

SUMMARY OF TOPICS

The following changes in requirements to the Standard for Smoke Detectors for Fire Alarm Systems, UL 268, are being proposed:

- 1. Sensitivity Test***
- 2. Special Applications***
- 3. Removal of Lamp Interchangeability Requirements***
- 4. Fire Test Revision***
- 5. Velocity***
- 6. Sensitivity Shift Criteria***
- 7. Go/No-Go Flaming Polyurethane Foam Test***
- 8. Detector Air Velocity in Excess of 300 fpm***
- 9. Nuisance Sensor Requirements***
- 10. Go/No-Go Field Test (for the smoke sensor)***
- 11. IRLED Light Degradation Determination***
- 12. Alarm Silence Requirements***
- 13. Additional Stability Tests for Multi-Criteria Smoke Detectors Employing CO Gas Sensors***
- 14. Audibility Test for Battery Operated Smoke Detectors***
- 15. Mechanical Push Test for Push-Type Features***
- 16. Firmware Update Requirements***
- 17. High Voltage Printed Wiring Boards***
- 18. Addendum - Minimum Screening Programs in Table D3.1***
- 19. Minimum Spacings Table 5***
- 20. Cooking Nuisance Test Editorial Revision***

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21. Manufacturer's Published Instructions**22. Reference and Editorial Corrections****STP BALLOTS AND ALL COMMENTS DUE: DECEMBER 11, 2018**

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~. Blocks of proposed new requirements are indicated by (NEW).

1. Sensitivity Test**RATIONALE**

Proposal submitted by: Joseph Farley, Tyco

The current language of the Sensitivity test requires that a smoke sensor operate within the limits of the applicable 0.5%/ft to 4%/ft requirements. There is an exception that allows for manufacturers to define their own sensitivity limits for multi-criteria detectors. This proposal clarifies the sensitivity test – should detector samples fall outside the specified limits, the same samples would be adjusted to the minimum sensitivity settings and again be subjected to and comply with the Fire Tests and Smoldering Smoke Test. Also, the sensitivity shift criteria that manufacturers define for multicriteria detectors must allow the alarm to pass the fire tests.

PROPOSAL

3.13 PRODUCTION SMOKE SENSITIVITY – ~~A smoke sensitivity range established by the tests in this standard within the limits outlined in Tables 9 and 10 for single criteria smoke detectors. For multi-criteria smoke detectors, smoke sensitivity limits may be provided by the manufacturer. A~~ The smoke sensitivity range produced during manufacture, established by the tests in this Standard within the limits outlined in Table 9, Visible Smoke Obscuration Limits (gray smoke) and Table 10, Measuring Ionization Chamber (MIC) Measurement for single criteria smoke detectors. For multi-criteria smoke detectors, smoke sensitivity limits may be provided by the manufacturer.

28.3.2 The performance of the multi-criteria detector shall meet the requirements of this standard except for the smoke sensitivity limits specified in Tables 9 and Table 10. Manufacturers shall provide samples that reflect, and information that identifies, the combined and discrete maximum and minimum sensitivities of each constituent sensor.

31.1.1.1 A spot type smoke detector, when calibrated to ~~each end of its production window, shall operate within the limits~~ maximum production sensitivity, shall not be more sensitive than the limit specified in Table 9 or Table 10 when subjected to a smoldering smoke or aerosol buildup condition using the test equipment described in 31.1.2.1 – 31.1.4.1 and when subjected to a range of air velocities. The manufacturer shall define gray smoke/aerosol limits for the smoke sensor in a multi-criteria smoke detector. The smoke generating method used for this test can be smoldering cotton lamp wick, aerosol generator, or punk sticks. Interchangeability between the methods is acceptable (e.g., conformity assessment testing utilizing a different method than the manufacturer) and shall be so documented in product reports and procedures created to document compliance to this standard. When the detector employs a variable field adjustable sensitivity setting, test measurements shall be made at ~~maximum and minimum detector settings~~ the maximum sensitivity setting as specified in Table 9 and/or Table 10. The sensitivity measurement is to be made with the detector located in the air stream in the least and most favorable horizontal positions for smoke entry as determined in the Directionality Test, Section 33.

Table 9
Visible smoke obscuration limits (gray smoke/aerosol)

Percent per meter	Percent per foot	OD per meter	OD per foot
12.5	4.0	0.0581	0.0177
1.6	0.5	0.0072	0.0022

Note: Refer to Annex C for the calculation of obscuration and optical density

Table 10
Measuring Ionization Chamber (MIC) measurement

United States	Canada
93 pA (maximum) — 37.5 pA (minimum)	Smoke Density* (Relative Measuring Ionization Chamber Units ^a): 0.625 (minimum) — 0.12 (maximum)
*NOTE: Smoke Density X is derived as follows: $X = (I_0 - I) / I_0$ Where: I_0 is the quiescent chamber current in clean air in pA, and I is the reduced chamber current when smoke is present in pA. ^a See Annex A, Section A4 Refer to Annex C for the calculation of obscuration and optical density	

2. Special Applications

RATIONALE

Proposal submitted by: Dave Mills, UL LLC

During the balloting of the new polyurethane fires and cooking nuisance smoke tests for UL 268/ULC-S529, there were comments by some stakeholders expressing concern about whether the new requirements should apply to both commercial and residential smoke detectors since many smoke detectors may not be exposed to cooking nuisance sources. In order to address these concerns, a task group was formed, chaired by Art Black. During initial meetings, the group decided that the standard should not be split into residential and commercial standards, but that additional clarification was needed around special applications requirements. A small sub-task group was formed within the task group to clarify the requirements for special applications. Special application evaluation is required for higher sensitivity detectors specified by certain NFPA standards for applications such as data centers, telecommunications, and clean rooms.

In the July 15, 2016 revision of ANSI/UL 268 and CAN/ULC-S529, “special application” is mentioned only in clause 31.1.1.2. The task group set out to rewrite this section by carefully defining special application and how it applies to both single and multi-criteria detectors. The task group also felt that it was important that all detectors comply with all of the requirements of the standard. It would be an option for manufacturers to create a “special application” mode of a standard detector. In other words, it would not be possible for a manufacturer to offer a detector that only complies with special application requirements.

For reference, there are two operational modes for smoke detectors:

Typical applications (“Normal”)

- Single criteria: compliant with nuisance test and 0.5 to 4.0%/ft. sensitivity range
- Multi-criteria: compliant with nuisance test but is allowed to be outside of 0.5 to 4.0%/ft.
- Compliant with all test fires

Special applications mode (optional)

- Single criteria: a sensitivity setting that is more sensitive than 0.5%/ft. and likely does not comply with nuisance test requirements
- Multi-criteria: a mode that does not comply with the nuisance test
- Compliant with all test fires

PROPOSAL

3.13.1 SAMPLING NETWORK – A component or series of components, e.g., a pipe network, a tube, a duct probe and sampling ports, which transfers air from the protected area to a Sampling Type Smoke Detector.

3.13.2 SAMPLING PORT – Any point at which an air sample is drawn into the sampling network. Sampling ports are also known as sampling holes or sampling points.

3.13.3 SPECIAL APPLICATION – Single or multi-criteria detector mode or configuration characterized by sensitivity limits that are more sensitive than the limits defined in this standard.

3.20 SMOKE DETECTOR – SAMPLING TYPE – A detector that draws air and particulate from the protected area into a sampling network that runs to the detector. At the detector, the air is analyzed for fire products. ~~consists of a piping or tubing distribution network that runs from the detector to the area(s) to be protected. An aspiration fan in the detector housing draws air from the protected area back to the detector through air sampling ports, piping, or tubing. At the detector, the air is analyzed for fire products.~~

~~31.1.1.2 When a detector evaluated for a special application employs sensitivities more sensitive than outside of the range limit specified in Table 9 and/or Table 10, it shall be evaluated using the sensitivities specified in the conditions covered by the smoke detector's Technical Bulletin (see Technical Bulletin, Section 84) per the requirements in 31.1.8, Special Application Mode (optional).~~

(NEW)

31.1.8 Special Application Mode (optional)

31.1.8.1 Detectors that have a special application mode/configuration in accordance with 31.1.8.2 to 31.1.8.4 shall comply with normal application requirements wherein the detector or relevant sampling ports of an air sampling detector complies with all applicable requirements defined in this standard.

31.1.8.2 For air sampling detectors the manufacturer shall provide means to calculate the sensitivity at the sampling port, e.g., pipe modeling software or a look up table. The version of the software/look up table shall be recorded.

31.1.8.3 Single or multi-criteria detectors or sampling ports of single criteria air sampling detectors that are capable of being set more sensitive than the sensitivity limit in Table 9 and/or Table 10 or that have a mode/configuration allowing for operation outside of the requirements outlined in Section I4, Cooking Nuisance Smoke Test, shall be designated for special applications.

31.1.8.4 Detectors that employ a special application mode/configuration in addition to the required normal mode/configuration shall be designed and shipped from the factory with the normal application mode/configuration being the default mode of operation.

31.1.8.5 The special application mode/configuration shall not be activated without a deliberate action by the installer to initiate the special application mode/ configuration. Deliberate actions include, but are not limited to, activation of the special application mode/configuration mechanically or wirelessly either at the device or remotely via the control panel or device configuration software using a fixed or portable device.

31.1.8.6 Detectors shall include a visual indication with identifiable markings when operating in special application mode:

- a) At the spot-type or air sampling-type detector, or
- b) At the control panel, or
- c) At the relevant sampling ports of the air sampling-type detector.

31.1.8.7 Detectors that are solely compatible with control units evaluated per the Standard for Household Fire-Warning System Units, UL 985, shall not be designated for special application.

31.1.8.8 Special application detectors shall comply with the Stability Test, Section 38.1 (a), at their highest special application sensitivity.

(NEW)

83.5 Special Applications

83.5.1 Installation instructions for special application detectors shall include the following information relating to operating the detector in special application mode/configuration:

- a) The statement: "Detectors [Sampling ports] set to the special application sensitivity are not suitable for use in areas where cooking appliances may be used. If cooking appliances are used within the protected space, a normal application detector or normal application mode or configuration must be used for that area."
- b) A warning to users that the special application mode of operation is not for general use and may be more prone to false alarms if used in unsuitable environments.
- c) A list of examples of suitable and unsuitable environments for the detector, consistent with the requirements in item (a).
- d) A description of potential nuisance alarm sources.

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- e) A description of the method to configure the detector's special application sensitivity.

3. Removal of Lamp Interchangeability Requirements

RATIONALE

Proposal submitted by: Lynn Madsen, UTC

Section 36, Lamp Interchangeability Test should be deleted, because there are no longer any products in the industry that use a replaceable (photoelectric) lamp.

PROPOSAL

~~36 Lamp Interchangeability Test (Photoelectric)~~

~~36.1 The sensitivity of a photoelectric smoke detector (both spot and beam type) shall vary not more than specified in 29.3.1 from its initial measurement and shall comply with the requirements of the Sensitivity Test, Section 31, when tested with the intended replacement lamps.~~

~~36.2 Three samples, set at the minimum smoke sensitivity setting, shall be subjected to the Sensitivity Test, Section 31. The detectors are then to be de-energized, the photocell illuminating lamps replaced, reenergized, and subjected again to the Sensitivity Test, Section 31.~~

4. Fire Test Revision

RATIONALE

Proposal submitted by Eric Sacco, Siemens Industry, Inc.:

To correlate with the changes proposed in the new draft binational Standard for Smoke Alarms, UL 217/ULC-S531, the following clarification and changes are being proposed for 41.2.2 of the Fire Tests.

PROPOSAL

41.2.2 The materials and procedures shall be used as follows:

- a) Combustible – Shredded newsprint preconditioned in a relative humidity of 50 ±5% at a temperature of 23 ±2 °C (73 ±3.6°F) for at least 48 h prior to the test is to be cut in strips as follows:

	In the United States	In Canada
Width	6 – 10 mm (0.25 – 0.375 inch)	6 – 10 mm (0.25 – 0.375 inch)
Length	25.4 – 102 mm (1 – 4 inches)	25.4 – 102 mm (1 – 4 inches)
Total weight	42.6 g (1.5 oz)	28.3 g (1 oz)

The paper, cut and weighted to the dimensions above, is to be placed into the receptacle, see (b), with the bottom covered temporarily by a flat plate. The receptacle is to be tamped periodically during the pouring operation until the paper contents are even with the top of the receptacle. The paper is then to be further tamped by hand or by a rod 25.4 mm (1 in) in diameter until the paper level is of a height specified by country, see #1 or #2, but below the top edge of the receptacle. A hole approximately 25.4 mm (1 in) in diameter is to be formed through the center from top to bottom of the paper. The temporary bottom plate is then to be removed and the assembly mounted 0.9 m (3 feet) above the floor on a 127-mm (5-in) diameter ring support.

1) In the United States – The paper is to be placed into the receptacle, see (b), with the bottom covered temporarily by a flat plate. The receptacle is to be tamped periodically during the pouring operation until the paper contents are even with the top of the receptacle. The paper is then to be further tamped by hand or by a rod 25.4 mm (1 inch) in diameter until the paper level is 102 mm (4 inches) below the top edge of the receptacle. A hole 25.4 mm (1 inch) in diameter is to be formed through the center from top to bottom of the paper. The temporary bottom plate is then to be removed and the assembly mounted 0.9 m (3 feet) above the floor on a 127-mm (5-inch) diameter ring support: a height of 102 mm (4 inches)

2) In Canada – The paper should be placed into the receptacle to a height of 115 mm with 25 mm diameter hole in center a height of 115 mm (4.5 inches).

b) Receptacle – To be formed of sheet metal seamed together, with no air gap at the seam (open at both ends). Dimensions are as follows:

	In the United States	In Canada
Thickness	0.40 mm ±2 mm (0.031 inch ±0.08 inch)	0.40 mm ±2 mm (0.031 inch ±0.08 inch)
Diameter	101 mm ±2 mm (4 inches ±0.08 inch)	101 mm ±2 mm (4 inches ±0.08 inch)
Height	300 mm ±2 mm (12 inches ±0.08 inch)	175 mm ±2 mm (6.9 inches ±0.08 inch)
Support flange at the bottom 152 mm ±2 mm (6 inch ±0.08 inch). Wire screen of 18 AWG (0.82 mm ²) wire, 6.4 mm (1/4 in) minimum mesh.		

c) Point of Ignition – The probe tips of the igniter shall be placed at the bottom center of the receptacle and arcing sustained for up to 5 seconds.

d) Smoke Profile – The test fire shall follow the test profile for the respective country. The test shall be terminated 4 minutes after ignition. The response time of each detector shall not be more than 4 minutes..

1) In the United States refer to Figure 9. Additionally, the following conditions apply:

i) Flame breakthrough is to occur at between 1 and 3 minutes.

ii) The first principle peak is to occur at between 1 and 3 minutes.

iii) Smoke is to peak at between 0.45 and 0.66 OD/m (0.137 and 0.2 OD/foot) [64.4 and 78.1 %/m obscuration (27 and 37 %/ft obscuration) at the ceiling detector location, and between 0.345 and 0.66 OD/m (0.0105 and 0.2 OD/foot) [54.8 and 78.1 %/m obscuration (21.5 and 37 percent per foot obscuration) at each sidewall location.

iv) There is to be between 20 and 40 seconds of 0.058 OD/m (0.018 OD/foot) [12.56 %/m (4 %/ft obscuration)], or higher obscuration at the ceiling detector location, and between 10 and 30 seconds of 0.15 OD/m (0.045 OD/foot) [29.26 %/m (10 %/ft obscuration)] or higher obscuration at the sidewall detector location.

v) The secondary peak is not to exceed 0.198 OD/m (0.061 OD/foot) [36.7 %/m (13 %/ft) obscuration] at any detector location.

2) In Canada refer to Figure 10.

5. Velocity

RATIONALE

Proposal submitted by Scott Lang on behalf of the UL/ULC Technical Harmonization Committee for Smoke Alarms and Smoke Detectors

While evaluating recent sensitivity proposals for UL 268/ULC-S529, the THC proposed the clarification of requirements for the Velocity-Sensitivity Test, Section 34 as follows.

PROPOSAL

34.2 Multi-criteria detector with gas sensor

34.2.1 The sensitivity of the gas sensor shall not vary by more than that specified in 31.2 when tested at an minimum air velocity of 0.16 ± 0.1 m/s (32 ± 2 fpm) and 1.52 m/s ± 10 percent (300 fpm ± 10 percent) ~~using equipment specified in Section 31.2.~~

6. Sensitivity Shift Criteria

RATIONALE

Proposal submitted by Scott Lang, Honeywell

As currently written, the text of 29.3.1 does not make it clear that manufacturers must define the shift of the non-smoke sensors in multi-criteria detectors so that the detector will still pass the fire tests. This proposal is consistent with the recommendations from the multi-criteria task group.

PROPOSAL

29.3 Sensitivity shift criteria

29.3.1 During or immediately after performance tests, the sensitivity of the smoke sensor shall not vary more than ± 3.3 percent per meter (± 1 percent per foot) [± 0.014 optical density per meter [± 0.0045 optical density per foot]] obscuration from the value recorded prior to the test. For non-multi-criteria smoke detectors the sensitivity limits shall comply with 31.1.1. For multi-criteria detectors mManufacturers shall

define acceptable sensitivity shift for non-smoke sensors in multi-criteria detectors that will allow the smoke detector to pass the Fire Tests (Section 41 and Annex I) and Smoldering Smoke Test (Section 42)

7. Go/No-Go Flaming Polyurethane Foam Test

RATIONALE

Proposal submitted by Dave Mills, UL LLC

The intent of this revision is to verify that the smoke alarms have not been silenced beyond 1.5%/ft OBS during the Cooking Nuisance test. The addition of this test is intended to be a “go/no-go” type test by slightly modifying an existing set of requirements with similar particle size and distribution.

Provided as supporting documentation in the CSDS work area is a particle size and distribution comparison between the cooking nuisance test and flaming polyurethane. The graph illustrates the %/ft OBS vs MIC buildup rate between the Cooking Nuisance and the Flaming Polyurethane foam fire test as conducted during UL’s Cooking Nuisance research work.

The graph also illustrates the Obscuration (%/Ft.) vs MIC (i.e. size vs. distribution) at the 10 foot location. When comparing the profile of the Cooking Nuisance Test (time shifted) data against the Flaming Polyurethane foam data, the particle size and distribution for both fires are very similar. Therefore, using the existing Flaming Polyurethane requirements was considered an excellent “go/no-go” type test to verify that a smoke detector has not been silenced as a result of the cooking nuisance test and that the samples can still detect a smoke if a cooking nuisance scenario should transition to a state of fire.

PROPOSAL

(NEW)

I.5 Go/No Go flaming polyurethane foam test

I.5.1 General

I.5.1.1 The Flaming Polyurethane Foam test requirements outlined in Clause I.2 shall be conducted with the acceptance criteria applying to the 17 ft test location. Test samples shall not be located at the 17 ft location. As defined in I.2.1 and I.2.3, the samples located at the 10 ft test location shall produce an alarm signal before the Flaming Polyurethane Foam acceptance criteria at the 17 ft location has been reached

I.5.1.2 While conducting the entirety of this test, the room shall remain in static mode, i.e. no air movement caused by opening doors, ventilation systems or air movement caused by sources other than the electric cooking appliance and PU foam burning.

I.5.2 Test method

I.5.2.1 The smoke detector calibration and orientation shall be the same as specified in I.4.5.3.1 and I.4.5.3.2.

I.5.2.2 The Cooking Nuisance test and Flaming Polyurethane acceptance criteria shall be conducted as specified in Section I.4.2 except for the following.

Immediately after achieving the 1.5 %/ft OBS during the Cooking Nuisance Test:

- a) The samples located at the 10 ft location shall remain powered and shall not be modified via software, mechanical intervention or electrically during the entirety of the test.
- b) The Flaming Polyurethane Foam Test as outlined in Section I.2 shall be conducted
- c) The polyurethane foam used for the Flaming Polyurethane Foam Test, Section I.2 shall be ignited within 10 seconds of achieving 1.5 %/ft OBS during the Cooking Nuisance Test.
- d) The electric range used for the Cooking Nuisance Smoke Test shall be turned off once ignition of the foam has been confirmed.

I.5.3 Acceptance criteria

I.5.3.1 When conducting the Cooking Nuisance test, the four smoke detector samples located at the 10 ft location shall not produce an alarm signal as specified in I.2, but all four samples located at the 10 ft location shall produce an alarm signal once the 5 %/ft OBS acceptance criteria defined in I.2 has been achieved.

8. Detector Air Velocity in Excess of 300 fpm

RATIONALE

Proposal submitted by: Scott Lang, Honeywell

The intent of this proposal is to document past practice in evaluating smoke detectors for air velocity ratings in excess of 300 feet per minute.

PROPOSAL

40.3 In the United States only – For detector velocities in excess of 300 fpm, the detector shall be tested to Fire Tests (Section 36) in the Standard for Smoke Detectors for Duct Application, UL 268A.

9. Nuisance Sensor Requirements

RATIONALE

Proposal submitted by: Scott Lang, Honeywell International

The intent of this proposal is to correct an omission in the requirements for multi-criteria smoke detectors that incorporate a sensor that is solely used for the identification of nuisance conditions (e.g., humidity). As written, the standard only has requirements for sensors that identify fire conditions such as smoke, heat, and gas.

The current definition for multi-criteria detectors does not distinguish between fire sensors and nuisance sensors; therefore, a detector that consists of one fire sensor (smoke/particulate) and one sensor only used to detect nuisances would be considered a multi-criteria detector. However, there are no requirements about how the nuisance sensor is allowed to affect the performance of the overall smoke detector. For example, would a detector that is actively sensing a nuisance condition still be able to pass the fire tests? This proposal makes it clear that detectors that incorporate nuisance sensors must pass the fire and smoldering smoke tests while in their “nuisance rejection” mode.