IEE INDOOR ENVIRONMENTAL ENGINEERING IEE
1448 Pine Street, Suite 103, San Francisco, CA 94109
Phone: 415-567-7700
Fax: 415-567-7763
Email: admin@IEE-SF.com
http://www.IEE-SF.com

Tracer Gas Techniques for Measuring Outdoor Air and Air Contaminant Transport

There are a number of tracer gas techniques that may be employed to measure the outdoor air and air contaminant transport in buildings. Indoor Environmental Engineering, a pioneer in the development and implementation of tracer gas techniques, routinely utilizes tracer gas techniques in building IAQ research and forensic investigations.

The tracer gasses used for these investigations are typically sulfur hexafluoride (SF_6) or various perfluorocarbon gasses. At the concentrations employed for tests in buildings, these gasses are colorless, odorless, and non-toxic. In addition, these gasses are not present in the outdoor air at significant concentrations.

Outside Air Exchange Rate Measurements. An important characteristic of these tracer gasses is that they are chemically and physically non-reactive. This means if these gasses are introduced into the air of a building the only way they are removed is by the exchange of indoor air with outdoor air (i.e. these gasses are not removed by reactions with indoor surfaces, other air constituents, or air cleaners). Thus, these gasses are ideally suited for measuring the outdoor air exchange rate in buildings. In fact, for buildings that are not mechanically ventilated and rely only on natural infiltration of outdoor air (e.g. residential buildings), tracer gas techniques are the only way to measure the outdoor air exchange rate.

Active tracer gas techniques, which typically utilize sulfur hexafluoride gas, include step up, step down (i.e. decay), and constant concentration techniques, and can provide near real time information of the outside air exchange rate in buildings. These active techniques all involve injecting the gas into the building air and then sampling the concentration in the indoor air over time.

Passive tracer gas techniques, typically employ perfluorocarbon gasses, and provide a measure of the average outside air exchange rate over periods of time ranging from 24 hours to two or more weeks. Small passive sources of liquid perfluorocarbon gas are deployed throughout the indoor space along with small passive samplers. The outside air exchange rate is calculated directly from the known total emission rate of gas from the sources and the measured amount of gas collected by the samplers. In addition, different perfluorocarbon gas sources can be deployed in different zones of a building to measure the transport of air between the different zones.

Air Contaminant Transport Measurements. Tracer gas techniques are also valuable tools for measuring the transport of contaminants. The re-entrainment of exhaust air contaminants from rooftop exhaust into the outside air intakes of rooftop ventilation systems is readily measured by releasing the tracer gas into the exhaust air stream and measuring the concentration of the tracer gas entering the outside air intake. The efficacy with which chemical fume hoods capture and remove contaminants can also be readily measured using tracer gas techniques.