

MAY 12, 2017

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UL 2891

Outline of Investigation for Indoor Air Quality for Building Interiors

Issue Number: 3

May 12, 2017

Summary of Topics

This third issue of the Outline of Investigation for Indoor Air Quality for Building Interiors, UL 2891, is being issued to include the change in a published limit for benzene due to a new edition of a California specification that took effect April 1, 2017.

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INTRODUCTION

1 Scope

1.1 This outline provides the procedure and requirements for certification of a building, or specified portion of a building under the UL Environment program for Building Indoor Air Quality (BIAQ). This outline addresses certification for non-residential buildings.

1.2 This outline recognizes the issues surrounding Legionella in the built environment. Due to differing legal restrictions and licensure requirements, the microbial content and colonization of Legionella are beyond the scope of this outline. It is the responsibility of the building owner and/or operator to assure compliance with all regulations applicable within the jurisdiction. If there is no regulation within the jurisdiction, then a written policy pertaining to Legionella shall be required as a criterion for certification.

1.3 This outline recognizes the issues surrounding lead paint and asbestos in the built environment. Due to differing legal restrictions and licensure requirements, these materials are beyond the scope of this Certification. It is the responsibility of the building owner and/or operator to assure compliance with all regulations applicable within the jurisdiction. If there is no regulation within the jurisdiction, then a written policy pertaining to lead and asbestos shall be required as a criterion for certification.

1.4 These requirements provide a review of basic information about the building, conducts an initial assessment of the status of the building as related to Indoor Air Quality (IAQ), and initiates ongoing periodic assessments of building conditions that relate to IAQ. The focus of the reviews and assessments is on the quality of the indoor air. The program recognizes however that satisfactory IAQ requires the proper and integrated functioning of multiple aspects of the building systems, such as the design of the enclosure (building envelope) which can change over time. In addition, the program provides reasonable measures to detect recognized and common sources of IAQ problems where they occur. Not detecting recognized and common sources of IAQ problems is not however a guarantee of satisfactory IAQ.

1.5 Either an entire building or a portion of a building may be certified under these requirements. A building certification may include the design phase of the building as well as the construction phase and occupancy period, or the certification may apply to only the occupancy phase. The defined scope of the certification, including the extent of the building that is included and the phases that are assessed will be stated on the certificate.

2 Glossary

2.1 **ACH** – Air changes per hour with outdoor (fresh) air.

2.2 **AIR TEMPERATURE, DRY BULB (T_{db})** – Temperature of air as measured independently of humidity effects (temperature).

2.3 **AIR TEMPERATURE, DEW POINT(T_{dp})** – Temperature at which condensation (dew) will form from water vapor in the air.

2.4 **ASSESSMENT** – The multicomponent process of evaluating a building interior for Indoor Air Quality (IAQ).

2.5 **BUILDING ENCLOSURE (OR ENVELOPE)** – Materials, components and assemblies that separate the interior of a building from the external environment (collectively the walls, roof, and bottom of a building).

2.6 **CERTIFIED BUILDING** – Refers to either an entire building or the portion of the building that is included within the scope of assessment and certification.

2.7 **COUNT CONCENTRATION (PM)** – The number of particles per volume of air ($\#/cm^3$ or $\#/m^3$).

2.8 **DEW POINT** – See AIR TEMPERATURE (DEW POINT).

2.9 **INDOOR AIR QUALITY (IAQ)** – The quality of air in building interiors. IAQ is generally deemed acceptable if air pollutants are absent or the concentrations of pollutants are too low to cause dissatisfaction or discomfort. Identification and characterization of relevant levels of indoor pollutants continues to develop.

2.10 **INTERIOR** – A space within a building intended for human occupancy.

2.11 **IVOC** – Individual volatile organic compound.

2.12 **MASS CONCENTRATION (PM)** – The mass of particles per volume of air ($\mu g/m^3$).

2.13 **PM** – Particulate matter that is suspended in air. PM_{10} is PM that has an aerodynamic diameter of 10 micrometers or less. $PM_{2.5}$ is PM that has an aerodynamic diameter of 2.5 micrometers or less.

2.14 **SORBENT** – Material that will reversibly adsorb Volatile Organic Compounds (VOCs) from air.

2.15 **TVOC** – Total volatile organic compounds. The sum value of all compounds within the C6 to C16 range as measured by GC/MS techniques such as EPA Compendium Method TO-17 or Standard Practice for Selection of Sorbents, Sampling, and Thermal Desorption Analysis Procedures for Volatile Organic Compounds in Air, ASTM D6196.

2.16 **VOLATILE ORGANIC COMPOUND (VOC)** – Any carbon containing compound whose composition makes it possible to evaporate under normal atmospheric conditions of temperature and pressure. With specific regard to IAQ, this refers to C6 – C16 compounds that can be measured by GC/MS techniques such as EPA Compendium Method TO-17 or Standard Practice for Selection of Sorbents, Sampling, and Thermal Desorption Analysis Procedures for Volatile Organic Compounds in Air, ASTM D6196.

3 Units of Measurement

3.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

4 References

4.1 Any undated reference to a code or standard appearing in the requirements of this outline shall be interpreted as referring to the latest edition of that code or standard.

Evaluation and Assessment Criteria

5 Initial Certification Assessment

5.1 An initial assessment will be required to begin the certification process. This will include review of documentation, a physical assessment of the building, on-site measurements of environmental parameters and air monitoring or sampling for specified contaminants/conditions. A specified number of locations within the building will be included for inspection, measurement, and testing. The assessor shall identify the locations prior to or during the site visit.

5.2 Documents requested for review should be provided in advance if possible to expedite the on-site portion of the assessment.

5.3 A policy shall be in place that prohibits smoking in the certified space. This policy shall apply to tobacco and to any other plant material as well as to electronic cigarettes. The written policy shall be available to occupants of the certified space.

5.4 A policy shall be in place that excludes animals kept as pets – other than service animals – from the certified space. The written policy shall be available to occupants of the certified space.

5.5 A policy shall be in place to use integrated pest management programs and to minimize the use of synthetic pesticides in the certified space. Birds roosting near outdoor air intakes shall also be addressed in the policy. The written policy shall be available to occupants of the certified space.

5.6 A policy shall be in place assigning responsibility for maintaining and complying with the written response plan for moisture/water issues. The written policy shall be available to occupants of the certified space.

Note: Assuring ongoing satisfactory performance of a building relative to moisture issues needs to involve the operating staff that are routinely on-site and have the best knowledge of the building. For certification, training is required for the operating staff on how to recognize and promptly respond to moisture/water issues. For certification, a written response plan for moisture/water issues is also required.

6 Re-Certification Surveillance Audits/Assessments

6.1 Following the initial assessment, buildings that meet the certification requirements and are certified will conduct periodic surveillance audits and assessments to maintain the certification. Audits will be required in the 30 days prior to the end of the certification period. The document review for surveillance audits will pertain to pertinent records of operations (incident logs, training logs, etc.) since the previous assessment.

6.2 Maintenance of certification will be based on audits and/or repeat assessments. After the initial certification period (15 months) a successful audit of the program records and documentation of the continued policy implementation will allow a certification extension of 12 months. After the first certification extension period, another successful audit will allow a second certification extension period (12 months). Following two audit based certification extensions, a full repeat assessment of the building will be required to maintain certification and begin another certification cycle.

Event	Duration	Result
Initial full assessment	15 months	Certification
First audit	12 months	Certification extension
Second audit	12 months	Certification extension
Repeat full assessment	15 months	Renewed certification

7 Schedule Options for Surveillance Assessments after Initial Certification

7.1 One of the following options will be used to schedule surveillance audits and assessments. The option selected will be stated on the certificate:

- a) Fifteen-month intervals: Seasonal differences in demand on the ventilation system of a building, envelope exposure, and seasonal weather alter environmental factors that can change the indoor air quality. In order to avoid consistently seeing periods when the IAQ is either “best” or “worst,” this schedule will assure that the surveillance audits and assessments do not consistently occur in the same season.
- b) Annually during the most severe season: Where climate and location result in one season of the year being consistently more severe, that season can be selected for annual assessments. This option will provide more robust surveillance of the building when systems are functioning at peak loads. This option will not be able to detect problems associated with partial load conditions though (e.g. inadequate relative humidity (RH) control when the temperature is moderate but RH is still high which can occur in mild temperature seasons in humid climates). This option can start after the initial assessment or it can start after four assessments have been conducted that cover all seasons.
- c) Quarterly for the first year: This will provide information on seasonal differences and accumulate a database on the IAQ performance of the building on an accelerated schedule. After four assessments (initial plus three additional assessments at three month intervals) the assessment schedule can be amended to a less frequent schedule as long as there is at least one surveillance audit/assessment per 15 months.

8 Extent of Building to be included in the Assessment

8.1 The extent of the building to be included in the assessment must be agreed upon in the terms of the engagement. The entire building may be included, or a particular portion (building space). Any certification will only apply to the space assessed. The included extent of the building (space) will be noted in the certification.

9 Selection of Areas (Rooms) to Assess

9.1 A sample of areas (or rooms) in a building can yield information that is valid for the entire building if those locations are representative of the rest of the building. This is cost-effective and less time consuming compared to assessing the whole building. To be technically valid though, the selection of areas for sampling must be unbiased; that is, all areas in a building must have the same probability of being sampled. This is done by randomly (without bias) selecting areas of a building to be assessed. Access to the selected areas must be permitted as part of the site visit. Any area that, for security or privacy reasons, is excluded should be identified prior to the site assessment. Any such area will not be included in a certification.

10 Assessment Elements

10.1 The assessment of the building will include multiple elements. These include a review of documentation, a visual inspection of the building by a qualified assessor, readings of environmental parameters measured on-site, and test results of samples collected during the assessment and analyzed for specific analytes/pollutants.

10.2 Specific assessment elements apply to certain geographical regions and to certain types of building use. These specific elements are in appendices at the end of this outline. These specific elements are in addition to the general elements in the following sections.

11 Design Review

11.1 Existing buildings that are already occupied and are seeking certification shall not be required to conduct a design review if the owner/operator provides to the certification body written notice of intent to exclude a design review from the scope of certification. The certification will then be noted as not including design elements.