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ASHRAE Guideline 27-2019
Measurement Procedures for Gaseous Contaminants in Commercial Buildings

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NOTE

Approved addenda, errata, or interpretations for this guideline can be downloaded free of charge from the ASHRAE website at www.ashrae.org/technology.

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(This foreword is not a part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.)

FOREWORD

ASHRAE Guideline 27 was created to assist engineers and other professionals to plan and implement measurement and sampling of gaseous contaminants in commercial buildings. Properties of gaseous contaminants are discussed in detail in the 2017 ASHRAE Handbook—Fundamentals*, Chapter 11.*

It is assumed that users of this guideline have been specifically requested to obtain data on gaseous contaminants or have established through preliminary investigation that measurement or sampling of gaseous contaminants is warranted.

For the purposes of this guideline, commercial buildings include all building types covered by ANSI/ASHRAE Standard 62.1, Ventilation for Acceptable Indoor Air Quality*. These buildings typically use commercial HVAC equipment. The guideline may also be used for naturally ventilated commercial buildings, though interpretation of the data may be somewhat different.*

Commercial buildings are often complex structures containing a variety of functional spaces and occupant activities. HVAC systems also vary widely from building to building. The intent of the investigation will usually determine which gaseous contaminants to test. Other factors, such as likely concentration, will contribute to the choice of the most appropriate gaseous contaminant measurement or sampling method or methods to use, and building characteristics will play a part in selection of test locations and timing. These factors are important if meaningful data are to be obtained that can reliably be interpreted to draw conclusions about conditions in the building and to guide any recommendations for change.

This guideline is intended for making gas measurements or sampling.

This guideline is not intended for use in industrial environments. Gaseous contaminant concentrations may be much higher in industrial environments, and different test methods are normally appropriate.

This guideline is also not intended for use in residential buildings. Residential buildings have different ventilation equipment, usage, and indoor air quality (IAQ) challenges than commercial buildings.

It should be noted that a variety of problems, including odor, other IAQ complaints, and some building system issues, can often be effectively resolved without resort to measurement or sampling. Resolution is typically achieved using information gathered from inspections, interviews, and sometimes questionnaire data. Procedures for such investigations are not included here. The IAQ Investigator's Guide *can supply useful guidance on conducting such investigations. Other references are also provided in the text.*

In the event that inspections and interviews do not resolve an issue unambiguously, test data likely will be needed to confirm or reject a problem diagnosis. Note that the decision to acquire data needs to be made before using this guideline, because the guideline does not address non-equipment-based problem solving.

Sometimes measurement or sampling can be completed using simple, inexpensive equipment (screening), but sometimes an additional stage using more complex, sensitive, or accurate equipment is needed, particularly if unacceptable levels of contaminant are indicated at the screening stage. This guideline addresses both needs.

Instrument calibration is not covered here because manufacturers normally either factory calibrate suitable instruments or provide detailed instructions for instrument owners to enable them to carry out the task. It is assumed that any instrumentation employed relative to this guideline will be calibrated, at minimum, within manufacturer recommended timelines and following manufacturer suggested procedures.

Guideline Project Committee (GPC) 27 accepts that fine and ultrafine particles are important components of both outdoor and indoor air pollution. However, the scope of this guideline covers only gaseous contaminant measurement and sampling procedures. While particulate matter is not discussed here, measurement of particles should be considered when planning an IAQ survey. Some test methods are discussed in the 2017 ASHRAE Handbook—Fundamentals*, Chapter 11.*

1. PURPOSE

This guideline provides recommended procedures for effective measurement of airborne gas and vapor concentrations inside commercial buildings. Its goal is to provide consistent procedures to follow so field measurements of contaminant concentrations are accurate and reproducible, avoiding typical problems that may cause unreliable or inconsistent results, while recommending sample acquisition techniques, sampling locations in equipment and spaces, sampling requirements, and criteria for data analysis.

2. SCOPE

This document provides guidance on the procedures to follow when measuring gas-phase concentrations of contaminants in commercial buildings. The subject measurements are those used to establish existing, baseline, or changed conditions as a function of the building systems or interior environments. The methods in this guideline emphasize obtaining meaningful data within a reasonable time period at a reasonable cost.

This guideline does not apply to industrial or residential buildings. It does not address

a. specific measurement equipment or devices or
b. calibration of instruments.

3. DEFINITIONS AND ACRONYMS

3.1 Definitions

accuracy: a measure of the ability of an analytical method to provide a correct answer. It can also define the level of agreement between the observed result and true value.

area measurement or sample: a measurement or sample taken at a selected location.

average concentration: the mass or volume concentration of a gaseous contaminant, averaged over the sampling time. See *time-weighted average*.