



ADDENDA

**ASHRAE Addendum c to
ASHRAE Guideline 36-2021**

High-Performance Sequences of Operation for HVAC Systems

Approved by ASHRAE on August 1, 2023

This addendum was approved by a Standing Guideline Project Committee (SGPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the guideline. Instructions for how to submit a change can be found on the ASHRAE® website (www.ashrae.org/continuous-maintenance).

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(This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.)

FOREWORD

Addendum c fixes an error in the minimum outdoor airflow set point logic for ASHRAE Standard 62.1 ventilation. There may be instances where the zone primary airflow rate (V_{pz}) is lower than the required zone outdoor airflow (V_{oz}), causing the zone primary outdoor air fraction (Z_{pz}) to exceed 1 and the minimum outdoor airflow set point to be driven to the design total outdoor air rate ($DesVot$).

A high limit of 1 has been added for the calculation of Z_{pz} to prevent this. A limit of Z_{pz} on transition to Occupied Mode has been added to prevent the minimum outdoor airflow set point from immediately jumping from 0 cfm to $DesVot$ at the start of occupancy. A five-minute rolling-average has also been added to the Z_{pz} calculation to counteract instabilities in the V_{pz} reading.

This addendum also moves the Z_{pz} calculation from the Multiple Zone VAV Air Handling Unit section to the Generic Ventilation Zones section, as the Z_{pz} calculation should occur for all ventilation zones, not at the air-handling unit.

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

Addendum c to Guideline 36-2021

(IP and SI Units)

Add Section 5.2.1.3.g as follows:

- g. For each zone in Occupied Mode, calculate the zone primary outdoor air fraction, Z_{pz} , where V_{pz} 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. Z_{pz} 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

- a. See Section 5.2.1.3 for zone outdoor air requirement V_{oz} .
- b. See Section 3.1.4.2.a for setpoints $DesVou$ 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 V_{ou} is recalculated continuously based on the adjusted ventilation rates V_{bz-A^*} and V_{bz-P^*} of the zones being served determined in accordance with Section 5.2.1.3.

Some diversity factor is included in V_{ou} , 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 V_{ou} is limited to design V_{ou} , and the diversity value of D in the calculation of $DesV_{ou}$ 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 $DesV_{ou}$.

$$V_{ou} = \text{MIN}(DesV_{ou} | (\sum V_{bz-A*} + \sum V_{bz-P*}))$$

- 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} :~~

$$\del{Z_{pz} = V_{oz} / V_{pz}}$$

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:

$$Z_p = \max(Z_{pz})$$

- 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 $MinO_{Asp}$ as the uncorrected outdoor air intake divided by the system ventilation efficiency, but no larger than the design total outdoor air rate $DesV_{ot}$:

$$MinO_{Asp} = \text{MIN}\left(\frac{V_{ou}}{E_v} \mid DesV_{ot}\right)$$

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As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

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