UL MCV 1495

Methodology for Marketing Claim Verification: UL Verified Healthy Building – Manufacturing Facilities

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First Edition

July 15, 2022

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1.0 PURPOSE

The purpose of this document is to define the program for the UL Verified Healthy Building mark for manufacturing buildings.

This verification claim focuses on the evaluation of indoor environmental quality parameters within a manufacturing facility, for identification as a 'Verified Healthy Building'.

The key areas are: a) Indoor Air Quality (required baseline), b) Water Quality, c) Lighting and Acoustic Quality, and d) Building Hygiene and Janitorial Effectiveness; all supported by a set of policies adopted for continuous improvement in building indoor environmental quality. The three available verification mark tiers are described in Section 2 below.

2.0 SCOPE

There are three verification mark tiers that can be achieved, each one building upon the previous. Each tier requires performance testing and confirmation of the presence of all applicable policies/plans as described in Section 5.0 of this document.

Tier 1: "Verified Healthy Building for Indoor Air"

a. Defined as performance achievement for the Indoor Air Quality areas, as well as confirmation of the presence of all listed policies/plans

Tier 2: "Verified Healthy Building for Indoor Air and Water"

b. Defined as performance achievement for the Indoor Air Quality and Water Quality areas, as well as confirmation of the presence of all listed policies/plans

Tier 3: "Verified Healthy Building for Indoor Environment: Air, Water, Hygiene, Light and Acoustics"

c. Defined as performance achievement for 4 key areas: Indoor Air Quality, Water Quality, Lighting and Acoustics, and Building Hygiene/Janitorial Effectiveness, as well as confirmation of the presence of all listed policies/plans

This verified facility mark is supported by on-site quantitative measurements, visual inspections, validation of existing plans or policies, and by bi-annual on-site inspections and/or data from indoor air quality sensors for continuous monitoring of quantitative metrics.

This verification program recognizes the issues surrounding lead paint, PCBs, asbestos, airborne mold, and other hazardous materials as they pertain to the built environment. Due to differing legal restrictions and licensure requirements, these contaminants are beyond the scope of this verification mark. It is the responsibility of the building owner and/or operator to assure compliance with all regulations applicable within the jurisdiction.

3.0 DEFINITIONS

- ACH - Air changes per hour with outdoor (fresh) air.
- AIR TEMPERATURE, DRY BULB (Tdb)- Temperature of air as measured independently of humidity effects (temperature).
- AIR TEMPERATURE, DEW POINT (Tdp) - Temperature at which condensation (dew) will form from water vapor in the air.
- ASSESSMENT - The multicomponent process of evaluating a building interior for Indoor Air Quality (IAQ) or Indoor Environmental Quality (IEQ).
- BUILDING ENCLOSURE (OR ENVELOPE) - Materials, components and assemblies that separate the interior of a building from the external environment (collectively the assemblies that make up the walls, roof and bottom of a building).
- CARBON DIOXIDE – a greenhouse gas and byproduct of human respiration. In IAQ, carbon dioxide serves as a metric that can be evaluated as a proxy for ventilation or air exchange.
- COUNT CONCENTRATION (PM) - The number of particles per volume of air (#/cm3 or #/m3)
- DEW POINT - See AIR TEMPERATURE (DEW POINT).
- HEATING VENTILATION and AIR CONDITIONING (HVAC) – Refers to building mechanical equipment to provide thermal comfort, acceptable IAQ including ventilation, and the maintenance of pressure relationships.
- FILTER – A porous component of the HVAC system designed to remove particulate or gaseous pollutants from the air
- FORMALDEHYDE – a ubiquitous volatile organic compound sourced to building construction materials and household products
- 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.
- INDOOR EVIRONMENTAL QUALITY (IEQ) – The quality of environmental parameters in building interiors, including air, water, light, acoustics, and building hygiene. IEQ is deemed acceptable if quantitative performance measurements meet set thresholds such as contaminant loads for air and water quality, and performance outputs for lighting, acoustics, and building hygiene.
- INTERIOR - A space within a building intended for human occupancy
- IVOC - Individual volatile organic compound, sometimes referred to as speciated VOCs.
- LEED – Leadership in Energy and Environmental Design
- MASS CONCENTRATION (PM) - the mass of particles per volume of air (µg/m3)

- MERV – Minimum Efficiency Reporting Value, a measurement scale to rate the effectiveness of air filters to capture particles (ASHRAE). Ranging from 1 – 20.
- OZONE (O3) - a colorless unstable toxic gas with a pungent odor and powerful oxidizing properties, formed from oxygen by electrical discharges or ultraviolet light. It differs from normal oxygen (O2) in having three atoms in its molecule (O3).
- RELATIVE HUMIDITY (RH) – the ratio of the amount of moisture in air compared to what the air can "hold" at a given temperature (%)
- RELATIVE LIGHT UNITS (RLU) a unit of measurement for adenosine triphosphate and a metric for cleaning verification
- RESPIRABLE SUSPENDED PARTICULATE (RSP) – Particulate matter suspended in air has an aerodynamic diameter less than 10 micrometers in diameter (PM 10). PM 2.5 (particulate matter less than 2.5 micrometers in diameter) are considered fine inhalable particulate and a greater risk to human health.
- SORBENT - Material that will reversibly adsorb Volatile Organic Compounds (VOCs) from air.
- TVOC - Total volatile organic compounds. The estimated sum value of all volatile organic compounds within the C6 to C16 range as measured by GC/MS techniques such as EPA method TO-17 or ASTM D 6196. <<ISO16000-6>> Direct reading instruments also estimate TVOC concentrations using Photo Ionization Detection (PID) technology.
- UL Verification Program – Science based testing and surveillance program that verifies a marketing or performance claim for a given product or process. For this program, the performance claims are focused on indoor environmental quality metrics at the facility level.
- VERIFIED FACILITY - Refers to either an entire building or the portion of the building that is included within the scope of assessment and certification.
- 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 method TO-17 or ASTM D 6196.
- WELL – Certification program for the International WELL Building Institute

4.0 RESPONSIBILITY

UL Solutions Approved Personnel will perform Indoor Environmental Quality testing, observations, and verifications for annual and midyear inspections to support the verification mark claim.

4.1 Period

Verification Mark Claim use authorization expires [1 year] after the original Mark issuance date. The mark can be used and maintained throughout the year, provided that continuous monitoring or midyear site visit results meet threshold values defined in this program, and any corrective action narratives (if required) are completed[1]. Clients have the option to reevaluate their Claim via the Inspection Criteria and Surveillance Program outlined below.

4.2 Reevaluation Test/Audit/Inspection Criteria

After the initial verification mark, the following schedules for reinspections and evaluations will be completed on an ongoing basis.

- A second screening of indoor air quality quantitative parameters identified in the tables within section 5 from a representative number of air handling systems shall be completed each year, no closer than 3 months apart (midyear inspection)
    - Where ongoing sensor data is available and able to be shared with the UL Solutions team, the midyear inspection will not need to be completed on-site. Sensors should be selected, installed and maintained in alignment with acceptable sensor standards for sensor performance (such as UL 2905 and RESET) and sensor placement and layout (such as UL 2906 and RESET).
    - For buildings verified under the UL Verified Ventilation and Filtration Program, the midyear inspection will not need to be completed.
- An Annual Reevaluation Inspection with all the parameters included for performance testing, visual observations and verification shall be completed for the annual award of the Verification mark

[1] The timeline from the issuance of the verification mark is subject to a 1 year requirement for re-verification. There is a 60-day grace period for the annual re-verification to allow for scheduling site visits and any lab or data processing turnaround times.

4.3 Non-compliance Actions (Surveillance)

For items where performance is not verified to the thresholds and requirements defined herein, the following corrective action will be necessary. Failure to document corrective action as needed may result in rescinding of the Verification Mark and removal from the Verify.UL.com database.

- Quantitative Metrics: Sampling results are required to be in compliance with thresholds set in this document for the Verification Mark as follows:
    - Air: Provided that 90% of the tested locations have met the performance criteria per constituent, a failure for a key metric is temporarily acceptable with an approved corrective action plan and/or explanation. However, verification may be held if two consecutive failures occur at the same sampling location (midyear testing) until all performance levels are tested below the thresholds. If less than 90% of the tested locations have met the performance criteria per constituent, retesting is required.
    - Utility Water (Cooling Towers and Decorative Fountains): Corrective action is required for legionella results between 10 CFU/ml and 99.9 CFU/ml. Retesting is required for any legionella results 100 CFU/ml and higher. Retesting can be conducted by UL Solutions or a client's contracted water treatment vendor.
    - Potable Water: Requires 100% of performance criteria related to EPA Primary Drinking Standards to be met, otherwise retesting is required. Re-testing is not required for contaminants related to Secondary Drinking Standards as long as an approved corrective action plan and/or explanation is provided (more details in the water section below)
    - Lighting: For any performance criteria that is not met, corrective action or explanation is required from the client.
    - Sound: For any results between 45 and 85 dBA, corrective action or explanation is required from the client. For any results over 85 dBA in areas that are not designated as high noise areas with appropriate hearing protection notifications already posted, corrective action is required, followed by a retest.
    - Hygiene: Provided that 75% of locations meet the threshold for ATP testing and APPA audits, failures at some sampling locations are temporarily acceptable with an approved corrective action plan and/or explanation. If less than 75% of locations meet the thresholds during the initial inspection for the verification mark, corrective action must be taken by the building. If less than 75% of locations meet the thresholds during subsequent annual reevaluations, then retesting is required. Verification may be held if two consecutive failures occur at the same sampling location (annual testing) until all performance levels are tested below the thresholds.

- Qualitative metrics: Any necessary corrective action associated with visual observations, building or mechanical systems should be submitted by the responsible person documenting the corrective action with photographs where appropriate and verified through visual observation at the next site visit.

5.0 GENERAL REQUIREMENTS

All testing will be completed at the facility by UL Solutions approved personnel. Sampling data will be collected and analyzed using the methods shown in the tables that follow and compared with the defined thresholds.

Where available, the following general facility information will be provided prior to site visit and/or verified or collected during the on-site inspection:

- Building configuration, size, and use.
- Renovation details.
- Special use areas such as smoking lounges, copying, kitchens.
- Air handling unit type, design, and operation.
- Building exhaust and return fan operation and fan tracking system.
- Heating and cooling system type and operation.
- Economizer system type, operational parameters and other energy management device details.
- Filtration type and maintenance program.
- Air supply system operation and controls, including VAV zoning, regulation and sequencing.
- Humidification type and control details, if present.
- Chemicals use and storage.
- Building materials that may affect the indoor air quality.
- Assessment of surrounding grounds and outdoor features that may impact IAQ

In addition to general information and sampling in the key areas defined in sections 5.1 – 5.4, the UL Solutions team will confirm with the responsible person the presence of a list of maintenance and management policies (listed below). For some policies not already in place, we have example policies that can be customized by the facility management team for use. UL Solutions' goal for verification of this section is to confirm the presence of each policy. Additionally, it is recommended that all policies contain appropriate sections for continuous improvement and management. If a project is pursuing the Verification Mark in tandem with complementary rating systems such as LEED, BREEAM In-Use, WELL, Fitwel, or others – it is recommended that these policies align with the requirements therein in concert with the Verification Mark review.

Each policy should be comprehensive for continuous improvement, including the following components:

Policy components:

1. Goals statement (what is covered and why)
2. Responsible Person (include additional vendor contact info if applicable)
3. Timeframe for policy (what dates is it valid for, and when was the most recent version adopted)
4. Scope of work (details)
5. Quality Assurance Process (i.e. - maintenance logs are kept on record, etc.)
6. Documentation of staff training where necessary

List of required policies:

- Indoor Air Quality Management Plan
- Mold & Moisture Response Plan
- Preventative Maintenance Plan
- Asbestos Operations and Management Plan (if known asbestos present and in accordance with local, state and/or regional regulations)
- Respiratory Protection Program (if employees are required to wear respirators as part of their duties)
- Legionella Risk Assessment and Water Management Plan (Tiers 2 and 3 only)
- Janitorial Policy (Tier 3 only)

5.1 Air Quality

Parameter	Threshold	Testing Process	Testing Specifics	Referenced for Threshold Value
CO_2	700 ppm above outdoor levels (with upper limit of 1100)	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	ASHRAE 62 Informative Appendix
$PM_{2.5}$	15 µg/m^3; 25 µg/m^3 interim target used to determine if retesting is required (Office Area)	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	WHO
	75 ug/m^3 (Manufacturing area) This threshold is not needed for the verification mark, though exceedances may require more detailed sampling to ensure regulatory compliance.			
TVOC	500 µg/m^3 (Office Area)	handheld device, direct reading for all spaces; lab sampling for manufacturing space	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart) via a Photo Ionization Detector (PID) direct-read device. One lab sample per 25,000 sq ft of manufacturing space will also be collected and analyzed via TO-17 (or equivalent).[2]	LEED, WELL, Fitwel, Molhave et. al, ACGIH, NIOSH, OSHA
	3,000 µg/m^3 (Manufacturing Area, via handheld device). Varies per constituent for lab sampling.			

[2] If elevated readings are found, retesting will be required at a later date via lab sampling per TO-17 (or equivalent) in a minimum of 25% of locations with elevated readings

Parameter	Threshold	Testing Process	Testing Specifics	Referenced for Threshold Value
Temp	68-79°F (Office Area only)	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	ASHRAE 55
Humidity	<65%	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	ASHRAE 62
Formaldehyde	0.08 ppm 8-hour TWA (Office Areas only)	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart) Sampling will be taken with a direct-read device.[3]	WHO
Ozone	51 ppb	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	WHO
CO	3.5 ppm	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	WHO
NO_2	0.2 ppm 8-hour TWA	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	ACGIH
SO_2	0.25 ppm STEL	handheld device, direct reading	breathing zone (3-6 feet above finished floor), test 2 times per location (at least 60 minutes apart)	ACGIH

[3] If elevated readings are found in more than 10% of tested locations, retesting will be required at a later date via field instrument in 100% of failed locations OR lab sampling per ASTM D5197 (or equivalent) in a minimum of 25% of failed locations.

Parameter	Threshold	Testing Process	Testing Specifics	Referenced for Threshold Value
Building Pressurization	building entrances, transition zones between office areas and manufacturing areas (if applicable), are under positive pressure, all contaminant / pollutant sources are under negative pressure	smoke pen test or equivalent	at representative locations	ASHRAE 62
Mold and Moisture inspection	verification of no mold/moisture issues	visual inspection, thermal imagery and/or moisture meters	at representative locations	IICRC, EPA
Filter quality	MERV 13 (or highest possible). Proper filter fit and condition.	visual inspection	If MERV 13 is not achievable due to system constraints and air quality parameters are achieved, a narrative explanation of system constraints is acceptable.	ASHRAE 52.2
No Smoking policy	No smoking policy inside the building and within 25 feet of any openings or air intakes.	Visual inspection	Signage present at entrances and dedicated smoking areas, if present	Federal Management Regulation Amendment 2008-08
Sampling Methodology:	Sampling for Indoor Air Quality shall include a sampling location on every occupied floor or one sample per 25,000 sf minimum + outdoor air sample (same protocols per indoor sampling locations, at least 60 minutes apart) A minimum of 6 test locations with direct reading instruments will be required for projects of a smaller size. A fewer number of test locations specifically for TVOC and/or formaldehyde is allowable for small projects if using EPA TO-17 and/or ASTM D5197 methods or equivalent and subsequent laboratory analysis (minimum 3 locations, at least 1 in manufacturing space). Midyear inspection and testing will be completed only for representative HVAC components and air quality performance metrics, representative of the testing locations at annual inspections (i.e. – thermal imagery and building pressurization are not required in the midyear inspection scope).			

Parameter	Threshold	Testing Process	Testing Specifics	Referenced for Threshold Value
Site Inspection:	- visual inspection of representative number of air handling units (ventilation, filtration, hygiene - including coils, condensate drainage, fan chambers, humidifiers, controlling hardware, etc.) - visual inspection of representative number of supply air diffusers and air intakes - visual inspection of cooling towers (if applicable) - visual inspection of ongoing construction renovations (if applicable) - visual inspection of occupied areas			

5.2 Water Quality

Parameter	Threshold	Testing Process	Testing Specifics	Referenced Standard
pH (potable)	6.5-8.5	handheld device	Samples will be taken with cold water, after flushing the fixture for 60 to 90 seconds	EPA Secondary Drinking Water Standard[4]
temp (potable)	no threshold	handheld device	Samples will be taken of both hot and cold water taps, after flushing the fixture for 60 to 90 seconds	N/A
free chlorine (potable water)[5]	> 0.01mg/L	handheld device	Samples will be taken with cold water, after flushing the fixture for 60 to 90 seconds	N/A
turbidity (potable water)	1 NTU * *this threshold is not required for the verification mark*	handheld device and/or sample collection and lab analysis	Samples will be taken with cold water, after flushing the fixture for 60 to 90 seconds	EPA Primary Drinking Water Standard
Total Dissolved Solids	500 mg/L	handheld device and/or sample collection and lab analysis	Samples will be taken with cold water, after flushing the fixture for 60 to 90 seconds	EPA Secondary Drinking Water Standard[4]

[4] Thresholds for items considered part of EPA Secondary Drinking Water Standards are considered non-mandatory water quality standards, and therefore not subject to enforcement under this Verification Mark. Where secondary standards are exceeded a qualitative response from the Verification Mark user will suffice.

[5] In areas where the Authority Having Jurisdiction (AHJ) does not use halogenated disinfectants for potable water, this threshold for free chlorine is not required for the Verification Mark.

Parameter	Threshold	Testing Process	Testing Specifics	Referenced Standard
heavy metals (potable water - aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, selenium)	varies per metal	Sample collection and lab analysis	Samples will be taken with cold water, after flushing the fixture for 60 to 90 seconds ** retesting for the verification mark will only be required where EPA Primary Drinking Water Standards are exceeded.*	EPA Primary and Secondary Drinking Water Standards[4]
Total Coliforms	Absent	Sample collection and lab analysis (20-hour hold time max)	Samples will be taken with cold water, after flushing the fixture for 60 to 90 seconds	EPA
E. Coli	Absent	Sample collection and lab analysis (20-hour hold time max)	Samples will be taken with cold water, after flushing the fixture for 60 to 90 seconds	EPA
Legionella sampling	Asset Dependent	Sample collection and lab analysis	Samples will be taken from representative cooling tower cells[6] and decorative fountains where present	OSHA, ASHRAE Guideline 12, ASHRAE Standard 188, AIHA 2015
Legionella Risk Assessment	no threshold	full risk assessment of representative potable and process water assets and fixtures	at least one of each fixture/asset type present (i.e., cooling towers, decorative fountains, sink faucets, showers, drinking fountains, ice machines, eye washes, emergency showers, water heaters, holding tanks, etc.)	ASHRAE Standard 188, WELL v2 W03, Fitwel 2.1 Strategy 9.3, BREEAM In-Use issue HEA 18, CDC toolkit
Potable Water Sampling Methodology:	Water Quality sampling shall be completed with one sample to be taken at the water main + one at the most distal fixture per every 100,000 square feet with a maximum of 12 samples, and a minimum of 2 sampling points. All sampling locations should be building maintained fixtures (including at the water main), or fixtures within the project boundary for leased spaces (not including the water main).			
Site Inspection:	- inspect tested fixtures/assets for general hygiene			

[6] In buildings where cooling towers are drained seasonally, legionella sampling should be scheduled when the cooling tower is operating. This can be completed with the annual or midyear inspection. If the cooling tower is drained during the initial verification inspection, verification can move forward provided legionella sampling is completed before the next reevaluation.

5.3 Acoustics

Parameter	Threshold	Testing Process	Testing Specifics	Referenced Standard
dBA for background noise	45 dB* (for office, residential, and retail) 45 - 85 dB provide narrative about reasons why noise sources are outside of locus of control 85 dB + provide documentation of a formal noise survey performed and proof of hearing conservation program if needed	sampling for background noise when un-occupied with all HVAC systems on (representing normal operating conditions)	- 3 feet from any wall surfaces, and 3 feet above the finished floor - one sample every 25,000 sf or one per floor, ensure all space types are covered (this may mean more than one sample per floor) - 3 samples at each location	ASHRAE Handbook Sound and Vibration NIOSH[7]
Site Inspection:	- if hearing protection plan pathway is pursued, observe if present and in use			

5.4 Tier 3 Support Spaces Only (Non-manufacturing spaces such as Office, Admin, Retail, etc.)

5.4.1 Hygiene

Parameter	Threshold	Testing Process		Referenced Standard
bioluminescence	750 RLUs	Surface sampling of representative areas throughout the building on high touch areas such as those located in the admin area on desktops, countertops, door handles and handrails	- Representative high-touch surfaces from common areas - sample collection should be conducted following cleaning and prior to occupancy	Lewis et al, 2008; Whitely et al, 2016) Hygiena, 2014 *(References for equipment and sampling metrics)*

[7] referenced hearing conservation program should include employers to measure noise levels, provide free annual hearing exams and free hearing protection, provide training, and conduct evaluations of the adequacy of the hearing protectors in use unless changes to tools, equipment and schedules are made so that they are less noisy and worker exposure to noise is less than the 85 dBA. The sampling completed for the Verification Mark does NOT constitute a formal noise survey; however, this data can lead to the recommendation to complete a formal noise survey.

Parameter	Threshold	Testing Process		Referenced Standard
		to validate cleaning efforts		
Site Inspection:	- an evaluation of the level of cleanliness of the representative areas sampled will be conducted based on APPA's Custodial Effectiveness Protocol. All areas inspected must meet a score of 2 or less on the APPA scale.			

5.4.2 Lighting

Parameter	Threshold	Testing Process	Testing Specifics	Referenced Standard
Lux	Varies by space type	At each sampling location, on horizontal plane	- 3 samples to be taken at each location - Testing will include occupied spaces and common areas where appropriate. Sampling will be conducted in 10% of all occupied and common areas.	IESNA guidelines (Lighting Handbook) or equivalent (international, EN12464-1: 2011, ISO 8995-1:2002, GB50034:2013, etc.)
Flicker	less than 10%	At each sampling location, on horizontal plane		IEEE standard 1789:2015 for LEDs

5.5 The following records and tracking will be in place for all UL Solutions personnel and equipment:

a. Data Storage – how and where are records and data maintained

   i. Record keeping practices meet ISO 17025 intent, test results and records will be maintained for a period of 2 years after testing

b. Training Records – demonstrate how staff are qualified to conduct the testing

c. Calibrations Records – in-house and factory calibrations will be performed and recorded for all associated equipment

d. Sample tracking system in place for lab sampling, when required:

   i. The laboratory shall have procedure for the transportation, receipt, handling, protection, storage, retention and/or disposal of test items, including all provisions necessary to protect the integrity of the test item.

6.0 TESTING LOCATIONS

See tables above for testing location definition in each parameter set.

7.0 AGREEMENTS

It is the participant's contractual responsibility to notify UL Solutions of any changes made to their facilities and staff that may have an effect on the testing performed under this Program.

It is the participant's responsibility to respond to policy confirmations and data requests truthfully, and representative of typical facility operations.

8.0 PROGRAM INACTIVATION

For items where performance is not verified to the thresholds and requirements defined herein, corrective action will be necessary as determined by guidelines outlined in Sections 4.3 and 5. Failure to document corrective action as needed will result in rescinding of the Verification Mark and removal from the Verify.UL.com database.

9.0 RECORDS

All records to show compliance with this policy and associated procedures shall be stored and maintained by UL Solutions and by the test facilities. All records are maintained for a minimum of 2 years.

APPENDIX A: EQUIVALENCIES

This appendix includes International Equivalents for parameters that can be accepted in exceedance of set thresholds to support regional context only if parameters set in this document cannot already be met.

Other standards may be applied outside those listed below. Should your project feel there are additional regional exceptions applicable to your project, please communicate with your UL Solutions approved personnel completing the on-site inspections for further guidance.

China		
Contaminant/Condition	**Acceptable Limit**	**Reference**
PM2.5	75 µg/m^3	WHO 24Hr Interim target I
Ozone	75 ppb	US NAAQS
GB/T 18883. National Standard of the People's Republic of China: Indoor Air Quality Standard		
US EPA National Ambient Air Quality Standards http://www.epa.gov/air/criteria.htm		
GB 50325 National Standard of the People's Republic of China: Code for Indoor Environmental Pollution Control (Table 6.0.4) I		

UAE		
Contaminant/Condition	**Acceptable Limit**	**Reference**
Formaldehyde	80 ppb	Dubai Regulations
TVOC	300 µg/m^3	Dubai Regulations
CO2	800 ppm	Dubai Regulations
The Green Building Regulations and Specifications in the Emirate of Dubai		

India		
Contaminant/Condition	**Acceptable Limit**	**Reference**
PM2.5	40 µg/m^3	NAAQS India
National Ambient Air Quality Standards of India		

Filter Rating Equivalency Chart

<table>
<tr><th colspan="6">MERV Rating Equivalency Table</th></tr>
<tr><th>MERV Rating / ASHRAE 52.2</th><th>EN 779</th><th>ISO 16890 ePM1</th><th>ISO 16890 ePM2.5</th><th>ISO 16890 ePM10</th><th>ISO 16890 Coarse</th></tr>
<tr><td>5</td><td>G3</td><td rowspan="5">NA</td><td rowspan="3">NA</td><td rowspan="2">NA</td><td>>80%</td></tr>
<tr><td>6</td><td rowspan="2">G4</td><td rowspan="2">>90%</td></tr>
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<tr><td>8</td><td rowspan="2">M5</td><td rowspan="2">>50%</td><td rowspan="6">NA</td></tr>
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<tr><td>10</td><td rowspan="3">M6</td><td rowspan="3">50-65%</td><td rowspan="3">>60%</td></tr>
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<tr><td>13</td><td>F7</td><td>50-65%</td><td>65-80%</td><td>>85%</td></tr>
<tr><td>14</td><td>F8</td><td>65-80%</td><td>>80%</td><td>>90%</td></tr>
<tr><td>15</td><td>F9</td><td>>80%</td><td>>95%</td><td>>95%</td></tr>
</table>

APPENDIX B: ALIGNMENT

The Verified Healthy Building Mark is aligned with the following list of sustainability and health and wellness standards and intended to work in tandem with these and other formal programs. Please visit the Verification Mark website for more detailed information on alignment.

- LEED for Operations + Maintenance credits for Indoor Air Quality Testing
- WELL Features' Ongoing Monitoring requirements for Air and Thermal Comfort
- Fitwel credits for Indoor Air Quality testing
- WELL Health-Safety Feature requirements for Ongoing Air and Water Quality Monitoring and Mold and Moisture Management
- BREEAM In-Use issue for Air and Water Quality Assessments
- Indoor Environmental Quality assessments to support ENERGYSTAR certification, and
- Other alignments internationally