BSR/ASHRAE Addendum ar
to ANSI/ASHRAE Standard 62.1-2016

Public Review Draft

Proposed Addendum ar to Standard 62.1-2016, Ventilation for Acceptable Indoor Air Quality

First Public Review (February 2019)
(Draft shows Proposed Changes to Current Standard)

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(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)

FOREWORD

This proposed addendum modifies language in Informative Appendix E (Acceptable Mass Balance Equations for Use with the IAQ Procedure) to be consistent with the current IAQP. It also clarifies that the equations do not include any potential compounds added by the HVAC system.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum ar to 62.1-2016

Modify Informative Appendix E as shown below.

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INFORMATIVE APPENDIX E
ACCEPTABLE MASS BALANCE EQUATIONS FOR USE WITH THE IAQ PROCEDURE

When applying the IAQ Procedure from Section 6.3, mass balance analysis may be employed to determine outdoor air ventilation requirements to control concentrations to meet design targets ~~indoor contaminant levels~~.

Table E-1 presents mass balance equations for analysis of single-zone systems. Figures E-l and E-2 show representative single-zone systems. A filter may be located in the recirculated airstream (location A) or in the supply (mixed) airstream (location B). The equations do not account for sources within the HVAC system that may occur such as filter off-gassing, energy recovery carryover of specific gases, or generation of particles or compounds.

Variable-air-volume (VAV) single-zone systems reduce the circulation rate when the thermal load is lower than the design load. This is accounted for by a flow reduction fraction (F_r).

A mass balance equation for each design compound or PM2.5 ~~the contaminant of concern~~ may be written and used to determine the required outdoor airflow or the breathing zone ~~contaminant~~ resultant concentration for the various system arrangements. Six permutations for air-handling and single-zone air distribution systems are described in Table E-l. The mass balance equations for computing the required outdoor airflow and the breathing-zone contaminant concentration at steady-state conditions for each single-zone system are presented in Table E-l.

If the allowable breathing zone ~~contaminate concentration~~ design target is specified, the equations in Table E-l may be solved for the zone outdoor airflow rate (V_{OZ}). When the zone outdoor airflow rate is specified, the equations may be solved for the resulting breathing zone design compound or PM2.5 concentration.

While the calculation methods in this appendix are based on single-zone systems and steady-state analysis, calculation methods that account for multiple-zone and transient effects are also available.[E-1]

TABLE E-1 Required Zone Outdoor Airflow or Space Breathing Zone Contaminant Concentration with Recirculation and Filtration for Single-Zone Systems

Required Recirculation Rate				
Filter Location	**Flow**	**Outdoor Airflow**	**Required Zone Outdoor Airflow (V_{oz} in Section 6)**	**Breathing Zone Contaminant Concentration**
None	VAV	100%	$V_{oz} \quad \frac{N}{E_z F_r \ C_{bz} \quad C_o}$	$C_{bz} \quad C_o \quad \frac{N}{E_z F_r V_{oz}}$
A	Constant	Constant	$V_{oz} \quad \frac{N \quad E_z R V_r E_f C_{bz}}{E_z \ C_{bz} \quad C_o}$	$C_{bz} \quad \frac{N \quad E_z V_{oz} C_o}{E_z \ V_{oz} \quad R V_r E_f}$
A	VAV	Constant	$V_{oz} \quad \frac{N \quad E_z F_r R V_r E_f C_{bz}}{E_z \ C_{bz} \quad C_o}$	$C_{bz} \quad \frac{N \quad E_z V_{oz} C_o}{E_z \ V_{oz} \quad F_r R V_r E_f}$
B	Constant	Constant	$V_{oz} \quad \frac{N \quad E_z R V_r E_f C_{bz}}{E_z \ C_{bz} \quad 1 \quad E_f \quad C_o}$	$C_{bz} \quad \frac{N \quad E_z V_{oz} \ 1 \quad E_f \ C_o}{E_z \ V_{oz} \quad R V_r E_f}$
B	VAV	100%	$V_{oz} \quad \frac{N}{E_z F_r \ C_{bz} \quad 1 \quad E_f \quad C_o}$	$C_{bz} \quad \frac{N \quad E_z F_r V_{oz} \ 1 \quad E_f \ C_o}{E_z F_r V_{oz}}$
B	VAV	Constant	$V_{oz} \quad \frac{N \quad E_z F_r R V_r E_f C_{bz}}{E_z \ C_{bz} \quad 1 \quad E_f \quad C_o}$	$C_{bz} \quad \frac{N \quad E_z V_{oz} \ 1 \quad E_f \ C_o}{E_z \ V_{oz} \quad F_r R V_r E_f}$

Symbol or Subscript	**Definition**
A, B	filter location
V	volumetric flow
C	contaminant concentration
E_z	zone air distribution effectiveness
E_f	filter efficiency
F_r	design flow reduction fraction
N	contaminant generation rate
R	recirculation flow factor
Subscript: *o*	outdoor
Subscript: *r*	return
Subscript: *b*	breathing
Subscript: *z*	zone

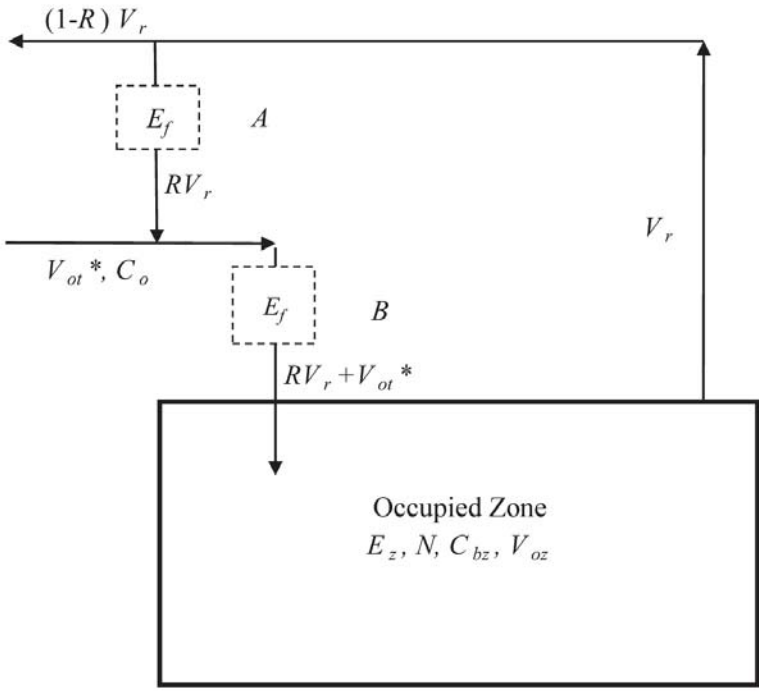

FIGURE E-1 Ventilation system schematic—constant volume system with no infiltration/exfiltration. (*V_{ot} = V_{oz} for single-zone systems.)

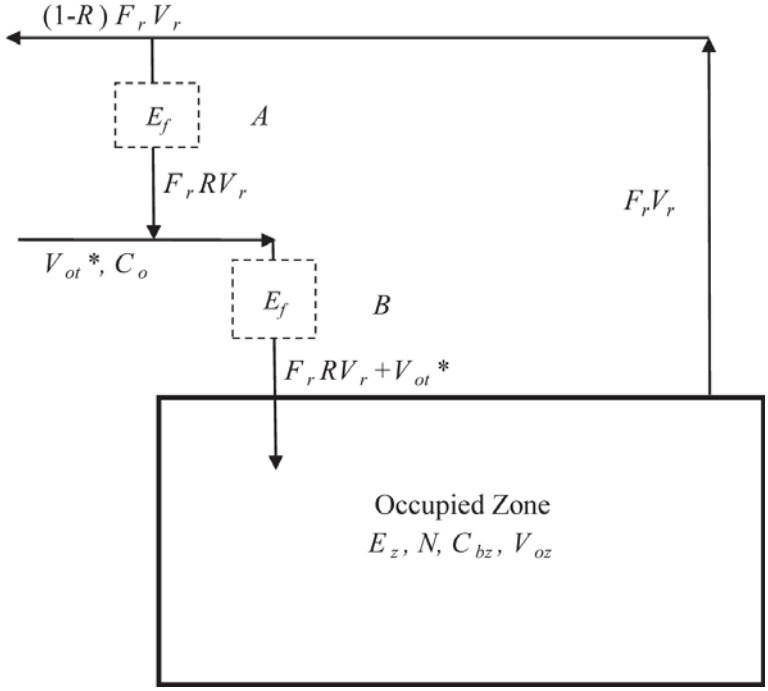

FIGURE E-2 Ventilation system schematic—variable air volume system with no infiltration/exfiltration. (*V_{ot} = V_{oz} for single-zone systems.)

REFERENCE

E-1. Dols, W.S., and G.N. Walton. 2002. CONTAMW 2.0 User Manual. National Institute of Standards and Technology, NISTIR 6921.