Addendum c to
ASHRAE Guideline 36-2021

Public Review Draft
Proposed Addendum w to Guideline
36-2018, High-Performance
Sequences of Operation for HVAC
Systems

First Public Review (February 2022)
(Draft shows Proposed Changes to Current Guideline)

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FOREWORD

This addendum fixes an error in the minimum outdoor airflow setpoint logic for ASHRAE Standard 62.1 ventilation. There may be instances where the zone primary airflow rate (Vpz) is lower than the required zone outdoor airflow (Voz) causing the zone primary outdoor air fraction (Zpz) to exceed 1 and the minimum outdoor airflow setpoint to be driven to the design total outdoor air rate (DesVot).

A high limit of 1 has been added for the calculation of Zpz to prevent this. A limit of Zpz on transition to Occupied Mode has been added to prevent the minimum outdoor airflow setpoint from immediately jumping from 0 cfm to DesVot at the start of occupancy. A 5-minute rolling-average has also been added to the Zpz calculation to counteract instabilities in the Vpz reading.

This addendum also moves the Zpz calculation from the Multiple Zone VAV Air Handling Unit section to the Generic Ventilation Zones section since the Zpz calculation should occur for all ventilation zones, not at the air handling unit.
Addendum c to ASHRAE Guideline 36-2021, High-Performance Sequences of Operation for HVAC Systems
First Public Review

Note: In this addendum, changes to the current guideline are indicated in the text by underlining (for additions) and strikethrough (for deletions) unless the instructions specifically mention some other means of indicating the changes. Only these changes 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 substantive changes.

Addendum c to Guideline 36-2021

(IP and SI Units)
Add Section 5.2.1.3.g as follows:

f. For each zone in Occupied Mode, calculate the zone primary outdoor air fraction, Zpz, where Vpz is the zone primary airflow rate as measured by the VAV box:

\[ Z_{pz} = \text{MIN} \left( 1, \frac{V_{oz}}{V_{pz}} \right) \]

1. Zpz shall be limited to a value no greater than 0.5 for 5 minutes following the onset of Occupied Mode and shall otherwise be calculated based on a 5-minute rolling average.

Revise Section 5.16.3.1 as follows:

5.16.3.1. Outdoor Airflow Setpoint for ASHRAE Standard 62.1-2016 Ventilation

The CO2 DCV strategy for Standard 62.1 currently increases both the zone primary airflow and the population component of the breathing zone outdoor airflow in response to increasing CO2 concentrations. Through the dynamic implementation of the Standard 62.1 Multiple Spaces Equation (see Voz and Ev calculations in this section), the minimum outdoor airflow setpoint is adjusted accordingly in tandem with the zone DCV response. Though this combined response increases ventilation with rising CO2 concentrations, it is not strictly adherent with Standard 62.1. ASHRAE research projects RP-1547 and RP-1747 developed and tested a technically rigorous DCV approach that may be considered for future versions of the guideline pending further confirmation of its stability in real-world applications.

a. See Section Error! Reference source not found. for zone outdoor air requirement Voz.

b. See Section Error! Reference source not found. for setpoints DesVoz and DesVot.

The following logic solves the Standard 62.1 multiple-spaces equation dynamically. This is required prescriptively by ASHRAE/IES Standard 90.1 for single-duct VAV systems. The logic does not strictly apply to VAV systems with multiple recirculation paths, such as dual-fan dual-duct systems and systems with fan-powered terminals, nor is it required by Standard 90.1 for these systems. Logic for dynamic reset for these systems has yet to be developed.

c. The uncorrected outdoor air rate setpoint Vou is recalculated continuously based on the adjusted ventilation rates Vbz-A* and Vbz-P* of the zones being served determined in accordance with Section Error! Reference source not found..

Some diversity factor is included in Voz, calculated below, because the ventilation requirements have been zeroed out for unoccupied zones and those with open window switches. But there is additional diversity in areas with occupancy sensors because only one person in the room will trigger the sensor. There is also diversity in other areas without occupancy sensors. Therefore operating Voz is limited to design Voz, and the diversity value of D in the calculation of DesVoz is not required.
1. Calculate the uncorrected outdoor air rate \( V_{ou} \) for all zones in all Zone Groups that are in Occupied Mode, but note that \( V_{ou} \) shall be no larger than the design uncorrected outdoor air rate \( DesV_{ou} \).

\[
V_{ou} = \text{MIN}(DesV_{ou} | (\sum V_{dz-A} + \sum V_{dz-P}))
\]

d. \( V_{ps} \) is the sum of the zone primary airflow rates \( V_{pz} \) as measured by VAV boxes for all zones in all Zone Groups that are in Occupied Mode.

e. For each zone in Occupied Mode, calculate the zone primary outdoor air fraction \( Z_{pz} \):

\[
Z_{pz} = \frac{V_{oz}}{V_{pz}}
\]

*See ASHRAE Guideline 13 for best practices in locating programming logic for the zone primary outdoor air fraction calculation based on network architecture.*

f. Calculate the maximum zone outdoor air fraction \( Z_{p} \), where \( Z_{pz} \) is evaluated for all zones in all Zone Groups that are in Occupied Mode:

\[
Z_{p} = \text{max}(Z_{pz})
\]

g. Calculate the current system ventilation efficiency \( E_{v} \):

\[
E_{v} = 1 + (V_{ou}/V_{ps}) - Z_{p}
\]

h. Calculate the effective minimum outdoor air setpoint \( MinOAsp \) as the uncorrected outdoor air intake divided by the system ventilation efficiency, but no larger than the design total outdoor air rate \( DesVot \):

\[
MinOAsp = \text{MIN}(\frac{V_{ou}}{E_{v}} | DesV_{ot})
\]