



**Addendum f to  
ASHRAE Guideline 36-2018**

**Public Review Draft**

# **Proposed Addendum f to Guideline 36- 2018, High-Performance Sequences of Operation for HVAC Systems**

**First Public Review (November 2019)  
(Draft shows Proposed Changes to Current Guideline)**

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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. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE)**

## FOREWORD

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*In Section 3.2.1.5, the designer is required to provide setpoint S-R-DIFF, which is the airflow differential between supply air and return air fans required to maintain building pressure at desired pressure when using Return Fan Tracking control option. In Section 5.16.11.2, the AHU return fan speed is controlled so that return airflow rate tracks the supply airflow rate less S-R-DIFF. Issues with this logic:*

- 1. This maintains a fixed offset even when the AHU is not in occupied mode, i.e., when minimum ventilation outdoor air is zero. This causes excess outdoor air during warmup, setback, cooldown, and setup to make up this differential. The differential can also be caused if the return air fan is smaller in size than the supply air fan, which is common. Since VAV zones can be operating at cooling-maximum during these modes, the supply air fan is often at full speed and its airflow can exceed the return fan's capabilities, again resulting in excess outdoor air.*
- 2. The offset is the same regardless of how many Zone Groups are in Occupied Mode. Clearly, the amount of air needed for pressurization will be lower when not all zones are being supplied.*

*This addendum addresses both issues by assuming the amount of air needed for pressurization is proportional to the area-component of the ventilation rate. This was deemed to be the variable the control system "knows" that is likely to be most indicative of the airflow needed for pressurization. If no zones are in Occupied Mode, the offset setpoint would be zero.*

*Note that Figure 5.16.2.3-2 and Figure 5.16.2.3-3, which apply to AHUs with return fans using either airflow tracking or direct building pressure control, call for the outdoor air damper to be wide open during all operating modes, including warmup, setback, cooldown, and setup. This has the advantage of decoupling the return fan and supply fan when the S-R-DIFF is set to zero – if the outdoor air damper were closed, the fans would be in series and airflow tracking would be unstable as the action one fan affects the other. But having the outdoor air damper open can cause excess outdoor air intake if there are airflow calibration differences between the return fan and supply fan, e.g., if the return fan airflow reading is higher than actual return airflow causing return airflow to be less than supply airflow, with the remainder being non-zero outdoor airflow. Another issue with Figure 5.16.2.3-2 and Figure 5.16.2.3-3 is that they effectively only work if the minimum outdoor air control scheme uses a single airflow measuring station, as opposed to separate minimum outdoor air and economizer outdoor air dampers. These issues will be addressed by future addenda.*

*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 f to Guideline 36-2018

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*(IP and SI Units)*

*Revise Section 3.2.1.5 as follows:*

3.2.1.5 Return-Fan Airflow ~~Differential~~Tracking Setpoints. (For return-fan airflow tracking control, see Section 5.16.11.)

- a. S-R-DIFF. The airflow differential between supply air and return air fans required to maintain building pressure at desired pressure (e.g., 12 Pa [0.05 in. of water]) using a handheld sensor if a permanent sensor is not provided. All exhaust fans that normally operate with the air handler should be on.
- b. Vrf-max. The maximum return fan airflow rate, typically the scheduled design airflow rate.

*Revise Section 5.16.11 as follows:*

5.16.11 Return Fan Control – Airflow Tracking

5.16.11.1 Return fan operates whenever associated supply fan is proven on.

5.16.11.2 The active differential airflow setpoint S-R-DIFF\* shall be S-R-DIFF for the entire system (see Section 3.2.1.5) adjusted by the sum of the area component of the breathing zone outdoor airflow rate of zones in Zone Groups that are in Occupied Mode relative to that in all zones served by the system.

*The equations below will result in S-R-DIFF set to zero if no zones are in Occupied Mode, e.g., during Warmup, Cooldown, Setback, and Setup Modes.*

**If the project is to comply with California Title 24 ventilation requirements, keep Equation b. and delete Equation a.**

**If the project is to comply with ASHRAE Standard 62.1 ventilation requirements, keep Equation a. and delete Equation b.**

$$\text{a. } S - R - DIFF^* = S - R - DIFF \frac{\sum_{\text{all Occupied Zones}} V_{bz-A}}{\sum_{\text{all Zones}} V_{bz-A}}$$

$$\text{b. } S - R - DIFF^* = S - R - DIFF \frac{\sum_{\text{all Occupied Zones}} V_{area-min}}{\sum_{\text{all Zones}} V_{area-min}}$$

5.16.11.23 Return fan speed shall be controlled to maintain return airflow equal to supply airflow less differential S-R-DIFF\* ~~determined per Section 3.2.1.5.~~

*The following logic will keep supply airflow from exceeding the capability of the return fan, which is often designed to be smaller than the supply fan, which can result in excess outdoor air intake. This becomes an issue when S-R-DIFF\* is zero during Warmup, Cooldown, Setback, and Setup Modes because the supply air fan can be at full speed due to VAV boxes operating at Vcool-max during these modes.*

5.16.11.4 Supply fan airflow shall be limited by a reverse-acting P-only loop whose set point is  $(V_{rf-max} + S-R-DIFF^*)$  and whose output is maximum supply fan speed ranging from 0% to 100%.