STANDARDS UPDATE NOTICE (SUN)
ISSUED: January 11, 2022

STANDARD INFORMATION

This SUN supersedes all previous UL 268 / ULC S529 SUNs

Standard: UL 268 / ULC S529
Standard ID:
Smoke Detectors for Fire Alarm Systems [UL 268:2016 Ed.7+R:15Jul2016]
Standard for Smoke Detectors for Fire Alarm Systems [CAN/ULC S529:2016 Ed.4+R1]

Previous Standard ID:
Smoke Detectors for Fire Alarm Systems [UL 268:2016 Ed.7]
Standard for Smoke Detectors for Fire Alarm Systems [CAN/ULC S529:2016 Ed.4]

Smoke Detectors for Fire Alarm Systems [UL 268:2009 Ed.6]
Standard for Smoke Detectors for Fire Alarm Systems>Expires on: 31Dec2021< [CAN/ULC S529:2009 Ed.3]

EFFECTIVE DATE OF NEW/REVISED REQUIREMENTS

Effective Date: **June 30, 2024**

IMPACT, OVERVIEW, AND ACTION REQUIRED

Impact Statement: Per our accreditation, Intertek is required to review reports against the standard revisions to confirm compliance. Once compliance is confirmed, the standard reference in the report is updated to show continued compliance to the technical requirements of the standard. Reports not updated to this version by the effective date above will be withdrawn.

Overview of Changes:

January 1, 2016:
- Multi-Criteria Smoke Detectors
- Wireless interconnected smoke detectors shall be supervised
- New requirement for all smoke detectors employing non-replaceable, limited life components
- Revised requirement for smoke detector sensitivity shall not vary by more than 1%

July 15, 2016:
- New Cooking Nuisance, Polyurethane Flaming and Smoldering Tests for the United States Only

Specific details of new/revised requirements are found in table below.

Current Listings Not Active? – Please immediately identify any current Listing Reports or products that are no longer active and should be removed from our records. We will do this at no charge as long as Intertek is notified in writing prior to the review of your reports.

STANDARD INFORMATION

CLAUSE	VERDICT	COMMENT
		Additions to existing requirements are <u>underlined</u> and deletions are shown ~~lined out~~ below.
		The following changes reflect the January 11, 2016 revision
4	Info	**Detector reliability prediction**
4.5		***New clause added;*** A gas sensor or a gas sensing component supervision system of an alarming device shall be provided with the following: a) Reliability data developed using the Military Standardization Handbook, MIL-HDBK 217 or equivalent demonstrating a predicted failure rate of not more than 2.5 failures per million hours operation (see 4.4); or b) Supervision of the predicted failure modes other than for loss of electrical continuity; or c) If the sensor is automatically and periodically tested for its performance response to the target gas (acceptable proxy gas), and results in a trouble signal when the sensor drifts out of specification, then the sensor can be excluded from the reliability calculation.
4.6		***New clause added;*** Documentation of the failure modes resulting from aging for the gas sensor in a multi-criteria alarm or the sensing components and identification of failure modes addressed by the supervision system shall be provided. The manufacturer shall submit a test method to render the sensor unresponsive to the test concentrations as specified by the manufacturer if the documentation submitted for the sensor or the sensing components indicates drift in the less sensitive direction. This method shall be used when conducting the Electrical Supervision Test, Section 30. All predicted failure modes shall result in a trouble signal.
4.7		***New clause added;*** An integral or remote accessory is not required to be included in the reliability prediction except for those components whose failure affects the normal operation of the alarm.
6		***New section added;*** **Automatic drift compensation for smoke sensing** This section contains requirements for automatic drift compensation (see standard for details).

CLAUSE	VERDICT	COMMENT
	Info	**CONSTRUCTION**
7	Info	**General**
7.5	Info	**Supplementary heat sensor**
7.5.4		***New clause added;*** A fixed-temperature heat detector shall operate within the temperature tolerance range according to its rating as specified in the operating temperature test of the following standards: a) In the United States, the Standard for Heat Detectors for Fire Protective Signaling Systems, UL 521; or b) In Canada, the Standard for Heat Actuated Fire Detectors for Fire Alarm Systems, CAN/ ULC-S530.
7.6	Info	**Maintenance (Field Cleaning)**
7.6.1		***New clause added;*** If recommended by the manufacturer, the detector shall be cleaned without: a) Degradation of performance, when tested in accordance with Section 71, Field Service Tests; and b) Disturbance of field wiring. The procedures shall be described in the manufacturer's instructions.
12	Info	**Field wiring connections**
12.3	Info	***New section added;*** **Field wiring terminals (general)** This section contains requirements for field wiring terminals (see standard for details).
12.4		***New section added;*** **Special field-wiring terminals (qualified application)** This section contains requirements for special field wiring terminals (see standard for details).

CLAUSE	VERDICT	COMMENT
12.8	Info	**Isolated (nongrounded) detectors**
12.8.2		The arrangement described in 12.8.1 is permitted only on a detector intended for connection to a low-voltage circuit. In addition, the word “CAUTION” «MISE EN GARDE» and the following or equivalent marking is to be displayed in letters at least 3.2 mm (1/8 inch) high adjacent to the detector wiring area: “INSTALL ENCLOSURE ISOLATED FROM GROUND PER MANUFACTURER’S INSTRUCTIONS AND HARDWARE PROVIDED. GROUNDING COULD RESULT IN A FALSE ALARM.” «INSTALLER ENCEINTE ISOLE DE LA TERRE SELON LES INSTRUCTIONS ET MATERIELS DU CONSTRUCTEUR PREVUE. TERRE POURRAIT ENTRAINER UNE FAUSSE ALARME».
24	Info	**Transformers and coils**
24.1		***New clause added;*** A transformer shall meet the requirements of the following: a) In Canada, C22.2 No. 66-1988 (R2001) Specialty Transformers b) In the United States, Transformers, Specialty, UL 506
28	Info	**Transformers and coils**
28.2	Info	***New section added;*** **Accessories** This section contains requirements for accessories for test units (see standard for details).
28.3		***New section added;*** **Performance of single sensor components of multi-criteria detectors** This section contains requirements for performance of components (see standard for details).

CLAUSE	VERDICT	COMMENT
28.8	Info	**Test conditions**
28.8.1		***New clause added;*** The detector shall be installed in an environment so as to permit accurate monitoring of the conditions in (a) – (e). Unless otherwise specified, the following conditions shall be established and maintained throughout the test: a) Ambient temperature at 23 ±3°C (73.4 ±5°F) or a higher temperature if specified by the manufacturer, b) Relative humidity at 50 ±20 percent, c) Oxygen concentration at 20.9 ±1 percent, d) Barometric pressure of 760 ±30 mm of mercury (101 ±4 kPa), and e) Supply voltage, if applicable, adjusted to 100 percent of rated input voltage.
28.9		**Tests and analysis**
28.9.1		***New clause added;*** Samples are to be subjected to analysis and tests as specified in Table 8 but are not required to be completed in the sequential order unless otherwise noted within the specified clauses.
29	Info	**Normal operation test**
29.1	Inf0	**General**
29.1.1		***New clause added;*** No individual sensor of a smoke detector shall be rendered inoperative by any of the Performance Tests (Sections 29 – 74) of this standard.
29.1.4		***New clause added;*** When a smoke detector initiates an alarm signal, the means incorporated to identify the initiation of an alarm shall remain activated after the combustion products have dissipated from the chamber.
29.1.5		***New clause added;*** Actuation of the heat or smoke sensing portion of a detector shall result in the same type of alarm signal as defined in 3.2 and required in the Normal Operation Test, 29.1.4.

CLAUSE	VERDICT	COMMENT
29.1.6		***New clause added;*** If low power wireless transmission between smoke detectors and between the smoke detectors and the panel is used, it shall be in compliance with the requirements outlined: a) In Canada, CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems; b) In the United States, NFPA 72, National Fire Alarm and Signaling Code, Section 23.16, Special Requirements for Low-Power Radio (Wireless) Systems.
29.1.7		***New clause added;*** If low power wireless transmission between smoke detectors is used, it shall be in compliance with the requirements outlined in (a) or (b) below. The transmission signal of a smoke detector with integral or remote transmitter to a compatible receiver shall result in an alarm signal, at the receiver, being locked-in for at least 4 minutes. The test is to be conducted at the maximum distance specified by the manufacturer when tested under free-field conditions with no obstructions between the smoke detector transmitter and receiver units. Refer to 83.4.1 for instructions to be provided. Lock-in of the receiver is not required when the receiving unit audible alarm signal is energized in time sequence and duration with the smoke detector. a) In Canada: 1) CAN/ULC-S545, Residential Fire Warning System Control Units, and 2) CAN/ULC-S527, Control Units for Fire Alarm Systems; b) In the United States: 1) Standard for Household Fire Warning System Units, UL 985, section entitled "Short Range Radio Frequency Devices", and. 2) Standard for Control Units and Accessories for Fire Alarm Systems, UL 864.
29.1.8		**New clause added;** A detector or accessory that employs one or more non-fire alarm features shall operate as follows: a) The smoke detector/fire alarm signal shall take precedence or be clearly recognizable over any other signal even when the non-fire alarm signal is initiated first. b) Distinctive signals shall be obtained between the smoke detector/fire alarm and other nonfire alarm functions. The use of a common sounding appliance for the fire alarm and non-fire alarm function(s) shall be used only when distinctive signals are obtained. When an audible trouble signal is additionally provided it shall be distinctive from all alarm signals. The trouble signal may be common to all functions employed. c) Any fault condition of limited life non-fire alarm components shall not interfere with the operation and supervision of the smoke detector.

CLAUSE	VERDICT	COMMENT
29.2	Info	**Standardized alarm signal**
29.2.2		***New clause added;*** A voice message shall be permitted to be included with the standardized alarm signal in one or both of the formats noted below. a) A voice message of 1.5 seconds or less in length shall be permitted to be inserted into any or all of the 1.5 second OFF phases of the temporal pattern. b) A voice message that exceeds 1.5 seconds but does not exceed 10 seconds in length shall be permitted to be inserted following a minimum of 8 cycles of the initial "three pulse" temporal pattern. This voice message shall be followed by not less than 2 cycles of the "three pulse" temporal pattern. The voice message shall then be permitted to be repeatedly inserted provided that each additional use of the voice message follows at least 2 cycles of the "three pulse" temporal pattern. c) In the United States: In Board and Care Occupancies, provisions should be made to allow premise staff to have multiple languages available which reflect the general region.
30	Info	**Electrical supervision test**
30.6		***New section added;*** **End-of-life signal** This section contains requirements for smoke detectors employing non-replaceable, limited life components (see standard for details).
30.7		***New section added;*** **Multi-criteria smoke detector with gas sensor** This section contains requirements for multi-criteria smoke detectors with gas sensors (see standard for details).
31	Info	**Sensitivity test**
31.1	Info	**Sensitivity test – smoke sensor**
31.1.7	Info	**Sensitivity test feature**
31.1.7.2		When a sensitivity test feature is provided as an operational test to simulate either mechanically or electrically a specified level of smoke in the sensing chamber, the maximum permissible measured obscuration level using gray smoke/aerosol shall not exceed ~~0.088 OD/m~~ <u>a) 6 percent per foot, or if the marked sensitivity is greater than 4 percent per foot, the test shall provide for a maximum of 2 percent per foot over the marked range; or</u>

CLAUSE	VERDICT	COMMENT
		b) 18.4 percent per meter, or if the marked sensitivity is greater than 12.5 percent per meter, the test shall provide for a maximum of 6.4 percent per meter over the marked range.
31.2		***New section added;*** **Sensitivity test – gas sensor of a multi-criteria detector** This section contains requirements for the sensitivity test for multi-criteria detectors including installation instructions (see standard for details).
31.3		***New section added;*** **Sensitivity test – heat sensor** This section contains requirements for the sensitivity test for heat sensors including installation requirements (see standard for details).
31.4	Info	**Sensitivity test - sensors other than smoke, gas or heat**
31.4.1		***New clause added;*** For sensors other than smoke, gas or heat the manufacturer shall provide a method for measuring the sensor's response acceptable limits (see standard for details).
32		***New section added;*** **Automatic drift compensation for smoke sensing** This section contains requirements for automatic drift compensation for smoke sensing (see standard for details).
34	Info	**Velocity-sensitivity Test**
34.2	Info	***New section added;*** **Multi-criteria detector with gas sensor** This section contains requirements for multi-criteria detector with gas sensor (see standard for details).
37	Info	**Reduction in Light Output Test**
37.2		Five samples, calibrated to the minimum smoke sensitivity, shall be subjected to the Sensitivity Test, Section 31 while connected to a source of rated voltage and frequency. Following this, the light output from the LED is to be reduced to 50 percent of the intended output or to the light level anticipated at the end of the failure rate prediction described in 3.6 when less than 50 percent light reduction, by reducing the supply voltage to the detector, or an equivalent method. The samples shall then be subjected to the Fire Tests, Section 41, and the Smoldering Smoke Test, Section 42. In no case shall the single criteria detector exceed the limits specified by Table 9.

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37.3		***New clause added;*** For detectors equipped with drift compensation, the Sensitivity Test shall be conducted after the samples have been allowed to compensate as defined in 32.4, in response to the light output reduction. The Fire Tests and Smoldering Smoke Test shall be conducted in the operational mode (normal light, or reduced light) that results in the least sensitive detector as measured in the Sensitivity Test, Section 31.
38	Info	**Stability Test**
38.1		There shall be no false alarms of a detector set at the maximum smoke detector sensitivity setting when two representative samples are subjected to the test specified in (a) – (f). Different detectors may be employed for each test. A test is not required to be conducted when the principle of operation is such that conducting the test has no possible effect. A detector for which smoke detector sensitivity is affected by air velocity is to be tested in the position in which a false alarm is most likely to occur. c) Ten cycles of temperature variations between minus 17.8 °C (0°F) and plus 66 °C (150°F). <u>For extended temperature range the following formulas shall be applied:</u> <u>1) Low temperature = (TLO - 0°C) - 17.8°C or (TLO - 32°F) - 0°F</u> <u>2) High temperature = (THI - 38°C) + 66°C or (THI - 100°F) + 150° F</u> <u>Where TLO and THI are the respective low and high operating temperatures</u>
38.3		***New clause added;*** For 38.1(b), the detector is to be transferred from the 20 percent humidity environment to the 90 percent humidity environment as follows: 1) The detector is to be first conditioned in the 20 percent humidity environment for at least ½ hour. 2) The detector shall be transferred from the 20 percent humidity environment to the 90 percent humidity environment in less than 5 seconds. 3) The detector shall remain powered during each transfer and while in the sample conditioning environment. 4) When conducting the transfer of the detector between conditioning environments, the detector shall; a) be placed in an enclosure that was conditioned in the same environment as the detector, such as a portable cooler, b) the enclosure shall be closed, prior to opening the door of the test environment, c) then the enclosure containing the detector shall be transferred between environments. 5) Once the enclosure containing the sample is placed in the 90 percent relative humidity conditioning environment:

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		a) The target temperature and humidity within the conditioning environment shall be reached within 3 minutes of placing the enclosure, containing the sample, within the conditioning environment. b) The enclosure shall be opened after the target temperature and humidity within the conditioning environment have been reached. 6) After conditioning the detector in the 90 percent environment for at least ½ hour, the detector is to be placed in the 20 percent environment, repeating items 1-6 two additional trials.
		New clause added;
38.4		The transfer method noted within 38.3 (1) – (6) may be conducted using an alternate means provided that the detector is only exposed to the two conditioning environments as noted in 38.1(b).
		The tests specified in (a) and (b) are an alternate test method to the 90 day stability test requirement of 38.1(a): a) A detector shall operate for its intended signaling performance after being subjected for ~~14~~ 90 days to an ambient temperature of ~~66 ±3~~ 15 degrees below its maximum installation temperature (minimum 38°C). Alternately, the detector may be subjected to a shorter time period and higher temperature as determined by the following equation: $$\frac{4 * D_1}{D_2} = e^{-\frac{\theta}{K}(\frac{1}{T_2}-\frac{1}{T_1})}$$
38.7		Where: D1 = 90 days, D2 = proposed time period in days, T1 = the temperature in Kelvin when testing for 90 days (minimum 23°C) T2 = temperature in Kelvin when testing for proposed time period in days, Q = 0.65 eV and k = 8.62 x 10-5 eV/K followed by 10 cycles of change of air velocity from 0 to 1.5 ±0.13 m/s. No false alarms shall occur following the aging or during exposure to the air velocity; and b) Sensitivity measurements recorded before and after the exposures in (a) shall be conducted in accordance with Section 31, Sensitivity Test Method. The sensitivity values shall be in accordance with 29.3, Sensitivity Shift Criteria.

CLAUSE	VERDICT	COMMENT
39		***New section added;*** **Stability tests – multi-criteria detectors incorporating gas sensor(s)** This section contains requirements for the stability test for multi-criteria detectors including installation requirements (see standard for details).
41	Info	**Fire tests**
41.1	Info	**General**
41.1.1		***New clauses added;*** Fire test fuel guidelines are provided, but actual fuel amounts used can be varied to meet the required profiles as specified in Figures 9 – 12, as applicable to the specific country requirements.
41.1.2		***New clause added;*** All combustibles shall be ignited with the device as described. The bottom of the container for all combustibles is to be 3 feet (0.9 m) ±3 inches (7.6 cm) above the floor. Both the paper and wood brand are to be preconditioned in a relative humidity of 50 ±5 percent at a temperature of 23 ±2°C (73.4 ±3°F) for at least 48 hours prior to the test.
41.2	Info	**Paper fire**
41.2.2		The materials and procedures shall be used as follows: d) Smoke Profile – The test fire shall follow the test profile for the respective country. The test shall be terminated 4 minutes after ignition. <u>The response time of each detector shall not be more than 4 minutes.</u>
41.3	Info	**Wood fire (United States only)**
41.3.1		The following materials and procedures shall be used for the wood fire test. Dimensions and locations of test apparatus are intended for reference only. These are variable as long as the correct build up rates are achieved. d) Smoke Profile (Refer to Figure 11) – For this test the following conditions apply: <u>5) The test shall be terminated 4 minutes after ignition. The response time of each detector shall not be more than 4 minutes.</u>
41.4	Info	**Wood fire (United States only)**
41.4.1		The following materials and procedures shall be used for the flammable liquid fire test: d) Smoke Profiles – For this test the following conditions apply: <u>3) The test shall be terminated 4 minutes after ignition. The response time of each detector shall not be more than 4 minutes.</u>

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42	Info	**Smoldering smoke test**
42.3		The combustible for this test shall be pine sticks, and preconditioned as follows: a) In the United States – The combustible for this test is to be Ponderosa pine sticks (nonresinous, free from knots or pitches). All surfaces of each stick shall be relatively smooth and free from burrs or holes. The grain of the wood is to be parallel to the stick length. Each stick is to be conditioned for not less than 48 hours at 52 °C (125°F) in an air-circulating oven. The stick weight is to be 16 ±2 grams (0.56 ±0.07 oz) following the oven conditioning. The following stick configuration has been used for this test: 1) Eight sticks placed in four parallel rows of two sticks each. The two sticks in each row are configured to touch at the 1 by 3/4 inch (25.5 by 19.1 mm) face, with the 3/4 by 3 inch (19.1 by 76.2 mm) face in contact with the hotplate. The rows are arranged such that the outermost corner of the end sticks is flush with the edge of the hotplate. The distance between each row is roughly 1/2 inch. b) In Canada – The combustible is to be white pine, 19 by 38 by 90 mm long, six pieces resting on the 38 mm by 90 mm face. The wood shall be pre-conditioned in a relative humidity of 50 ±5% at a temperature of 23 ±3 °C for at least 7 days prior to the test.
44		***New section added;*** **Selectivity Test – Multi-criteria Detectors Incorporating Gas Sensor(s)** This section contains requirements for the selectivity test for multi-criteria detectors including installation requirements (see standard for details).
45	Info	**Circuit Measurement Test**
45.2	Info	**Battery trouble voltage determination**
45.2.3		To determine compliance with 45.2.1 each of three detectors is to be connected in series with a variable regulated direct current power supply and a variable resistor as illustrated in Figure 27. The trouble level is to be determined by the following steps: d) Internal Resistance Increase With Constant Terminal Voltage – The voltage of the power supply is to be set at the battery rated voltage (terminal voltage of new battery under normal standby current drain) and the resistance increased from zero ohms until the smoke-alarm trouble signal is obtained. The rate of resistance change prior to the trouble point shall be reduced to a value required to eliminate any error due to any time lag in the trouble circuit of the smoke detector;

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		e) Terminal Voltage Decrease With Constant Internal Resistance – With the variable resistance set at zero ohms, the power supply voltage is to be decreased until the smoke detector trouble signal is obtained. The rate of voltage change prior to the trouble point shall be reduced to a value required to eliminate any error due to any time lag in the trouble circuit of the smoke detector; f) Variable Internal Resistance With Variable Terminal Voltage – The rated battery voltage (Item A of Figure 28) is to be repeated with the power supply voltage set to values equal to the 25%, 50% and 75% points of the voltage range determined in the trouble level voltage (Item B of Figure 28.
46	Info	**Overvoltage and Undervoltage Tests**
46.1	Info	**Overvoltage test**
46.1.2		***New clause added;*** When a nominal rated voltage value is specified, the overvoltage shall be 110 percent of the test voltage specified in 28.4.1, Test Voltages. When an operating voltage range is specified, the overvoltage shall be either 110 percent of the high value of the voltage range or 110 percent of the test voltage specified in 28.4.1 Test Voltages, whichever is higher. Sensitivity measurements at the increased voltage shall vary not more than specified in 29.3, Sensitivity Shift Criteria. Three samples are to be subjected to the specified increased voltage in the normal standby condition for at least 16 h, or until stabilized temperatures have been reached, and then tested for normal signaling operation and sensitivity.
46.1.3		***New clause added;*** Three samples are to be subjected to the specified increased voltage in the normal standby condition for at least 16 h, or until stabilized temperatures have been reached, and then tested for normal signaling operation and sensitivity.
47	Info	**Temperature Test**
47.8		The thermocouple wire is to conform with the requirements for “special” thermocouples as listed in ~~ISA-MC96.1, Temperature Measurement Thermocouples~~ ASTM MNL12: Manual on the Use of Thermocouples in Temperature Measurement – Edition 4, 1993.01.01.
51	Info	**Variable Ambient Temperature Tests**
51.1	Info	**Operation in high and low ambients**
51.1.1		***New clause added;*** The detector shall operate for its intended performance. For products that identify an installation temperature below 0° C and above 38° C, the following ambient test conditions shall be applied: a) Relative humidity = 30 to 50 percent;

CLAUSE	VERDICT	COMMENT
		b) Low temperature = proposed low end environmental ambient temperature (TLO) c) High temperature = (THI - 38° C)+49° C or (THI - 100° F) + 120° F
51.1.5		Sensitivity measurements shall be recorded before and during exposure to each ambient temperature in accordance with the Sensitivity Test, Section 31, except that: 2) In Canada: The visible smoke buildup rates shall be maintained within the limits illustrated in Figure 4 and Figure 5 for 0 °C ambient, and Figure 5 for 49 °C ambient.
51.1.6		***New clause added;*** For products that identify an installation temperature below 0° C and above 38° C it is permissible to conduct the sensitivity test at 0°C (32°F) and 49°C (120°F) after conditioning at the temperatures identified in 51.1.1. When conducting the transfer of the detector between conditioning environments, the detector shall; a) Be placed in an enclosure that was conditioned in the same environment as the detector, such as a portable cooler, b) The enclosure shall be closed, prior to opening the door of the test environment, c) Then the enclosure containing the detector shall be transferred between environments.
51.3		***New section added;*** **Effect of shipping and storage – Multicriteria Detectors Incorporating Gas Sensor(s)** This section contains requirements for the effect of shipping and storage of multicriteria detectors (sees standard for details).
52.2		***New section added;*** **Low humidity (multi-criteria detectors with gas sensors)** This section contains requirements for low humidity detectors (see standard for details).
53	Info	**Corrosion Tests**
53.1		***New clause added;*** Two detectors shall be tested for sensitivity in accordance with the Sensitivity Test, Section 31, prior to exposure to the corrosive atmospheres, one at the maximum and one at the minimum smoke detector sensitivity setting.
55	Info	**Transient Tests**
55.4	Info	**Supply line (ring wave surge voltage) transients**

CLAUSE	VERDICT	COMMENT
55.4.2		***New clause added;*** For this test, the product is to be connected to a transient generator capable of producing the Location Category A, 100 kHz Ring Wave transient as defined in ANSI/IEEE C62.41, IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
55.4.3		Each unit is to be subjected to 500 oscillatory transient pulses at an average rate of ~~6~~ 3 pulses every minute. Each transient pulse is to be induced 90 degrees into the positive half of the 60 hertz cycle. A total of 250 pulses are to be applied so that the polarity of the transients is positive with reference to earth ground, and the remaining 250 pulses are to be negative with respect to earth ground.
56	Info	**Static Discharge Test**
56.3		Ten discharges shall be applied to different points on the exposed surface of the detector, recharging the capacitors for each discharge. Five discharges shall be made with one lead connected to earth ground and the other lead probed on the detector surface followed by five discharges with the polarity reversed. Ten additional discharges are to be applied on all internal parts that are able to be contacted during servicing. Discharges inside the detector are not to be applied when the detector is not intended to be serviced in the field and is marked to be returned to the factory for servicing.
57	Info	**Dust Test**
57.1		***New clause added;*** The smoke detector samples subjected to the Go/no-go Field Test, Section 71.2 shall be used for the dust test.
57.2		***New clause added;*** The sensitivity of a detector shall not be reduced by an accumulation of dust. Energization of the alarm or trouble circuit is permissible.
57.3		***New clause added;*** The smoke sensitivity of a smoke detector shall be evaluated in conformance with the requirements of 57.4 – 57.6.
57.6		Following the exposure to dust the smoke detector is to be removed carefully, mounted in its intended position, energized from a source of supply in accordance with 28.4.1, and tested for smoke sensitivity, using gray smoke/aerosol, unless a trouble signal or false alarm is obtained. Following this test, the smoke detector shall comply with the requirements of Section 31, Sensitivity Test. The sensitivity of the smoke sensor shall not vary in the less sensitive direction by 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 single criteria detectors, the sensitivity limit of the smoke sensor shall not exceed

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		12.5 percent per meter (4 percent per foot [0.058 optical density per meter (0.017 optical density per foot)].
60	Info	**Audible signaling appliance**
60.1		The internal and/or external audible signaling appliance associated with each of two smoke detectors shall operate as intended when the smoke detectors are operated for 8 hours of alternate 5-minute periods of activation and de-activation of the audible alarm signal, followed by 72 hours of continuous activation of the alarm signal. For this test, the smoke detectors shall be connected to a source of rated voltage and frequency. For a battery operated smoke detector, a filtered DC supply shall be employed that has an output voltage equivalent to the fresh battery voltage. The sound level output following endurance shall meet the requirements of Section 70 Audibility Test.
61	Info	**Fire Test – Smoke Detector with supplementary heat detection**
61.1		The smoke detector with supplementary heat detection shall comply with: a) the operating temperature test for a fixed temperature device; and/or b) the rate of rise operation test for devices that incorporate a rate of rise feature as specified in the Standard for Heat Detectors for Fire Protective Signaling Systems, UL 521; or the Standard for Heat Actuated Fire Detectors for Fire Alarm Systems, CAN/ULC-S530.
61.1.1		The smoke detector with supplementary heat detection shall be sensitive enough to qualify for at least a 15.2 m (50 foot) spacing when subjected to the Fire Test described below: a) In the United States, Standard for Heat Detectors for Fire Protective Signaling Systems, UL 521. b) In Canada, Standard for Heat Actuated Fire Detectors for Fire Alarm Systems, CAN/ULCS530.
66	Info	**Tests on Polymeric Materials**
66.2	Info	**Temperature test**

CLAUSE	VERDICT	COMMENT
66.2.1		There shall not be warping that impairs intended operation or exposes hazardous-voltage uninsulated current-carrying parts when representative samples of a polymeric material ~~are aged for 7 days in a circulating-air oven maintained at 90 °C (194°F), or 28 days at a temperature of 70 °C (158°F),~~ in a circulating-air oven for the number of days associated with the test temperature per the equation below, and at a relative humidity of 0 – 10 percent. $$t_{test-time} = (t_{real-time}/2)^{(T_{oven}-T_{installation})/10}$$ Where $t_{real\ time}$ = 257 days, t_{oven} = oven temperature (70°C minimum) $t_{installation}$ = maximum installation temperature (as specified by the manufacturer) For example, for a smoke detector with a maximum installation ambient temperature of 38°C (100°F) shall be tested at an oven temperature of 90°C (194°F), the calculation below would apply; $t_{test-time}$ = 257/2(90-38)/10 $t_{test-time}$ = 7 days
67	Info	**Strain Relief Test**
67.2		***New section added;*** **Special field-wiring terminals** This section contains requirements for field-wiring terminals (see standard for details).
70	Info	**Audibility test**
70.2		The sound power output of the detector shall be measured in a reverberation room using procedures outlined in ANSI ASA Standard S12.51 (Acoustics Determination of Sound Power Levels of Noise Sources using Sound Pressure Precision Method for Reverberation Rooms). The sound power in each 1/3 octave band shall be determined using the comparison method. The A-weighing factor shall be added to each 1/3 octave band. The total power is to be determined on the basis of actual power. ~~An equivalent sound pressure level for a radius of 3.05 m (10 feet) is to be calculated by subtracting 14.6 dB from the A-weighted power level.~~ The total power is then to be converted to an equivalent sound pressure level for a radius or 10 feet (3.05 m) using the following formula: Lp = Lw – 20Log10 R – 0.6 where:

CLAUSE	VERDICT	COMMENT
		Lp is converted sound pressure level, Lw is the sound power level measured in the reverberation room, and R is the radius for the converted sound pressure level (10 feet). An additional 6 db is to be added to allow for two reflecting planes.
70.4		***New section added;*** **Low frequency alarm signal format** This section contains requirements for low frequency alarm signals (see standard for details).
71	Info	**Field Service Tests**
71.1	Info	**Go/no-go field test (for the smoke sensor)**
71.1.2		***New clause added;*** Following the successful completion of the go/no-go field test these samples shall be subjected to the Dust Test, Section 57.
71.2		***New section added;*** **Go/No-Go field test (gas sensors used in multi-criteria smoke detectors)** This section contains requirements for Go/No-Go field test (see standard for details).
72	Info	**Battery Tests**
72.2		Six samples of the battery, or sets of batteries when more than one battery is used for primary power, shall be tested under each of the following ambient conditions for a minimum of 1 year while connected to the detector or a simulated load to which the battery is to supply power: ~~a) A room ambient temperature of 23 ±2 °C (73.4 ±3.6°F), 30 – 50 percent relative humidity, and 760 mm Hg;~~ ~~b) High temperature of 45 °C (113°F);~~ ~~c) Low temperature of 0 °C (32°F), and~~ ~~d) Temperature of 30 ±2 °C (86 ±3°F), and 85 ±5 percent relative humidity.~~ a) A room ambient temperature of 23 ±2 °C (73.4 ±3.6°F), 30 – 50 percent relative humidity, and 760 mm Hg; b) High temperature of = (THI - 38°C) + 45°C or (THI - 100°F) + 113°F; c) Low temperature of = (TLO - 0°C) or (TLO - 32°F), and d) Temperature = (THI - 38°C) + 30°C or (THI - 100°F) + 86°F, and 85 ±5 percent relative humidity and; e) Where TLO and THI are the respective low and high end operating temperatures.
73	Info	**Conformal Coatings on Printed Wiring Boards**

CLAUSE	VERDICT	COMMENT
73.1	Info	**General**
73.1.1		***New clause added;*** Conformal coatings are allowed for use only on printed wiring boards only when: a) The acceptability of the combination has been investigated for flammability in accordance with ANSI/UL 94in the United States or CSA C22.2 No. 0.17 in Canada; and b) The dielectric property after environmental, humidity, and thermal conditioning in accordance with: 1) In the United States, ANSI/UL 746E, Polymeric Materials - Industrial Laminates, Filament Wound Tubing, Vulcanized Fibre, and Materials Used in Printed Wiring Boards; or 2) In Canada, CAN/CSA-C22.2 No. 0.17-00, Evaluation of Properties of Polymeric Materials.
76	Info	**Sensitivity calibration tests**
76.2		***New clause added;*** For multicriteria detectors, the sensitivity of each applicable sensor shall be verified according to the manufacturer's specification for each sensor following the warm-up period specified by the manufacturer. The limits shall be as specified by the manufacturer and verified by Section 31, Sensitivity Test.
79	Info	**Production line dielectric voltage-withstand tests**
79.1		***New clause added;*** Each alarm rated at more than 30 volts AC rms (42.4 volts DC or AC peak) shall withstand, without breakdown, as a routine production-line test, the application of an essentially sinusoidal AC potential of a frequency within the range of 40 – 70 hertz, or a DC potential, between high-voltage live parts and the enclosure, high-voltage live parts and exposed dead metal parts, and live parts of circuits operating at different potentials or frequencies. The test potential is to be: a) For an alarm rated at 250 volts AC rms or less – either 1000 volts (1414 volts, when a DC potential is used) applied for 60 seconds or 1200 volts (1697 volts, when a DC potential is used) applied for 1 second or b) For an alarm rated at more than 250 volts – either 1000 volts plus twice the rated voltage (1414 volts plus 2.828 times the rated AC rms voltage, when a DC potential is used) applied for 60 seconds or 1200 volts plus 2.4 times the rated voltage (1697 volts plus 3.394 times the rated AC rms voltage, when a DC potential is used) applied for 1 second. Exception: A product, the housing of which is entirely comprised of polymeric materials, is not required to be subjected to this test when there are no exposed dead metal parts that become energized under fault conditions.

CLAUSE	VERDICT	COMMENT
80		***New section added;*** **Measurement of in-service reliability for multi-criteria detectors with gas sensor(s)** This section contains requirements for reliability of multi-criteria detectors (see standard for details).
	Info	**MARKING**
81	Info	**General**
81.1		A detector shall be permanently marked with the following information in a contrasting color, finish, or equivalent. Unless the letter height is specified all markings shall be at least 1.2 mm (3/64 inch) high. c) A multi-criteria smoke detector shall be marked, "Multi-criteria Smoke Detector." n) The following or equivalent notice shall be on the outer surface of the enclosure. The letters shall not be less than 3.2 mm (1/8 inch) high and shall be located to be readily visible after the detector is mounted in its intended manner. 1) In Canada: "DO NOT PAINT" and "NE PAS PEINTURER" and/or symbol indicated below; 2) In the United States: "DO NOT PAINT" and/or symbol indicated below. The symbol shall be min 2.5 cm (1/2 in) diameter u) The end-of-life marking requirements shall apply as follows; 1) Smoke Detectors with Specified Lifetime (i.e. limited life components)– Shall be marked with the following or equivalent, "Replace after X years". X = Lifetime of the product when the end-of-life signal will be initiated based on manufacturers recommended end-of-life not to exceed 10 years.
83	Info	**Installation instructions – wiring diagram**
83.1	Info	**All detectors**
83.1.1		Installation instructions, including an installation wiring diagram, shall be packaged with each detector (head with integral base) illustrating the field connections to be made. For detectors that consist of separable heads and bases, the instructions and diagram shall be packaged with the base. It is permissible for the instructions to be attached to the detector (head with integral base) or separable base. When not attached, the instructions shall be referenced in the detector (head with integral base) or base marking. Where devices are packaged in bulk (multiple devices in one single package) and not intended for individual resale, a minimum of one set installation instructions and drawings shall be provided.
83.1.2		The installation wiring diagram shall show a pictorial view of the installation terminals or leads to which field connections shall be made as specified in (a) – (c): c) When duplicate terminals are not provided to facilitate monitoring of the installation wiring connections, and there is no provision to prevent looping an

CLAUSE	VERDICT	COMMENT
		unbroken wire around or under a terminal, the word ”CAUTION” «MISE EN GARDE» and the following or equivalent text in letters not less than 2.38 mm (3/32 inch) high shall be included on the installation drawing: “FOR SYSTEM MONITORING - FOR TERMINALS ___ AND ___, DO NOT USE LOOPED WIRE UNDER TERMINALS. BREAK WIRE RUN TO PROVIDE MONITORING OF CONNECTIONS.” The blanks shall contain the applicable terminal identification.
83.1.8		***New clause added;*** The instructions for projected beam type smoke detectors shall include an indication that the light beam path of the units shall be kept free of blockage.
83.4		***New section added;*** **Installation Instructions and User Manual – RF Equipment**
83.4.1		The installation instructions and user manual shall include at least the following: a) All information applicable to the interconnected equipment, such as a household (residential) control unit for fire, burglar alarm, health care, and the like; b) Specific and detailed installation limitations for RF equipment, such as building construction, specification of procedures, installation aids, and test equipment (by manufacturer and model number or the equivalent) needed to install the system as intended, special receiver-to-transmitter orientations, and metallic bodies that are not visible on the outside; c) The maximum separation (range) of the equipment, including indication that the manufacturer’s specified range is for comparative purposes only and is not applicable when the equipment is installed in a typical home; and d) Instructions to test the system for operation upon completion of installation.
Table 12		***New table added;*** **Gas and vapor concentrations** See standard for details.
		The following changes reflect the July 15, 2016 edition for UL 268 ONLY
41	Info	**Fire tests** Advisory Note: In the United States, mandatory requirements for flaming and smoldering polyurethane foam tests and cooking nuisance tests are specified in Annex I. The requirements in Annex I are not applicable for Canada.
41.1	Info	**General**

CLAUSE	VERDICT	COMMENT
41.1.5		***New clause added;*** In the United States smoke detectors shall be subjected to the following tests specified in Annex I: a) Flaming polyurethane foam test, b) Smoldering polyurethane foam test, and c) Cooking nuisance test. In Canada these requirements do not apply.
42	Info	**Smoldering smoke test**
42.1		Each detector shall operate for continuous (steady or pulsing) alarm when installed as intended in service and exposed to the controlled smoldering smoke condition specified in 42.3 – 42.10. For a detector whose alarm is identified as nonpulsing, and that emits alarm pulses with the initial entry of smoke, a continuous alarm condition is one which is continuous (nonpulsing) for not less than 5 seconds. In the United States – Detectors shall also comply with the Smoldering Polyurethane Foam test specified in Annex I.
42.2		Unless specifically indicated otherwise in the detector installation instructions, the detectors shall be installed in the least favorable position for smoke entry with respect to the smoldering smoke source as determined by the Directionality Test, Section 33. Detectors adjusted to the minimum smoke detector sensitivity shall be employed for this test. In the United States – Detectors shall also comply with the Smoldering Polyurethane Foam test specified in Annex I.
Annex I		***New annex added;*** **ANNEX I (NORMATIVE) – FLAMING AND SMOLDERING POLYURETHANE FOAM TESTS AND COOKING NUISANCE TEST REQUIREMENTS (UNITED STATES ONLY)** This annex includes information on the flaming and smoldering polyurethane foam tests (see standard for details).