Interpretation IC 170-2013-14 of
ANSI/ASHRAE/ASHE Standard 170-2013
Ventilation of Health Care Facilities

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

Background: In Section 7.1.a.6 of ASHRAE/ASHE Standard 170 (S170), two methods are given to calculate the system minimum outside air quantity. Sub paragraph (i) states, "… it shall be the sum of the individual space requirements as defined by this standard [Table 7.1]." Sub paragraph (ii) allows the use of, "the Ventilation Rate Procedure (multiple zone formula) of ASHRAE Standard 62.1. The minimum outdoor air change rate listed in this standard shall be interpreted as the V_{oz} (zone outdoor airflow) for purposes of this calculation."

This first table presents a hypothetical multiple-zone VAV system that only serves spaces described in Table 7.1, where the two methods of calculating minimum required system outdoor air intake are used:

Variable	Abbr.	Value	Units	Reference
Room Volume	RV	2500	cu. ft.	
Outdoor air change rate	OACH	2	AC/hr	S170 Table 7.1
Zone Outdoor Airflow	Voz	83	cfm	RV x OACH / 60
Zone Discharge Airflow	Vdz	250	cfm	
Critical Zone Discharge Outdoor Air Fraction	Zd	0.33		Voz / Vdz
Uncorrected Outdoor Air Intake	Vou	**2000**	cfm	Sum of Voz's
System Primary Airflow	Vps	10000	cfm	
Average Outdoor Air Fraction	Xs	0.20		Vou / Vps
Zone Ventilation Efficiency	Evz	0.87		1 + Xs - Zd
System Ventilation Efficiency	Ev	0.87		Min(Ev)
Outdoor Air Intake Flow	Vot	**2308**	cfm	Vou / Ev
Required OA fraction	Y	0.23		Vot / Vps

In this example, the method in Sub-paragraph (i) results in 2000 cfm being required, equivalent to a System outdoor air fraction of 20%. Using the method in sub-paragraph (ii) results in 2308 cfm being required, with a System outdoor air fraction of 23%.

However, we understand that there are some in the industry that interpret the standard as requiring the System OA fraction to be no less than the Discharge Outdoor Air Fraction of the system's critical zone, being the zone with the highest ratio of required outdoor air to supply air (Max(Zd)), as described in this second table:

Variable	Abbr.	Value	Units	Reference
Alternate Req. OA Fraction	Y_alt	0.33		Max(Zd)
Alt. Outdoor Air Intake Flow	Vot_alt	**3333**	cfm	Vps x Y_alt

Interpretation No.1: For the hypothetical system described above, the first table correctly uses the two methods described in the standard to calculate the Minimum System Outdoor Air Intake Flow.

Question No.1: Is this interpretation correct?

Answer No.1: Yes.

Interpretation No.2: For the hypothetical system described above, the second table presents an alternate acceptable method of using the standard to calculate the Minimum System Outdoor Air Intake Flow.

Question No.1: Is this interpretation correct?

Answer No.2: No.

Comments No.2: The second table is not an alternate method to calculate the Minimum System Outdoor Air Intake Flow. Due to the use of the critical zone fraction (max (Z_d)), this proposed calculation method will always yield a result at least equal to and likely in excess of the minimum OA flow required by Standard 170. The multi-space equation recognizes that the unused portion (unvitiated) of outdoor air in recirculated systems has value to the ventilation within the overall system. Furthermore, Standard 62.1, Appendix A specifically advises that a designer may increase supply zone air flow, particularly to the critical zones requiring the highest fraction of outdoor air, and thereby reduce the system outdoor air intake flow requirement determined in the calculation, sometimes dramatically.