GRAYWOLF SENSING SOLUTIONS
ADVANCED ENVIRONMENTAL INSTRUMENTATION

USGBC LEED® v4 EQc4 - Air Quality Assessment

Utilizing an AdvancedSense/DirectSense/WolfPack LEED-v4 Kit as a highly efficient Screening Tool for "Option 2, Air Testing"

One full point is offered by the US Green Building Council for the LEED v4 credit EQc4 (formerly the IEQ 3.2 credit) in new and renovated buildings. This requires that the building is "flushed out", for a period of days or weeks ahead of occupancy. There is also the option of a two-phase flush-out, with a stage of HVAC operation prior to occupancy, and then some additional flush-out with significantly higher than normal outdoor (dilution) air being delivered during initial occupancy. Such flush-outs can have negative economic consequences resulting from delayed occupancy, and due to the energy costs associated with heating or cooling the additional outdoor air being delivered during the flush-out. However, as an alternative, 2 (two) full points are offered by LEED v4-EQc4 for "Option 2, Air Testing". With Option 2, if a range of specific parameters are measured below prescribed levels, the flush-out period may be reduced or eliminated, while providing added assurance that occupants will not be subjected to elevated pollutants associated with new building materials or construction; pollutants that may detrimentally impact the productivity and long-term health of the occupants.

Parameters to be measured (per LEED v4, 2016):

PARAMETER	TARGET
Particulates (PM10) (for all buildings)	50 µg/m3 Healthcare only: 20 µg/m3
Particulates (PM2.5) (for buildings in EPA non-attainment areas for PM2.5, or local equivalent)	15 µg/m3
Ozone (O_3) (for buildings in EPA non-attainment areas for Ozone, or local equivalent)	0.075 ppm
Carbon Monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels
Total volatile organic compounds (TVOCs)*	500 µg/m3 Healthcare only: 200 µg/m3
Formaldehyde (HCHO)	27 ppb Healthcare only: 16.3 ppb
Measurements must be taken over a minimum period of 4 hours.	

* In addition, 35 specific volatile organic compounds must be tested. The list of VOCs, with target values, is at: http://www.usgbc.org/resources/table-1-maximum-concentration-levels-contaminant-and-testing

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Tripod-Mounted AdvancedSense Kit

GrayWolf's ASP-LEED-EQC4 system measures TVOCs, CO, O_3, CO_2, %RH and Temperature. With the PC-3016A (or optional PM-205) connected, it also displays and data-logs µg/m^3 particulates. Formaldehyde (HCHO) is measured with the included GrayWolf FM-801 meter. Trend logging of all of these parameters can provide valuable information about the dispersion of measured pollutants, as well as provide the 4 hours of monitoring that USGBC calls for to establish that set values are not being exceeded.

All of the AdvancedSense Pro and Particulate readings are virtually instantaneous, while the test for Formaldehyde takes 30 minutes per reading.

AdvancedSense Pro IAQ Plus in security case with PC-3016A Particulate Meter on side bracket

PM-205 Particulate Meter (may be bracketed to side of security case)

FM-801 Formaldehyde Meter (may also be bracketed to top of security case)

This set of screening tests indicate when a building will likely pass the requirements, as set out by the LEED air testing option. However, LEED defers to an older USEPA guideline regarding sampling methodology. There is some debate as to the acceptance by USGBC of some of the state-of-the-art sensors employed by products such as the AdvancedSense Pro for particulates, ozone, carbon monoxide, formaldehyde and TVOCs. For any of these parameters, it is up to the end-user to determine if additional testing is necessary via SUMMA canisters, sorbent tubes (or other sample media), sent for lab analysis. In fact, some studies indicate that results from various air sampling methods for LEED 3.2 testing may vary dramatically[2]. However, for the specific 35 VOCs recently added in LEED v4, air samples sent to a laboratory for GC/MS analysis is a clear requirement. Of course, it can be very time and cost efficient to establish that general TVOC levels are low, using a GrayWolf IAQ/LEED kit, prior to sending out air samples for expensive speciation of the 35 VOCs.

In addition, the IAQ PLUS kits also measure Carbon Dioxide (CO_2), for verifying adequate dilution air distribution to specific occupied areas, Temperature and %RH for thermal comfort evaluation, and have options for Differential Pressure for pollutant pathway determination and a choice of specific gases including Nitrogen Dioxide (NO_2) and many others. These kits may also be utilized (CO_2 and TVOCs) for the LEED Dynamic Plaque (see GrayWolf's app note on this issue).

They are ideal for walk-thru and long-term monitoring of general IAQ parameters, an important component of any IAQ program (for baseline testing and response to complaints). The CO_2 sensors may also be used to assure compliance with LEED's IAQ Prerequisite 1 (minimum air quality performance) and to verify calibration of fixed sensors implemented for the outdoor air delivery monitoring option of LEED's Enhanced IAQ Strategy credit. Refer to GrayWolf's app note on fixed CO_2 sensor validation. GrayWolf's optional differential pressure sensor may be used to provide measurement and documentation of maintaining positive pressure in occupied areas adjacent to construction areas, as per LEED's Construction IAQ Management Credit.

Measurement tools required:

GrayWolf AdvancedSense Pro, WolfPack or DirectSense WIN10 notebook based kit

IQ-610 or TG-502 probe with Low Range PID (TVOC), O_3 and CO sensors installed

PC-3016A, PC-4005 or PM-205 particulate meter
(note: these units may be used as stand-alone loggers or may be interfaced to any GrayWolf platform for data file integration. The PM-205, with optional cyclones, measures the choice of PM2.5 or PM10, while the other 2 models measure both simultaneously).

FM-801 or RK-HCHO-FP31 formaldehyde meter
(note: the FM-801 interfaces to AdvancedSense Pro, WolfPack or WIN10 DirectSense kits, while the RK-HCHO-FP31 does not interface to any GrayWolf platforms for data file integration)

AdvancedSense Pro with IQ-610

Tablet PC with TG-502L TVOC Probe & FM-801 HCHO Meter

WolfPack with TG-502L & PC-3016A

RK-HCHO-FP31 (alternative, non-interfacing HCHO meter)

Footnotes

[1] USEPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air, 1990

[2] M Azad, Comparison of TVOC Sampling and Analytical Methods Used for Green Building Evaluation/LEED, AIHA Conference, Toronto, 2009

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