GR**EE**N BADGER

ULTIMATE GUIDE TO LEED V4 & V4.1

IEQc4:
Indoor Air Quality Assessment

A Resource Guide for General Contractors

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Earning IEQc4 Indoor Air Quality Assessment in LEED v4.1

Another throwback LEED credit, simply renamed from Construction IAQ Management, Before Occupancy, to the much more glamorous Indoor Air Quality Assessment.

You've still got two options: flush out the building with a whole bunch of outside air or hire someone to come and test the air. All in all, pretty straightforward for a LEED credit.

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REQUIREMENTS

Requirements for the IEQc4: Indoor Air Quality Assessment Credit

Select one of the following two options, to be implemented after construction ends and the building has been completely cleaned.

All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished. The options cannot be combined.

Option 1. Flush-Out (1 point)

Path 1. Before Occupancy

Install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of gross floor area while maintaining an internal temperature of at least 60°F and no higher than 80°F and relative humidity no higher than 60%.

OR

Path 2. During Occupancy

If occupancy is desired before the flush-out is completed, the space may be occupied only after delivery of a minimum of 3,500 cubic feet of outdoor air per square foot of gross floor area while maintaining the same

temperature and humidity requirements as Path 1.

Once the space is occupied, it must be ventilated at a minimum rate of 0.30 cubic foot per minute (cfm) per square foot of outdoor air or the design minimum outdoor air rate determined in EQ Prerequisite Minimum Indoor Air Quality Performance, whichever is greater. During each day of the flush-out period, ventilation must begin at least three hours before occupancy and continue during occupancy. These conditions must be maintained until a total of 14,000 cubic feet per square foot of outdoor air has been delivered to the space.

OR

Option 2. Air Testing (1-2 points)

After construction ends and before occupancy, but under ventilation conditions typical for occupancy, conduct baseline IAQ testing in occupied spaces for the contaminants listed in each path.

Table 1. Particulate Matter and Inorganic Gases

Contaminant (CAS#)	Concentration Limit (μg/m3)	Allowed Test Methods
Carbon monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels	ISO 4224EPA Compendium Method IP-3GB/T 18883-2002 for projects in China Direct calibrated electrochemical instrument with accuracy of (+/- 3% of reading and resolution of 0.1 ppm). NDIR CO Sensors with accuracy of 1% of 10 ppm full scale and display resolution of less than 0.1ppm
PM 10	ISO 14644-1:2015, cleanroom class of 8 or lower 50 μg/m3 Healthcare only: 20 μg/m3	Particulate monitoring device with accuracy greater of 5 micrograms/m3 or 20% of reading and resolution (5 min average data) +/- 5 μg/m3
PM 2.5	12 μg/m3 or 35 μg/m3**	
Ozone	12 μg/m3 or 35 μg/m3**	Monitoring device with accuracy greater of 5 ppb or 20% of reading and resolution (5 min average data) +/- 5 ppb ISO 13964 ASTM D5149 -– 02 EPA designated methods for Ozone

Path 1. Particulate Matter and Inorganic Gases (1 point)

Test for the particulate matter (PM) and inorganic gases listed in Table 1, using an allowed test method, and demonstrate the contaminants do not exceed the concentration limits listed in the table.

AND/OR

Path 2. Volatile Organic Compounds (1 point)

Perform a screening test for Total Volatile Organic Compounds (TVOC). Use ISO 16000-6, EPA TO-17, or EPA TO-15 to collect and analyze the air sample. Calculate the TVOC value per EN 16516:2017, CDPH Standard Method v1.2 2017 section 3.9.4, or alternative calculation method as long as full method description is included in the test report.

If the TVOC levels exceed 500 μg/m3, investigate for potential issues by comparing the individual VOC levels from the GC/MS results to associated cognizant authority health-based limits. Correct any identified issues and re-test if necessary.

Additionally, test for the individual volatile organic compounds listed in Table 2 using an allowed test method and demonstrate the contaminants do not exceed the concentration limits listed in the table. Laboratories that conduct the tests must be accredited under ISO/IEC 17025 for the test methods they use.

Table 2. Volatile organic compounds

Contaminant (CAS#)	Concentration Limit (µg/m3)	Allowed Test Methods
Formaldehyde 50-00-0	20 µg/m3 (16 ppb)	ISO 16000-3, 4; EPA TO-11a, EPA comp. IP-6 ASTM D5197-16
Acetaldehyde 75-07-0	140 µg/m3	
Benzene 71-43-2	3 µg/m3	ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15 ISO 16017-1, 2; ASTM D6196-15
Hexane (n-) 110-54-3	7000 µg/m3	
Naphthalene 91-20-3	9 µg/m3	
Phenol 108-95-2	200 µg/m3	
Styrene 100-42-5	900 µg/m3	
Tetrachloroethylene 127-18-4	35 µg/m3	
Toluene 108-88-3	300 µg/m3	
Vinyl acetate 108-05-4	200 µg/m3	
Dichlorobenzene (1,4-) 106-46-7	800 µg/m3	
Xylenes-total 108-38-3, 95-47-6, and 106-42-3	700 µg/m3	

Exemplary performance is available for projects that test for the additional target volatile organic compounds specified in CDPH Standard Method v1.2-2017, Table 4-1 and do not exceed the full CREL levels for these compounds adopted by Cal/EPA OEHHA in effect on June 2016.

Long story short:

Flush out your building for 1 point OR test for particulate matter, ozone, and carbon monoxide for 1 point AND/OR a bunch of VOCs for a second point.

STRATEGIES

Strategies for IEQc4

Honestly, this comes down to does the team really wants this point and if so, do they want to pay for it or take a few weeks for it.

If you've got the time before the building is occupied, it's pretty straightforward - calculate how much outside air you'll need (project square footage X 14,000 cubic feet), figure out how much outside air your HVAC system can provide (open up the dampers all the way for quicker turnaround) and let the system rock until you reach the thresholds. It will need to be conditioned somewhat, depending on location and time of year, so there may be a small energy penalty, but that's about it. Just document flow rates, start/end times, to justify the flush out duration, and you'll be good to go. Just make sure to reset any dampers that may have been changed back to original design settings, and to swap out all your filters, and you're good to go.

If the building has to be occupied, you'll do the same process to get at least 3,500 cubic feet before occupancy, then just dial it back and calculate how long you'll need to run the system to reach 14,000 cubic feet.

For testing, honestly, just give the testing agency the requirements for the option(s) you want to pursue and they'll give you a report detailing the results and hopefully, you comply. If you don't, well, then you may have to dive into researching trouble areas or do a flush out and re-test.

Version 4.1 is much better for Testing Option 2 for VOCs than v4. There are significantly fewer VOCs required to test for, so life will be easier.

Summary of Strategies

Flush-out OR hire a testing company

For flush-out, try and implement before occupancy

For testing, send the exact LEED requirements to the testing company

Summary for IEQc34

The strategies detailed will get you to the point, one way or the other. A few other tips:

- Making sure low-VOC products are used will help nip any off-gassing in the bud.

- Maintaining proper ventilation during the construction process will help dilute any contaminants.

- Time of year might be an issue for flush out - running 14,000 CF of air in the middle of a 100-degree humidity streak is a burden on the HVAC system.

- Have a narrative for flush out calculations and confirmation on system reset and filter change to documentation Path 1

- Have test results that show everything under the LEED limits for Path 2