



# USGBC LEED® IEQ Credit 3.2 Flush-Out Testing: Utilizing the AdvancedSense/DirectSense/WolfPack IAQ PLUS as a highly efficient Screening Tool for “Option 2, IAQ Air Testing”

One full credit is offered by the US Green Building Council for LEED IEQ credit 3.2 in new and renovated buildings. This requires the air handling system in the building to be run, or the space “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 ahead of 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, 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 with construction; pollutants that may detrimentally impact the productivity and long-term health of the occupants.

Parameters to be measured (per LEED Reference Guide for Green Building Design and Construction, 2009 edition):

PARAMETER		TARGET
Total Volatile Organic Compounds	(TVOCs)	<500µg/m3
Carbon Monoxide	(CO)	<9 ppm, and no more than >2ppm above outdoor levels
Particulates	(PM10)	<50µg/m3
Formaldehyde	(HCHO)	< 27 ppb
4-Phenylcyclohexene	(4-PCH)	<6.5µg/m3 This measurement is only required for spaces where carpeting or fabrics with styrene butadiene rubber (SBR) backing has been installed. GrayWolf does not measure this parameter.

Measurements must be taken over a minimum period of 4 hours.



Tripod-Mounted  
AdvancedSense Kit

GrayWolf’s AdvancedSense IAQ PLUS system measures TVOCs, CO, CO<sub>2</sub>, %RH and Temperature. With the optional PC-3016A or PM-205 connected, it will also display and data-log µg/m<sup>3</sup> particulates. Formaldehyde (HCHO) is measured with a 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 and Particulate readings are virtually instantaneous, while the test for Formaldehyde takes 30 minutes per reading.



AdvancedSense & IQ-610 probe 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 tests will indicate when a building will pass the requirements as set out by LEED IEQ credit 3.2, option 2. However, LEED 3.2 defers to a 20-year-old USEPA guideline<sup>1</sup> regarding sampling methodology. There is some debate as to the acceptance by USGBC of some of the state-of-the-art sensors employed by the AdvancedSense, and it is up to the end-user to determine if additional testing via SUMMA canisters or sorbent tubes, with samples sent for lab analysis, might be necessary. In fact, recent studies indicate that results from various air sampling methods for LEED 3.2 testing may vary dramatically<sup>2</sup>. Of course, sending out one set of air samples (once confidence has been established by the GrayWolf IAQ PLUS kit that they will pass) is far more time and cost efficient than sending out daily air samples until the tests pass.

In addition to LEED 3.2 testing, the IAQ PLUS kits also measure Carbon Dioxide (CO<sub>2</sub>), 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 numerous specific gases including ozone (O<sub>3</sub>), Nitrogen Dioxide (NO<sub>2</sub>) and Nitric Oxide (NO). These kits may also be

utilized for walk-thru and long-term monitoring of general Indoor Air Quality parameters, an important component of an IAQ program (for baseline testing and response to complaints). The CO<sub>2</sub> sensors may also be used to assure compliance with LEED IAQ Prerequisite 1 (minimum air quality performance) and to verify calibration of fixed sensors implemented for LEED IEQ credit 1.0 (outdoor air delivery monitoring). Refer to GrayWolf's Application Note "CO<sub>2</sub>Cal". 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 IEQ credit 3.1.

#### Measurement tools required:

GrayWolf AdvancedSense, WolfPack or DirectSense PocketPC/WIN7 notebook based kit

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

PC-3016A 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)

FM-801 or RK-FP30 formaldehyde meter

(note: the FM-801 interfaces to AdvancedSense, WolfPack or WIN7 DirectSense kits, but *not* to Pocket PCs and the RK-FP30 does not interface to any GrayWolf platforms for data file integration)



AdvancedSense with IQ-610



WIN7 notebook with FM-801 & TG-502



WolfPack with TG-502 & PC-3016A



PocketPC with IQ-610 & RK-FP30

#### Footnotes

<sup>1</sup> USEPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air, 1990

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

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