li>If relevant to the system.</li> <li>On-site witnessing of the test by a CSIRO representative may be required.</li> </ul>
52	Automatic extinguisher unit automatic operation extinguishment tests	Yes	<ul style="list-style-type: none"> <li>If relevant to the system.</li> <li>On-site witnessing of the test by a CSIRO representative may be required.</li> </ul>
53	Elastomeric parts test	Yes	If relevant to the system.
54	Stress corrosion cracking test for brass parts	Yes	If relevant to the system.
55	Aging test – condensed aerosol generator	Yes	-
56	Aging tests – plastic materials	Yes	If relevant to the system.
57	Nameplate exposure tests	Yes	Maybe waived depending on material, type, and compatibility, to be decided by UL.
58	Nameplate adhesion test	Yes	
59	Nameplate abrasion test	Yes	
60	Locking device and tamper indicator test	Yes	If relevant to the system.

**Table 6 Evaluation schedule required to demonstrate conformity to AS 4487 using the test methods of ISO 15779.**

Clause	Title	Evidence of conformity required	Comments
6.2.2	Class B fire	Yes	<ul style="list-style-type: none"> <li>If relevant to the system, on site witnessing to Appendix D of ISO 15779.</li> <li>Test report by an ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility.</li> </ul>
6.2.3	Class A solid burning surface fire	Yes	<ul style="list-style-type: none"> <li>If relevant to the system, on site witnessing to Appendix D of ISO 15779.</li> <li>Test report by an ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility.</li> </ul>
6.2.4	EDP (electronic data processing) rooms, telecommunication and electronic risks.	Yes	<ul style="list-style-type: none"> <li>If relevant to the system, on site witnessing to Appendix D of ISO 15779.</li> <li>Test report by an ILAC-MRA ISO 17025 and ISO 15779 accredited testing facility</li> </ul>
6.3.2	Distribution coverage	Yes	<ul style="list-style-type: none"> <li>Determined by the fire extinguishment / area coverage fire procedure in Appendix D.5.1 and D.5.2.</li> <li>On site witnessing of the test by a CSIRO representative may be required.</li> </ul>
6.3.3	Effective discharge	Yes	Verified by the test procedure described in Annex C.
6.3.4	Ambient temperature and humidity operation range	Yes	Verified by the test procedure described in Annex C.
6.3.5	Service life	Yes	Verified by the test procedure described in Annex C.
6.3.6	Vibration and shock resistance	Yes	Verified by the test procedure described in Annex C.
6.3.7	Corrosion	Yes	Verified by the test procedure described in Annex C.
6.3.8	Impact	Yes	Verified by the test procedure described in Annex C.
6.3.9	Actuation element	Yes	Specified by the manufacturer for all types of actuation devices incorporated in the aerosol container.
6.3.10	Exposure to fire	Yes	Verified by the test procedure described in Annex C.

## 6.2. Design application densities performance requirements

Table 7 provides a comparison of the requirements the design application densities of AS 4487 and UL 2775.

**Table 7 Comparison of the requirements design application densities of AS 4487 and UL 2775**

Class of fire	AS 4487	UL 2775
Class B fire	<ul style="list-style-type: none"> <li>Minimum extinguishing application density for each Class B fuel × safety factor of 1.3.</li> <li>Minimum extinguishing application density fire test -Appendix E, Paragraph E6.2.</li> <li>For hazards involving multiple fuels, the value for the fuel requiring the greatest design application density shall be used.</li> </ul>	<ul style="list-style-type: none"> <li>Minimum extinguishing application density for each Class B fuel × safety factor of 1.3.</li> <li>Minimum extinguishing application density fire test – Clause 49.3, Class B fire extinguishment test.</li> <li>For hazards involving multiple fuels, the value for the fuel requiring the greatest design application density shall be used.</li> </ul>
Class A fire	<ul style="list-style-type: none"> <li>Fire test procedure Appendix E, Paragraphs E6.1, E6.3 and E6.4.</li> <li>Minimum extinguishing application density for Class A fires is the highest extinguishing concentration density determined from the results of four test scenarios × safety factor of 1.3.</li> </ul>	<ul style="list-style-type: none"> <li>Fire test procedure in accordance with Clause 49.2.</li> <li>Minimum extinguishing application density for Class A fires is the highest extinguishing concentration density determined from the results of four test scenarios × safety factor of 1.3.</li> </ul>

Higher hazard Class A fires (e.g., electrical switch rooms, telecommunication, and electronic risks)	An extinguishing concentration not less than that determined in accordance with Clause 6.2.3, or not less than 95% of that determined from the heptane fire test described in Appendix E, Paragraph E6.2, whichever is the greater, shall be used under certain conditions. These conditions include: a) Cable bundles greater than 100 mm in diameter. b) Cable trays with a fill density greater than 20% of the tray cross-section. c) Horizontal or vertical stacks of cable trays (closer than 250 mm). d) Equipment energised during the extinguishment period where the collective power consumption exceeds 5 kW.	An extinguishing concentration not less than Clause 49.2, or not less than 95% of that of Clause 49.3, whichever is greater, shall be used under certain conditions. These conditions include: a) Cable bundles greater than 100 mm in diameter. b) Cable trays with a fill density greater than 20% of the tray cross-section. c) Horizontal or vertical stacks of cable trays (closer than 250 mm). d) Equipment energised during the extinguishment period where the collective power consumption exceeds 5 kW.
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### 6.3. Marking

Clause 6.4 states that each aerosol generator shall have a permanent nameplate or other permanent marking put by the manufacturer containing, but not limited to, the following details:

- a) Condensed aerosol trade name.
- b) Manufacturer.
- c) Date of manufacture.
- d) Serial number.
- e) Mass of aerosol forming compound.

### 6.4. Suitability of External Evidence

Assessment of the suitability of external agencies (laboratory) evidence shall be conducted in accordance with the CSIRO Recognition Framework.

Evidence of conformity, in the form of endorsed test reports written in English, are required to be submitted in full. Where test reports were originally produced in a language other than English, suitable translations may be supplied in addition. Submitted external test reports must provide sufficient detail to describe the product being evaluated in full and in detail and establish that an evaluation schedule was designed and applied to each component submitted to the external agency.

External evidence can only be accepted where verification between the product submitted for evaluation and the specimens in the endorsed test report is considered a critical requirement. Where external reports do not provide sufficient product identification, additional evaluation to specified requirements (testing) may be required.

### 6.5. Certificates of Conformity

Certificates, such as those published by a Conformity Assessment Body, do not provide direct and sufficient detail for the purposes of evaluation for conformity in accordance with this technical specification.

## 7. REPORTING

The conformity evaluation report shall include relevant information specified as follows:

- a) A statement of conformity with reference to CSIRO-TS016 and unambiguous designation of the following:
  - All system components evaluated in accordance with this technical specification.
- b) All other information in accordance with the reporting requirements of Australian Standard AS ISO/IEC 17025:2018.

## 8. REVISION HISTORY

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 Director, Infrastructure Technologies

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1	15-Sep-2023	<ul style="list-style-type: none"> <li>New Document</li> </ul>