Interpretation IC 170-2013-5 of
ANSI/ASHRAE/ASHE Standard 170-2013
Ventilation of Health Care Facilities

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Request from: Travis English (Travis.R.English@kp.org), Kaiser Permanente, 1800 Harrision Street, Oakland, CA 94612.

Reference: This request for interpretation refers to the requirements in ANSI/ASHRAE/ASHE Standard 170-2013, Section 7 and Table 7.1, regarding 2 ACH minimum outdoor air.

Background: Outdoor air ventilation rates (§7), use the volume-based *'air change per hour'* (ACH) method. In approximately 85% of the spaces, Table 7.1 Column 3 requires 2 ACH.

The volume-based *'air change per hour'* method, and 2ACH, date back over 140 years. In an address to the Queen in 1877, Army Surgeon General WM Muir reported on the new hospital designs in Europe. He noted wards had 100 ft^2 per bed, and 1200-1500 ft^3 per patient, *"the volume of which is to be exchanged twice per hour"* (i.e. 2 ACH).

IAQ has progressed since 1877. New methods have been developed, often by or with the participation of ASHRAE:

- The occupant-based method assumes indoor contaminants correlate to occupancy. From 1975-2004, ASHRAE Standard 62 had occupant-based rates for hospital spaces, an alternative to the 2 ACH method. Research indicated this is appropriate for health care spaces. In 1978, a University of Minnesota study (LBNL Paper LBL-8316) concluded *"Ventilation for many areas of the hospital can probably be reduced to that of commercial office space."* A 1983 ASHRAE-funded research project (312RP) concluded *"up to 90 percent of the hospital spaces might be ventilated to standards used for commercial buildings."*
- Beginning in 1989, ASHRAE Standard 62.1 has allowed contaminant-based ventilation, where systems are designed to, and measured to, meet specific contaminant concentrations (*"the IAQ procedure"*).
- Since the late 1990s, real-time occupant-based ventilation has been implemented using demand-controlled ventilation.
- Current ASHRAE Standard 62.1 design procedures use an additive area-based and occupant-based approach, assuming contaminants correlate to space type, area, and occupancy.

Alternate design methods could offer advantages:

- Using occupant-based 25 cfm/person in a patient area with 200 ft^2/occupant and 9 ft ceilings, acceptable IAQ could be achieved with 0.8 ACH (a 60% savings).
- Using area-based R_a and occupant-based R_p values of 0.12 and 5, respectively, for a patient area with 200 ft^2/occupant and 9 ft ceilings, acceptable IAQ could be achieved with 1.0 ACH (50% savings).

- Demand-controlled ventilation could yield acceptable indoor air quality at reduced energy in variable occupancy spaces. This practice was recently validated by ASHRAE RP-1547.

Additionally, please consider the following
- NIOSH, OSHA and other industrial hygiene standards use 800-1000 ppm of CO_2 as a diagnostic check for IAQ and safety. This type of field test assumes an <u>occupant-based</u> methodology; it cannot be used to check ACH.
- The UK health care ventilation standard, HTM-03-01, calls for an <u>occupant-based</u> 10 L/s/person (~20cfm/person) in general spaces.
- The German health care ventilation standard, DIS-1946-4, calls for an <u>occupant-based</u> $40m^3$/h/person (~25cfm/person) in general spaces.
- A 2009 WHO standard for *"Natural Ventilation for Infection Control in Health-Care Settings"* calls for a patient-based (sub set of <u>occupant-based</u>) 60 L/s/patient (120 cfm/patient).

Interpretation: The volume-based 2 ACH outdoor air requirement in Column 3 of Table 7.1 of Standard 170-2013 prohibits occupant-based ventilation, additive occupant-based and area-based ventilation, contaminant-based ventilation and/or demand-controlled ventilation in health care spaces.

Question: Is this interpretation correct?

Answer: Yes.

Comments: Standard 170-2013 does not currently address ventilation based on 1) different occupancy densities, or 2) demand-controlled ventilation.