



# Pre-Screening for ASHRAE's Standard 189.1: Post-Construction, Preoccupancy Baseline IAQ Monitoring

The U.S. Green Building Council (USGBC) states that buildings in the US are responsible for 41% of U.S. energy usage and 38% of U.S. carbon dioxide emissions<sup>1</sup>. There is a major opportunity to reduce these values by constructing energy efficient, "high performing green buildings". Many different standards and guidelines are available for designing and constructing green buildings. Two of the most recognized groups are the USGBC, for their Leadership in Energy and Environmental Design certification (LEED), and the International Well Building Institute (WELL). The American Society of Heating and Refrigeration Engineers (ASHRAE) has also weighed in with Standard 189.1, approved by the American National Standards Institute (ANSI) and co-sponsored by the Illuminating Engineering Society of N. America (IES) and the USGBC. Each one of these standards has specific criteria that must be met. Additional information on LEED and WELL applications can be found in the GrayWolf Application Notes: *LEED v4 EQc4*, *LEED ARC*, *WELL Air Quality Screening and WELL Continuous Monitoring*.

ASHRAE's Standard for the Design of High-Performance Green Buildings, ANSI/ASHRAE/USGBC/IES Standard 189.1-2014, has the goal to design buildings that result in energy savings and with positive environmental impacts throughout the design, construction, and operation. There are several different sections that outline all the necessary criteria that must be met. In the Construction and Plans for Operation, section 10.3.1.4 Indoor Air Quality (IAQ) Construction Management, there is the requirement for an IAQ construction management plan. The plan includes two parts, with the first being that all air conveyance materials are stored and covered so they remain clean. The second is that the HVAC

system should not be used during construction, except for system start-up, testing, balancing and commissioning. However, the HVAC system should be in operating mode *after* construction ends and prior to occupancy, while a flush-out must be completed, **or IAQ monitoring must be performed.**

The post-construction, preoccupancy flush-out - can be expensive and time consuming. Opting for IAQ monitoring can save time and money. The post-construction, preoccupancy baseline IAQ monitoring (10.3.1.4(b)(2)) must be performed after the ventilation system is continuously operated within +/-10% of the outdoor airflow rate provided by the ventilation system for a minimum of 24 hours. The testing must ensure that all the contaminants of interest are below the maximum concentration. A partial list is included in the table below:

Contaminant	Maximum Concentration
Carbon monoxide (CO)	9 ppm and no greater than 2 ppm above outdoor levels
Ozone (O3)	0.075 ppm (8 hr.)
Particulates (PM2.5)	35 µg/m <sup>3</sup> (24 hr.)
Particulates (PM10)	150 µg/m <sup>3</sup> (24 hr.)
Formaldehyde (HCHO)	33 µg/m <sup>3</sup>
Volatile Organic Compounds	Refer to Table 10.3.1.4 <i>Maximum Concentration of Air Pollutants Relevant to IAQ in Standard 189.1-2014*</i>

\*189.1-2014 does not assign a TVOC value, as do LEED and WELL (i.e. 500 µg/m<sup>3</sup>) to utilize as an initial screening point. Rather there is a list of 30 specific VOCs (plus HCHO) and a footnote about TVOCs being "... in conjunction with the individual VOCs" listed in table 10.3.1.4.

<sup>1</sup> USGBC. Benefits of Green Building. <http://www.usgbc.org/articles/green-building-facts> Retrieved January 12, 2017.





All the measurements must be made in the return airstreams of the HVAC systems that serve the space intended to be occupied.

GrayWolf specializes in equipment that can monitor for all the listed contaminants, using a combination of technologies. GrayWolf has specific electrochemical sensors for ozone, and carbon monoxide. Formaldehyde is tested with a colorimetric meter specific to low ppb levels of formaldehyde. Total volatile organic compounds (TVOCs) are monitored with a photo ionization detector (PID) with a 10.6 eV lamp. GrayWolf offers two different technologies for particulates, 90-degree light scattering and nephelometric. 189.1-2014 calls for testing using protocols consistent with the USEPA Compendium of Methods for the Determination of Toxic Pollutants in Ambient Air, TO-1, TO-11, TO-17 and ASTM Standard Method D 5197, (all via samples sent to a lab). However, the GrayWolf instrumentation can be used to quickly and accurately screen. The screening process reduces time and saves money by limiting the likelihood of failed results once samples are sent out to the lab. More information about the details of the 189.1-1 required technology can be found in the *GrayWolf ASHRAE 189.1 Tech Note*.



#### GrayWolf kit set up for ASHRAE Monitoring

GrayWolf meters can be rented for this specific application directly from the manufacturer, within North America and Europe, ensuring devices are properly calibrated prior to being sent into the field. There are significant credits available, of the rental amount paid, toward the purchase of new instruments. Devices that are purchased for screening are also able to be used for general indoor air quality (IAQ) with the addition of a CO<sub>2</sub> sensor (which is normally included in the rental units).

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