

SSL Test Specification

FTS-111

Sampling and Testing of Fire Detectors

(previously titled "Sampling and Testing of Heat and Smoke Detectors")

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SCOPE & GENERAL

1.1 SCOPE. This specification covers the requirements for sampling and testing of the following detectors listed in SSL's ActivFire Register of Fire Protection Equipment;

- 1.1.1 AS 1603: Part 1 heat detectors (Types, A, B, C and D)
- 1.1.2 AS 1603: Part 2 point type smoke detectors
- 1.1.3 AS 1603: Part 1 and AS 1603: Part 2 combined heat and smoke detectors
- 1.1.4 Carbon monoxide fire detectors.

This specification details procedures for;

- (a) selection of representative samples of detectors from Supplier consignments or production runs, and
- (b) determining if sampled detectors retain the same characteristics and Australian Standard requirements as the detectors that were subjected to the compliance testing.

1.2 APPLICATION. The specification applies to point type heat and smoke detectors and CO fire detectors.

- (a) have been subjected to and meet the requirements of the applicable Australian Standards, and
- (b) are listed in SSL's ActivFire Register of Fire Protection Equipment

1.3 REFERENCE DOCUMENTS.

STANDARDS

AS 1603: Part 1 Heat Detectors

AS 1603: Part 2 Point Type Smoke Detectors

AS 2362: Part 1 Automatic fire detection and alarm systems-Method 1.

AS 2362: Part 17 Automatic fire detection and alarm systems-Method 17.

SSL TEST SPECIFICATIONS

FTS-115 Correlation Testing of Smoke Detectors

FTS-118 Sensitivity Testing of Smoke Detectors - Smoke Detector Test Tunnel

FTS-119 Environmental Testing of Smoke Detectors - Damp Heat Test

FTS-135 Sensitivity Testing of Carbon Monoxide Fire Detectors - Product Specific Procedure

1.4 DEFINITIONS. For the purpose of this specification, the definitions below apply.

1.4.1 ActivFire Scheme - an operationally separate group, within Scientific Services Laboratory, responsible for maintaining and administering the listing of active fire protection equipment under specified conditions and requirements.

1.4.2 Register of Fire Protection Equipment - a database management system and associated documentation, maintained as part of the activities of SSL's ActivFire Scheme, recording and listing a broad range of fire protection equipment (including Fire Detection & Alarm Systems) that have been assessed to defined criteria for the purposes of determining fitness for purpose.

1.4.3 Consignment - that quantity of detectors covered by one set of documents and designated to be manufactured and supplied for a stated Supplier or destination.

Note: A consignment consists of detectors of a single designation and type or classification which have been manufactured under essentially the same conditions.

- 1.4.4 Group** - that quantity of detectors sub-divided from a consignment.
- 1.4.5 Sample** - a quantity of detectors selected randomly as a minimum percentage or number from a consignment or group.
- 1.4.6 Sample Id** - a numeric string that uniquely identifies the sample selection report which details sample units required to be selected from the consignment.
- 1.4.7 Sample Item** - an individual detector which is one of a number selected as a sample.
- 1.4.8 Supplier** - that organisation identified by ActivFire Scheme as the designated Supplier and/or the designated Audit Centre of products listed in the Register of Fire Protection Equipment.
- 1.4.9 Applicant** - that organisation acting either directly or indirectly on behalf of the Supplier, for the purposes of submitting fire detector consignment details for randomised sample selection.
- 1.4.10 Test agency** - an organisation specifically accredited by the National Association of Testing Authorities (NATA) for physical testing, assessment and reporting in accordance with requirements of this specification.
- Note: Upon application to ActivFire, accreditation of a test agency by a third party laboratory accreditation agency other than NATA will be considered, subject to the existence of a current Memorandum of Understanding (MOU) with NATA.
- 1.4.11 Available for testing** - The recorded date, when all sample units (as identified by the ActivFire sample selection report), information and specific equipment, that needs to be provided by the Applicant, is received by the test agency sufficiently for testing to proceed completely and effectively.
- 1.4.12 Combined heat and smoke detector** - A detector utilising at least two different sensing mechanisms and having been subjected to and met the requirements of the Australian Standards AS 1603: Part 1 and AS 1603: Part 2.

SECTION 2 SAMPLING PROCEDURE

2.1 GENERAL. This section sets out the sampling requirements of ActivFire Scheme. All consignments of fire detectors, listed in the Register of Fire Protection Equipment, are to be randomly sampled by ActivFire prior to forwarding the test agency.

Applications for sampling outside the provisions of this specification shall be subject to the discretion and requirements of the ActivFire manager.

2.2 APPLICATION FORM. An application for sampling shall be transmitted to ActivFire Scheme on an appropriate form. Details shall include the following

- i. Applicant details including organisation name, address and contact phone and facsimile numbers.
- ii. Detector designation, ie, trade brand and model.
- iii. Detector type, ie, ionisation smoke, photoelectric smoke, CO fire, Heat A, B, C, D.
- iv. Detector sensitivity settings (smoke detectors and CO fire detectors).
- v. Detector base designation, ie, trade brand and model.
- vi. Detector circuit type, ie, conventional, addressable, analogue.
- vii. CIE designation, where a general purpose fire indicator panel is unsuitable.
- viii. Alarm thresholds, for detectors and/or systems with settable alarm thresholds.
- ix. Year of manufacture.
- x. Listing id, as assigned in the Register of Fire Protection Equipment.
- xi. Detector serial numbers (in sequential order).
- xii. Consignment quantity.
- xiii. Proposed test agency including organisation name, address and contact phone and facsimile numbers.

The selection application form should be addressed to:

Scientific Services Laboratory
ActivFire Scheme
177 Salmon Street
Port Melbourne Victoria 3207

Facsimile No. (03) 9646 5165
Email: sampling@ActivFire.gov.au

2.3 SAMPLING RESPONSE. Selection of the consignment sample shall be administered, processed and recorded by ActivFire Scheme. Detectors or groups of detectors shall be randomly selected from the consignment details submitted by the Applicant. A large consignment of detectors (> 1000 units) may be broken down into smaller groups at the request of the Applicant or at the discretion of ActivFire. A sample selection report, referenced by the sample id, shall be created and transmitted to the Applicant. Processing of applications for sample selection shall normally be within six (6) hours but not more than one working day of receipt of the application for sampling.

2.4 RE-SAMPLING. Should any sample item fail to meet the testing requirements (see Section 3 TESTING), the consignment from which the sample item was sampled is deemed to be rejected. The Applicant may resubmit the consignment for sampling and testing after checking and removing any faulty detectors.

For combined heat and smoke detectors, should any sample item fail either the heat or smoke testing requirements then re-sampling shall be determined by the type of test failed. If the failure is from heat testing then the consignment will be re-sampled at 3% and the detectors will be subjected to the heat test. If the failure is from the smoke test then the consignment will be re-sampled at 6% and the detectors subjected to the smoke test. If there are failures to the heat and smoke tests from one selection then the consignment will be re-sampled at 6% and all samples subjected to the heat and smoke test requirements.

The Applicant may subdivide the consignment into groups and have each of the groups sampled and tested after checking and removing any faulty detectors (This option reduces the risk of total rejection of a very large consignment).

Where consignments are resubmitted for sampling and testing, the minimum requirements for sample size (see clause 2.5) apply.

Only one (1) re-application is permitted per consignment.

The test agency used for re-testing of the consignments that have failed these test requirements shall be nominated at the discretion of the ActivFire Scheme Manager. Failure in the re-test will be cause for total rejection of the consignment or group.

2.5 SAMPLE SIZE. The rate of sampling for consignments or groups shall be on a sliding scale between 3% and 1.5% for heat detectors and between 6% and 3% for smoke detectors (including CO fire detectors). Sampling of consignments for new products starts at the maximum applicable rate and is adjusted for subsequent consignments, depending upon the demonstrated performance of the detectors.

For smoke detectors (including CO fire detectors), the sampling rate shall be reduced in steps of 0.3% upon successful completion of testing piecewise continuous consignment totalling 500 detectors, except for those consignments which pass the applicable tests upon re-sampling. The sampling rate does not change for consignments which pass the applicable tests upon re-sampling.

The sample rate shall be increased by steps of 1.2% up to the maximum sampling rate of 6% when consignments of smoke detectors (including CO fire detectors) fail sample testing.

For heat detectors, the sampling rate shall be reduced in steps of 0.2% upon successful completion of testing piecewise continuous consignment totalling 500 detectors, except for those consignments which pass the applicable tests upon re-sampling. The sampling rate does not change for consignments which pass the applicable tests upon re-sampling.

The sample rate shall be increased by steps of 0.8% up to the maximum sampling rate of 3% when consignments of heat detectors fail sample testing.

Re-sampling of consignments or groups shall be at a rate of 3% for heat detectors and 6% for smoke detectors and CO fire detectors.

Where multiple failures occur during the sample testing of a consignment, the sampling rate for subsequent consignments shall be at the discretion of the Manager, ActivFire.

The minimum sample size required for a sample selected for testing, is six (6) for heat detectors and twelve (12) for smoke detectors (including CO fire detectors). The sample size for all selections shall be rounded up to the nearest whole number.

Combined heat and smoke detectors shall be sampled as for smoke detectors. The sample quantity shall not be less than twelve (12) units and be split into two groups. The first group shall comprise nominally 80% of sample quantity or ten (10) detectors, whichever is larger, and shall be tested as smoke detectors. The second group shall comprise of nominally 20% of sample quantity or four (4), whichever is greater, and shall be tested as heat detectors. When the total sample quantity of combined heat and smoke detectors is twelve (12) detectors, then eight (8) will be tested as smoke detectors, two (2) will be tested as heat detectors and two (2) will be tested as smoke and heat detectors.

(Refer Appendix A, Summary of sampling rate set-points, increments and decrements)

2.6 SELECTION. A sample of detectors shall only be selected from a consignment or group that contains a set or sets of sequential detector serial numbers. If there are missing detectors from within the consignment then the ActivFire Scheme must be notified appropriately at the time of application for sampling.

In cases where non-consecutive serial numbers occur within a consignment or group, the type of selection process shall be at the discretion of the ActivFire Scheme.

2.6.1 Individual Sampling. ActivFire Scheme shall randomly select individual detector serial numbers from the consignment or group details as nominated by the selection application. These detector serial numbers may be selected from anywhere within the consignment or group.

2.6.2 Box Sampling. Where a consignment or group of not less than 500 units has been produced or dispatched to the supplier and is pre-packaged in cartons or boxes containing multiple detectors that are numbered sequentially, the detectors may be sampled by box rather than individually. The boxes or cartons required for testing shall then be identified by the serial numbers of the detectors in each box.

For a consignment or group where the number of detectors required for testing is not a multiple of the number of detectors per box, then the next integral number of boxes shall be selected and the required number of samples shall be taken from the boxes by the testing personnel.

The requirements for box sampling of detectors for testing are;

- (a) the consignment or group must contain a minimum of 500 detectors in total,
- (b) the number of detectors per pre-packaged box or carton must be detailed with the application for sampling, and
- (c) the box sampling process assumes that all boxes are full except possibly the last box. Where this is not the case the Applicant must provide ActivFire Scheme with the details.

2.6.3 Special provision for irregular consignments. In some cases the serial numbering of a consignment may be made up of several discrete sets of consecutive serial numbers, ie a number of sets of consecutive numbers with each set separated by gaps or sequences of missing detector serial numbers. Where this is the case, the sample selected for testing shall be chosen randomly from each set of consecutive numbers such that the total number is as close to as possible but not less than, the minimum quantity required for testing from each consignment. No minimum sample size per set is required except in cases of re-applications. When re-application is necessary, subsequent selections shall be chosen from the set which included the failed sample item(s) and the minimum quantity requirements of clause 2.5 shall be applied.

SECTION 3 TESTING

- 3.1 GENERAL.** The sample of selected detectors shall be tested in an accredited test agency.
- 3.2 CONTROL AND INDICATING EQUIPMENT.** To avoid confusion in setting up sensitivity levels for testing of analogue detectors, suitable control and indicating equipment (CIE) shall be provided with the detectors. The sensitivity level of the detectors must be programmed for the sensitivity threshold(s) to meet the compliance test threshold(s).

The test report shall state the sensitivity level adopted for testing.

Where the detectors are tested by SSL's Fire Systems Group and the detector is of a type which cannot be monitored by an SSL general purpose fire indicator panel, the Applicant shall supply suitable interface equipment providing clean contact closures for each detector alarm to be monitored by the SSL indicator panel. Details of the indicator panel are available from SSL's Fire Systems Group.

- 3.3 HEAT DETECTORS (Types A, B, C, D).** When tested in accordance with AS 2362: Part 1, detectors of types A, B, C, and D shall comply with clauses 2.2.2 to 2.2.5 of AS 1603: Part 1 as appropriate.

3.3.1 All detectors except non-resetting types B and D.

Each detector is to undergo the 22 K/min test. In addition, 2 K/min tests are to be applied to the detectors as follows:

- (a) Where the detector (model and type) has a proven record of no failures in at least 50 consecutive 2 K/min tests or uses the same mechanism for both rate-of-rise and fixed temperature operation, one third of the number selected.
- (b) Otherwise, all of the number selected.

The detectors which undergo the 2 K/min test will normally be the same as those which underwent the 22 K/min test but may differ by prior written agreement of the ActivFire Scheme manager.

3.3.2 Non-resetting on fixed temperature mechanism (types B and D only).

Two thirds of the detector sample shall be subjected to the 22 K/min test and the remainder shall be subjected to the 2 K/min test.

3.3.3 Analogue heat detectors.

Analogue heat detectors which are specifically marked and listed as type A, B, C or D shall be tested as above.

Where analogue detectors can be configured as more than one type (eg A and C, A and B or A/B/C/D), the sample submitted for testing shall be split, by the testing laboratory, into approximately equal sub-sets representing each possible type. Testing on each sub-set shall be as above except that all detectors shall be subjected to both the 22 K/min test and the 2 K/min test until the detector has a proven record of no failures in at least 50 consecutive 2 K/min tests after which only one third of the number in each sub-set need be subjected to the 2 K/min test.

Example

A consignment of 200 analogue heat detectors is sampled at the 3% rate. The sample would consist of six detectors. The detectors can be either type A or type B depending on the fire indicator panel programming.

Prior to fifty (50) successful 2 K/min tests all detectors would be tested at 22 K/min and 2 K/min as follows:

Three (3) tested as type A at 22 K/min
Three (3) tested as type B at 22 K/min
Three (3) tested as type A at 2 K/min
Three (3) tested as type B at 2 K/min

After fifty (50) successful 2 K/min tests the 2 K/min testing would reduce and the test program would be as follows:

Three (3) tested as type A at 22 K/min
Three (3) tested as type B at 22 K/min
One (1) tested as type A at 2 K/min
One (1) tested as type B at 2 K/min

3.4 SMOKE DETECTORS. Each smoke detector shall be subjected to the smouldering room fire test in accordance with AS 2362:Part 17 (except that only one test shall be undertaken) or, subject to correlation testing*, one smoke detector test tunnel (SDTT) test in accordance with FTS-118. Any smoke detector which operates outside the correlated SDTT test limit shall be subjected to a validation smouldering room fire test in accordance with AS 2362:Part 17 (**except that only one test shall be undertaken**).

Each smoke detector shall be subjected to a damp heat test (40°C, 92±3% RH) in accordance with SSL test specification FTS-119.

Analogue smoke detectors which can be set to more than one of the sensitivity levels defined in AS 1603.2 shall be tested at the lowest sensitivity setting in the smoke test and at the highest sensitivity setting for the damp heat test.

The use of the Smoke Detector Test Tunnel (SDTT) is only possible after a successful correlation between sensitivity in the Room Fire Test Facility (RFTF) and the SDTT has been determined. Correlation testing is to be conducted in accordance with FTS-115.

3.5 CO FIRE DETECTORS. Each sample item shall be subjected to the product specific smoke box (PSSB) test in accordance with FTS-135 subject to a sensitivity verification.

The PSSB test is an absolute CO sensitivity test to verify the manufacturer's claimed alarm response threshold (ART). Correlation with the CO results obtained in the compliance test to AS 2362: Part 17 is limited to verification that an initial set of at least 12 samples tested in the smouldering room fire test (ref AS 2362:Part 17) complies with the equivalent nominal sensitivity marked on the detector. The same sample subjected to the PSSB test shall fall within the limits of 0.7 to 1.5 times the nominal CO ART.

Each sample unit shall be also subjected to a damp heat test (40°C, 92±3% RH) in accordance with SSL test specification FTS-119.

CO fire detectors that can be set to more than one of the sensitivity levels defined in AS 1603.2 shall be tested at the lowest sensitivity setting in the smoke box test and at the highest sensitivity setting for the damp heat test.

3.6 COMBINED HEAT AND SMOKE DETECTORS. Combined heat and smoke detector samples selected for smoke sensitivity testing shall be subjected to the requirements of Clause 3.4 or 3.5 as appropriate.

Combined heat and smoke detector samples selected for heat sensitivity testing shall be subjected to the requirements of clause 3.3.

Example 2.

A consignment of 200 combined heat and smoke detector analogue addressable smoke and heat detectors, using a single mechanism for rate-of-rise and fixed temperature heat operation, is sampled at the 6% rate. The sample would consist of twelve detectors. The detectors can be programmed at the control and indicating panel as either 8% or 12% or as a heat detector of Type A or B or C or D. The same algorithm is used for Types A and C as in B and D (respectively) for fixed temperature operation. The test program would be as follows:

Twelve (12) with a sensitivity setting of 12% obs/m subjected to a smouldering fire room test.
The same twelve (12) with a sensitivity setting of 8% obs/m subjected to a damp heat test.
Two (2) tested as a Type A at 22 K/min.
One (1) tested as a Type B at 22 K/min.
Two (2) tested as a Type C at 22 K/min.
One (1) tested as a Type D at 22 K/min.
One (1) tested as a Type A at 2 K/min
One (1) tested as a Type C at 2 K/min.

Commentary:

All sample items are subjected to the smoke testing procedure and half the sample items are subjected to the heat testing procedure. Because the four types do not evenly divide the sample of six items, the sub-sets of the least commonly used Types contain the smaller quantity. Since the same algorithm is used for Types A and C as in B and D (respectively) for fixed temperature operation, it is not necessary to test all four Types in the 2 K/min test.

SECTION 4 RESULTS

- 4.1 RESULTS.** The criterion for acceptance of a consignment or group is that all sample items, that have been selected, must operate within the prescribed test limits appropriate to the detector type, except in the following cases:
- a. It is evident that a detector is faulty immediately upon connection to control and indicating equipment (for example, permanent alarm or device fault indication). The sample is acceptable provided a maximum of one detector per consignment falls within this category. In such cases the supplier must return the detector to the manufacturer for evaluation, and a report as to the cause of the device fault is to be forwarded to the Manager - ActivFire Scheme.
 - b. Any number of detectors in the consignment have been damaged in transit to the test laboratory. In such cases replacement samples are to be selected.

Where a smoke detector has operated outside the correlated SDTT test limit and has subsequently been subjected to a validation smouldering room fire test, separate test reports shall be issued to cover both results from the SDTT and the smouldering room fire test. If SDTT and smouldering room fire tests conflict, then the smouldering room fire test result (**AS2362: Part 17, except one test only**) takes precedence.

Smoke detectors, combined heat and smoke detectors, and CO fire detectors must also satisfy the requirements of the damp heat test (FTS-119).

The test report must identify the following:

- i. Test agency, including organisation name, address and contact phone and facsimile numbers
- ii. Test report id
- iii. Sample id, as identified by ActivFire Sample Selection Report.
- iv. Detector designation, ie, trade brand and model.
- v. Detector type, ie, ionisation smoke, photoelectric smoke, CO fire, Heat A, B, C, D.
- vi. Detector sensitivity settings (smoke detectors and CO fire detectors only).
- vii. Alarm threshold settings (analogue detectors only).
- viii. Serial numbers of each tested sample unit (in sequential order)
- ix. Test results for each tested sample unit.
- x. Summary result stating whether or not the tested sample met the requirements of this specification.
- xi. Applicant details including organisation name.
- xii. Date sample was available for testing.
- xiii. Test report issue date.

Should any detector fail, other than in the condition described in item a. and b. above, the consignment may be rejected. Re-sampling and re-testing shall be subject to the requirements of section 2.4 of this specification.

If detectors are sold before the test results are issued, the Supplier bears the risk of having to recall them if the detectors are rejected following a failure in the retest.

The test report on all ActivFire selected fire detectors shall be forwarded to ActivFire Scheme within 10 working days regardless of whether they pass or fail.

Unless specifically requested to do so by the ActivFire manager, the test agency is not required to retain the test sample items after the tests are complete.

ActivFire Scheme maintains a records of sampled and tested consignments. Confirmation that particular detectors are from sampled and tested consignments is available to any interested party. Information on numbers of sample items tested, either in total or from individual suppliers, remains strictly commercial-in-confidence and is not publicly available.

4.2 AUDITS. The sampling and testing process is subject to review by ActivFire Scheme as part of the on-going compliance audits associated with each Supplier Listing Agreement.

Appendix A

Summary of sampling rate set-points, increments and decrements

Sampling rate characteristics		Smoke detectors	Heat detectors
Upper rate	% of consignment tested	6%	3%
	Equivalent units / consignment	60 units / 1,000 30 units / 500	30 units / 1,000 15 units / 500
Decrement rate	%	0.3% / 1,000 consignment units passed	0.2% / 500 consignment units passed
Lower rate	% of consignment tested	3%	1.5%
	Equivalent units / consignment	30 units / 1,000 15 units / 500	15 units / 1,000 8 units / 500
Quantity of consignment units successfully processed to reach lower rate		10,000 consignment units	4,000 consignment units
Increment rate <small>(applied in event of consignment compliance failure)</small>	%	1.2%	0.8 %
	Equivalent units / consignment	12 units / 1000	8 units / 1000