Practical Options and Code Requirements for Reduced Ventilation in Unoccupied Laboratories

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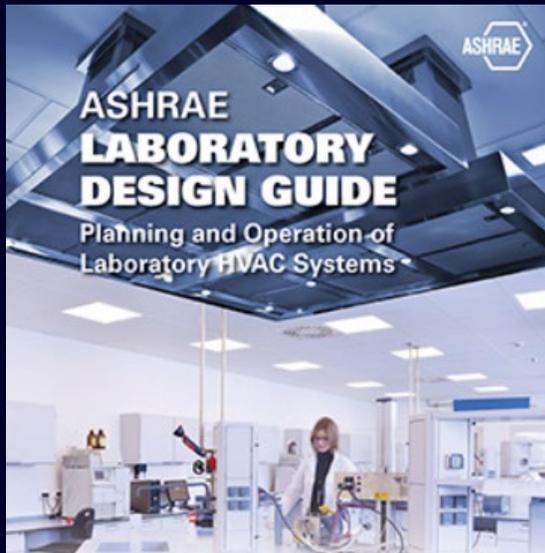
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SIEMENS

Who are we?

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Why?

Why do we ventilate less when users are absent?

We allow less ventilation because:

- Don't need clean air?

- Contaminant sources are inactive?

The only policy that makes sense is to keep the air clean from contaminant sources

The only policy that makes sense is to keep the air clean from contaminant sources!!!

History of Minimum Air Changes
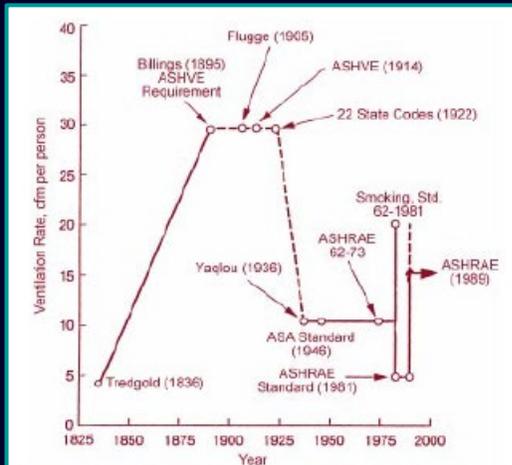
2011 ASHRAE HVAC Applications, Chapter 16

Figure 1: Minimum ventilating rate history.

ASHRAE Standard 62

-1973 ≈ 15.9 cfm/person

-2007 ≈ 10 cfm/person

How do we reduce pressure issues and energy usage in existing labs?

«Fixed minimum airflow rates in the range of 6 to 12 air changes per hour (ach) when the space is occupied have been used in the past. However, recent university research (Klein et al. 2009) showed a significant increase in dilution and clearing performance by increasing the air change rate from 6 to 8 ach with diminishing returns above 12 ach»

*John E. Janssen, "The History of Ventilation and Temperature Control," *ASHRAE Journal* 36, no. 6 (1994): 27.

Demand Based Control for Air Changes

Reducing ACH

BAS Schedule

If the lab is on verified schedule, controls logic can be added to decrease airflow through VAV boxes. Existing Minimums in the controllers could be used.

Occupancy Sensors

Using BACnet occupancy sensors which could be pulled into BAS, new script verifying the occupancy status is added. Timed approach shows bigger savings and less hazards

Contaminants Sensing

VOC, Gases, Particulates and CO2. 2 Air Changes while the air is clean and the volume ramps up when contaminants are present!

Risk Based Approach!

Quality Team and EHS (Environmental Health and Safety)

Great practice: list, in your LVMP considerations for setback

Examples:

- Identify occupancy pattern
- Consider current operating practices (storage, etc.)
- Classify hazards
- Notify users
- Plan monitoring and review

Apply EHS principles

Title 24 Update

Code sets ventilation rates for occupied and unoccupied lab

Allows higher rates set for health and safety requirements

EHS departments need to be ready to express requirements

Will need to assess risk and set ventilation rates

What about ASHRAE 90.1 ?

A B. Unoccupied minimum exhaust airflow. Within 20 minutes of no occupancy being detected by any occupant sensors covering the space, the minimum exhaust and makeup airflow rates shall be the greater of:

    i.   User-defined airflow not to exceed 0.67 cfm/ft² (equivalent to 4 air changes per hours for a 10-foot high ceiling), or

    ii.   The regulated minimum unoccupied circulation rate documented to comply with code, accreditation, or facility environmental health and safety department requirements, or

    iii.   The minimum needed to maintain unoccupied pressurization.

Commissioning

- Title 24 doesn't mention it

- ANSI Z9.5 says a lot

> *7.2.3.3 Lab Environment Tests*
> Where the lab space has more than one ventilation control operating mode (e.g., occupied/unoccupied modes), ... the air change rate shall be determined for each operating mode

ANSI/ASSP Z9.5-2022
Laboratory Ventilation

AMERICAN SOCIETY OF SAFETY PROFESSIONALS
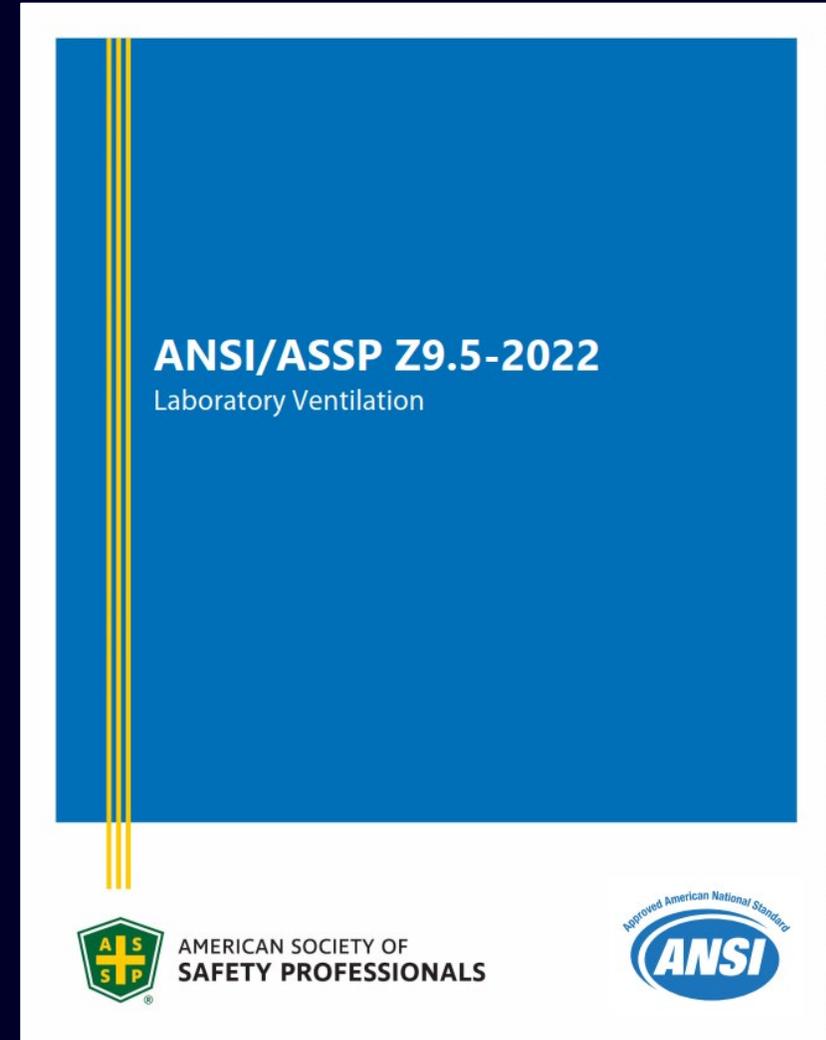
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Questions?

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ASHRAE Standard 90.1 Energy conservation...

Same language, same authors

Proposed, not approved

Applies everywhere, not building code. Yet.