ADDENDA

ASHRAE Addendum a to
ASHRAE Guideline 36-2021

High-Performance Sequences of Operation for HVAC Systems

Approved by ASHRAE on August 30, 2024.

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).

The latest edition of an ASHRAE Standard may be purchased on the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 180 Technology Parkway, Peachtree Corners, GA 30092. E-mail: orders@ashrae.org. Fax: 678-539-2129. Telephone: 404-636-8400 (worldwide), or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to www.ashrae.org/permissions.

 ISSN 1049-894X

SPECIAL NOTE

This Guideline was developed under the auspices of ASHRAE. ASHRAE Guidelines are developed under a review process, identifying a Guideline for the design, testing, application, or evaluation of a specific product, concept, or practice. As a Guideline it is not definitive but encompasses areas where there may be a variety of approaches, none of which must be precisely correct. ASHRAE Guidelines are written to assist professionals in the area of concern and expertise of ASHRAE's Technical Committees and Task Groups.

ASHRAE Guidelines are prepared by Project Committees appointed specifically for the purpose of writing Guidelines. The Project Committee Chair and Vice-Chair must be members of ASHRAE; while other committee members may or may not be ASHRAE members, all must be technically qualified in the subject area of the Guideline.

Development of ASHRAE Guidelines follows procedures similar to those for ASHRAE Standards except that (a) committee balance is desired but not required, (b) an effort is made to achieve consensus but consensus is not required, (c) Guidelines are not appealable, and (d) Guidelines are not submitted to ANSI for approval.

The Senior Manager of Standards of ASHRAE should be contacted for

a. interpretation of the contents of this Guideline,
b. participation in the next review of the Guideline,
c. offering constructive criticism for improving the Guideline, or
d. permission to reprint portions of the Guideline.

DISCLAIMER

ASHRAE uses its best efforts to promulgate Standards and Guidelines for the benefit of the public in light of available information and accepted industry practices. However, ASHRAE does not guarantee, certify, or assure the safety or performance of any products, components, or systems tested, installed, or operated in accordance with ASHRAE's Standards or Guidelines or that any tests conducted under its Standards or Guidelines will be nonhazardous or free from risk.

ASHRAE INDUSTRIAL ADVERTISING POLICY ON STANDARDS

ASHRAE Standards and Guidelines are established to assist industry and the public by offering a uniform method of testing for rating purposes, by suggesting safe practices in designing and installing equipment, by providing proper definitions of this equipment, and by providing other information that may serve to guide the industry. The creation of ASHRAE Standards and Guidelines is determined by the need for them, and conformance to them is completely voluntary.

In referring to this Standard or Guideline and in marking of equipment and in advertising, no claim shall be made, either stated or implied, that the product has been approved by ASHRAE.

(This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline. It has not been processed according to the ANSI requirements for a guideline 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

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 a adds an Outdoor Air Pollution Mode, which is used to manually or automatically disable the airside economizers. Wildfires and other sources of air pollution produce high outdoor concentrations of $PM_{2.5}$, small particles with diameters less than 2.5 µm that can penetrate deep into the human lungs, and other contaminants. The added Outdoor Air Pollution Mode will minimize indoor concentrations of air pollution while maintaining the required minimum ventilation rate. Providing minimum ventilation during periods of high outdoor air pollution also helps minimize uncontrolled infiltration through unfiltered openings.

Addendum a to Guideline 36-2021

(IP and SI Units)

Add new Section 3.1.10:

3.1.10. Outdoor Air Pollution Mode Setpoints

Air quality sensors may be provided to disable economizers when outdoor air quality is poor to reduce the indoor concentration of outdoor air pollutants and to reduce filter loading. The maximum setpoints below are the threshold above which Outdoor Air Pollution Mode will be enabled. Limits are defined for three common air pollutants, but the designer can add other sensors and control thresholds if desired.

3.1.10.1. Outdoor Air PM2.5 Concentration Limit (OA-PM2.5-Max)

Outdoor air PM.2.5 concentration limit can be set based on filter rating of AHUs with outdoor air economizers per Informative Table 3.1.10.1. If there are different filter MERV ratings for different AHUs, separate limits should be provided for each.

Informative Table 3.1.10.1 $PM_{2.5}$ Outdoor Air Concentration Limits

MERV-A Filter Rating	***$PM_{2.5}$ Removal Efficiency***	***Outdoor Air $PM_{2.5}$ Concentration Limit***
6	*7.2%*	*38 µg/m³*
8	*27.1%*	*48 µg/m³*
10	*31.5%*	*51 µg/m³*
11	*49.0%*	*69 µg/m³*
12	*66.4%*	*104 µg/m³*
13	*68.9%*	*113 µg/m³*
14	*71.4%*	*122 µg/m³*
15	*83.9%*	*217 µg/m³*
16	*96.3%*	*946 µg/m³*

The EPA has established primary and secondary standards for annual mean $PM_{2.5}$ at 12.0 µg/m³ and 15.0 µg/m³ respectively; 24-hour standards with 98th percentile forms and levels of 35.0 µg/m³. The outdoor air concentration limits in Table 3.1.10.1 are determined based on $PM_{2.5}$ mass removal one-pass efficiency of various filter ratings and a target indoor concentration limit of 35.4 µg/m³. $PM_{2.5}$ mass removal efficiency should not be confused with particle removal efficiency. The removal efficiencies listed in ASHRAE Standard 52.2 cannot be used because they are based on particle count and not mass.

3.1.10.2. Outdoor Air Ozone (O3) Concentration Limit (OA-O3-Max)

Typical value: 0.10 ppm.

Particle air filters will not directly remove gaseous pollutants such as ozone. However, ozone is highly reactive so its concentration will decrease as it flows through an HVAC system and oxidizes other compounds. But when it reacts, it can create noxious volatile organic compounds that are also indoor air pollutants. Hence, a conservative concentration limit is suggested. The following health-based standards for O_3 concentration have been established by various government agencies:

EPA National Ambient Air Quality Standards (NAAQS) 1-hour average: 0.12 ppm

EPA National Ambient Air Quality Standards (NAAQS) 8-hour average: 0.07 ppm

CARB California Ambient Air Quality Standards (AAQS) 1-hour average: 0.09 ppm

CARB California Ambient Air Quality Standards (AAQS) 8-hour average: 0.07 ppm

NIOSH Immediately Dangerous to Life or Health (IDLH): 5.00 ppm

NIOSH Permissible Exposure Limit (PEL) 15-minute average: 0.10 ppm

OSHA Permissible Exposure Limit (PEL) 8-hour average: 0.10 ppm

OSHA Short-term Exposure Limit (STEL) 15-minute average: 0.30 ppm

CARB Stage 1 Smog Alert: 0.20 ppm

CARB Stage 2 Smog Alert: 0.35 ppm

CARB Stage 3 Smog Alert: 0.50 ppm

3.1.10.3. Outdoor Air Quality Index (AQI) Limit (OA-AQI-Max)

Typical value: 100

AQI calculated per the US EPA is based on concentrations of six major air pollutants: Particulate Matter (PM10 and PM2.5), carbon monoxide (CO), ozone (O3), nitrogen dioxide (NO2), and sulfur dioxide (SO2). Per US EPA, the ranges and probable health impacts are:

0-50: The range shows that the air quality is good and it poses no health threat.

51-100: This range is moderate and the quality is acceptable. Some people may experience discomfort.

101-150: The air quality in this range is unhealthy for sensitive groups. They experience breathing discomfort.

151-200: The range shows unhealthy air quality and people start to experience effects such as breathing difficulty.

201-300: Air quality is very unhealthy in this range and health warnings may be issued for emergency conditions. All people are likely to be affected.

301-500: This is the hazardous category of air quality and serious health impacts such as breathing discomfort, suffocation, airway irritation, etc. may be experienced by all.

The indoor AQI will generally be lower than the outdoor air AQI because HVAC system particle filters will remove a high percentage of PM10 and a substantial percentage of PM2.5 depending on MERV rating. However, particle filters will not impact the concentration of gaseous pollutants such as CO, NO, and SO2.

Add Section 4.13 as follows:

4.13 Air Quality Sensors

Although air particulate matter and ozone sensors are generally inexpensive, they tend to require regular maintenance, calibration, and/or replacement. To reduce these costs, outdoor air PM2.5 and Ozone concentrations can be obtained via an internet connection to a weather station, where sensors are professionally maintained. Air Quality Index sensors that measure all six of the contaminants included in the US EPA AQI are generally not currently commercially available, or prohibitively expensive, so an internet connection to a weather station or EPA site is likely the only option. Note that some internet weather and air quality data may not be available without an ongoing subscription fee.

Field installed air quality sensors may be located at individual outdoor air intakes at AHUs, but more likely these are global points that apply to all AHUs. That would be the case where internet connections to weather stations are used. Optional control points are defined for three common air pollutants but the designer can add other sensors and control thresholds.

Required?	Description	Type	Device
O	Outdoor Air Fine Particulate Matter ($PM_{2.5}$) Concentration	AI	Air fine particulate matter sensor or via internet connection to a weather station

Required?	Description	Type	Device
O	Outdoor Air Ozone (O_3) Concentration	AI	Ozone sensor or via internet connection to a weather station
O	Air Quality Index (AQI)	AI	AQI sensor or via internet connection to a weather station

Revise Section 5.1.17 as follows:

5.1.17. ~~Not Used~~ Outdoor Air Pollution Mode

~~This section was deleted in Addendum a. To avoid section numbering changes, an empty section was inserted.~~

5.1.17.1. Provide a 3-position software switch for Outdoor Air Pollution Mode:

It is recommended to add the user-adjustable 3-position switch to the graphics in a centralized location for easy operator access to initiate Outdoor Air Pollution Mode.

a. Off. Locks Outdoor Air Pollution Mode off.

b. On. Outdoor Air Pollution Mode is enabled for a preset period of time, after which Outdoor Air Pollution Mode shall be disabled. The preset time shall be operator adjustable for up to 1 week.

c. Auto. Outdoor Air Pollution Mode is enabled when any of the following are true.

Include only those sensors provided.

1. PM2.5 is greater than OA-PM2.5-Max for 30 minutes until it drops below that limit for 30 minutes.

2. Ozone (O3) is greater than OA-O3-Max for 30 minutes until it drops below that limit for 30 minutes.

3. Air Quality Index (AQI) is greater than OA-AQI-Max limit for 30 minutes until it drops below that limit for 30 minutes.

5.1.17.2. When Outdoor Air Pollution Mode is enabled:

a. Generate a Level 1 alarm.

b. Disable all air economizers.

c. Generate a daily Level 3 alarm at a scheduled time indicating that Outdoor Air Pollution Mode is still active.

It is recommended that the Outdoor Air Pollution Mode switch status is shown on the graphics for all equipment with air economizers that can be disabled by Outdoor Air Pollution Mode switch.

Revise Section 5.16.4.4 as follows:

5.16.4.4. Outdoor Air and Return Air Dampers

The engineer must specify whether the unit has a return fan, relief damper or relief fans.

If there is a return fan, keep subsection (a) and delete subsection (b).

If there are relief damper or relief fans, keep subsection (b) and delete subsection (a).

Delete this flag note after selections have been made.

a. For units with return fans

Minimum outdoor air control is enabled when return damper position exceeds MRA-P because it cannot be assumed that the combination of the minimum and the economizer outdoor air dampers are providing sufficient outdoor airflow under these conditions.

The 20% threshold can be increased to ensure minimum outdoor airflow will be maintained but at the expense of fan energy. This threshold could be determined empirically during TAB work as well.

1. When the supply air fan is proven on and the system is in Occupied Mode and MinDPsp is greater than zero, the system shall calculate MRA-P. The value of MRA-P shall scale from 95% when supply fan speed is at 100% design speed proportionally down to 20% when the fan is at minimum speed. When MRA-P is not being calculated for any reason, it shall be set to 100%.

2. Minimum outdoor airflow control shall be enabled when the unit is in Occupied Mode and ~~either~~ any of the following conditions are true ~~for 10 minutes~~:

    i. The economizer high limit conditions in Section 5.1.18 are exceeded for 10 minutes.

    ii. When the minimum outdoor air damper is open and the return air damper position is greater than MRA-P for 10 minutes.

    iii. Outdoor Air Pollution mode is enabled per Section 5.1.17.

3. When minimum outdoor airflow control is enabled, the normal sequencing of economizer outdoor air and return air dampers per Section 5.16.2 shall be suspended per the following sequence:

    i. Fully open return air damper; and

Economizer outdoor air damper is closed when minimum outdoor airflow control is enabled to ensure a good signal across the minimum outdoor air damper.

    ii. Wait 15 seconds, then close the economizer outdoor air damper; and

    iii. Wait 3 minutes, then release return air damper position for control by the SAT control loop in Section 5.16.2. Economizer outdoor air damper remains closed.

    iv. The maximum return air damper position endpoint MaxRA-P shall be modulated from 100% to 0% to maintain DP across the minimum outdoor air damper at setpoint MinDPsp.

4. Minimum outdoor airflow control shall be disabled when the unit is no longer in Occupied Mode, or ~~both~~ all of the following conditions are true ~~for 10 minutes~~:

    i. The economizer high limit conditions in Section 5.1.18 are not exceeded for 10 minutes.

    ii. The minimum outdoor air damper is closed or the return air damper position is 10% below MRA-P for 10 minutes.

    iii. Outdoor Air Pollution Mode is disabled per Section 5.1.17.

5. When minimum outdoor airflow control is disabled:

i. Economizer outdoor air damper shall be fully opened.

ii. MaxRA-P shall be set to 100%.

iii. Economizer and return air damper positions shall be controlled by the SAT control loop per Section 5.16.2.

b. For units with relief dampers or relief fans

Minimum outdoor airflow control is enabled when economizer damper position is less than MOA-P because it cannot be assumed that the combination of the minimum and the economizer outdoor air dampers are providing sufficient outdoor airflow under these conditions.

Minimum outdoor airflow control is disabled when return damper position is less than MRA-P, because the economizer damper has been closed to enable an accurate airflow measurement through the minimum outdoor air damper.

The 20% and 80% thresholds can be increased/decreased to ensure minimum outdoor airflow will be maintained but at the expense of fan energy. This threshold could be determined empirically during TAB work as well.

1. When the supply air fan is proven on and the system is in Occupied Mode and MinDPsp is greater than zero, the system shall calculate MOA-P. The value of MOA-P shall scale from 5% when supply-fan speed is at 100% design speed proportionally up to 80% when the fan is at minimum speed. When MOA-P is not being calculated for any reason, it shall be set to 0%.

2. When the supply air fan is proven on and the system is in Occupied Mode and MinDPsp is greater than zero, the system shall calculate MRA-P. The value of MRA-P shall scale from 95% when supply fan speed is at 100% design speed proportionally down to 20% when the fan is at minimum speed. When MRA-P is not being calculated for any reason, it shall be set to 100%.

3. Minimum outdoor airflow control shall be enabled when the unit is in Occupied Mode and ~~either~~ any of the following conditions are true~~ for 10 minutes~~:

   i. The economizer high limit conditions in Section 5.1.18 are exceeded for 10 minutes.

   ii. When the minimum outdoor air damper is open and the economizer outdoor air damper position is less than MOA-P for 10 minutes.

   iii. Outdoor Air Pollution Mode is enabled per Section 5.1.17.

4. When minimum outdoor airflow control is enabled, the normal sequencing of economizer outdoor air and return air dampers per Section 5.16.2 shall be suspended per the following sequence:

   i. Fully open return air damper; and

Economizer outdoor air damper is closed when minimum outdoor airflow control is enabled to ensure a good signal across the minimum outdoor air damper.

   ii. Wait 15 seconds, then close the economizer outdoor air damper; and

   iii. Wait 3 minutes, then release return air damper position for control by the SAT control loop in Section 5.16.2. Economizer outdoor air damper remains closed.

iv. The maximum return air damper position endpoint MaxRA-P shall be modulated from 100% to 0% to maintain DP across the minimum outdoor air damper at setpoint, MinDPsp.

5. Minimum outdoor airflow control shall be disabled when the unit is no longer in Occupied Mode, or ~~both~~ all of the following conditions are true~~ for 10 minutes~~:

   i. The economizer high limit conditions in Section 5.1.18 are not exceeded for 10 minutes.

   ii. The minimum outdoor air damper is closed or the return air damper position is 10% below MRA-P for 10 minutes.

   iii. Outdoor Air Pollution Mode is disabled per Section 5.1.17.

6. When minimum outdoor airflow control is disabled:

   i. MaxRA-P shall be set to 100%.

   ii. Economizer and return air damper positions shall be controlled by the SAT control loop per Section 5.16.2.

Revise Section 5.16.5.4 Minimum Outdoor Air Control with a Separate Minimum Outdoor Air Damper and Airflow Measurement as follows:

5.16.5.4. Outdoor Air and Return Air Dampers

The engineer must specify whether the unit has a return fan, relief damper or relief fans.

If there is a return fan, keep subsection (b) and delete subsection (a).

If there are relief dampers or relief fans, keep subsection (b) and delete subsection (a).

Delete this flag note after selections have been made.

a. For units with return fans

Minimum outdoor airflow control is enabled when return damper position exceeds MRA-P because it cannot be assumed that the combination of the minimum and the economizer outdoor air dampers are providing sufficient outdoor airflow under these conditions.

The 20% threshold can be increased to ensure minimum outdoor airflow will be maintained but at the expense of fan energy. This threshold could be determined empirically during TAB work as well.

1. When the supply air fan is proven on and the system is in Occupied Mode and MinOAsp is greater than zero, the system shall calculate MRA-P. The value of MRA-P shall scale from 95% when supply fan speed is at 100% design speed proportionally down to 20% when the fan is at minimum speed. When MRA-P is not being calculated for any reason, it shall be set to 100%.

2. Minimum outdoor airflow control shall be enabled when the unit is in Occupied Mode and ~~either~~ any of the following conditions are true~~ for 10 minutes~~:

   i. The economizer high limit conditions in Section 5.1.18 are exceeded for 10 minutes.

   ii. When the minimum outdoor air damper is open and the return air damper position is greater than MRA-P for 10 minutes.

   iii. Outdoor Air Pollution Mode is enabled per Section 5.1.17.

3. When minimum outdoor airflow control is enabled, the normal sequencing of economizer outdoor air and return air dampers per Section 5.16.2 shall be suspended per the following sequence:

    i. Fully open return air damper; and

Economizer outdoor air damper is closed when minimum outdoor airflow control is enabled to ensure a good signal across the minimum outdoor air damper.

    ii. Wait 15 seconds, then close the economizer outdoor air damper; and

    iii. Wait 3 minutes, then release return air damper position for control by the SAT control loop in Section 5.16.2. Economizer outdoor air damper remains closed.

    iv. The maximum return air damper position endpoint MaxRA-P shall be modulated from 100% to 0% to maintain outdoor airflow across the minimum outdoor air damper at setpoint MinOAsp.

4. Minimum outdoor airflow control shall be disabled when the unit is no longer in Occupied Mode, or ~~both~~ all of the following conditions are true~~ for 10 minutes~~:

    i. The economizer high limit conditions in Section 5.1.18 are not exceeded for 10 minutes.

    ii. The minimum outdoor air damper is closed or the return air damper position is 10% below MRA-P for 10 minutes.

    iii. Outdoor Air Pollution Mode is disabled per Section 5.1.17.

5. When minimum outdoor airflow control is disabled:

    i. Economizer outdoor air damper shall be fully opened.

    ii. MaxRA-P shall be set to 100%.

    iii. Economizer and return air damper positions shall be controlled by the SAT control loop per Section 5.16.2.

b. For units with relief dampers or relief fans

Minimum outdoor airflow control is enabled when economizer damper position is less than MOA-P because it cannot be assumed that the combination of the minimum and the economizer outdoor air dampers are providing sufficient outdoor airflow under these conditions.

Minimum outdoor airflow control is disabled when return damper position is less than MRA-P, because the economizer damper has been closed to enable an accurate airflow measurement through the minimum outdoor air damper.

The 20% and 80% thresholds can be increased/decreased to ensure minimum outdoor airflow will be maintained but at the expense of fan energy. This threshold could be determined empirically during TAB work as well.

1. When the supply air fan is proven on and the system is in occupied mode and MinOAsp is greater than zero, the system shall calculate MOA-P. The value of MOA-P shall scale from 5% when supply-fan speed is at 100% design speed proportionally up to 80% when the fan is at minimum speed. When MOA-P is not being calculated for any reason, it shall be set to 0%.

2. When the supply air fan is proven on and the system is in occupied mode and MinOAsp is greater than zero, the system shall calculate MRA-P. The value of MRA-P shall scale from 95% when

supply fan speed is at 100% design speed proportionally down to 20% when the fan is at minimum speed. When MRA-P is not being calculated for any reason, it shall be set to 100%.

3. Minimum outdoor airflow control shall be enabled when the unit is in Occupied Mode and ~~either~~ any of the following conditions are true ~~for 10 minutes~~:

    i. The economizer high limit conditions in Section 5.1.18 are exceeded for 10 minutes.

    ii. When the minimum outdoor air damper is open and the economizer outdoor air damper position is less than MOA-P for 10 minutes.

    iii. Outdoor Air Pollution Mode is enabled per Section 5.1.17.

4. When minimum outdoor airflow control is enabled, the normal sequencing of economizer outdoor air and return air dampers per Section 5.16.2 shall be superseded per the following:

    i. Fully open return air damper; and

Economizer outdoor air damper is closed when minimum outdoor airflow control is enabled to ensure a good signal across the minimum outdoor air damper.

    ii. Wait 15 seconds, then close the economizer outdoor air damper; and

    iii. Wait 3 minutes, then release return air damper position for control by the SAT control loop in Section 5.16.2. Economizer outdoor air damper remains closed.

    iv. The maximum return air damper position endpoint MaxRA-P shall be modulated from 100% to 0% to maintain outdoor airflow across the minimum outdoor air damper at setpoint MinOAsp.

5. Minimum outdoor airflow control shall be disabled when the unit is no longer in Occupied Mode, or ~~both~~ all of the following conditions are true ~~for 10 minutes~~:

    i. The economizer high limit conditions in Section 5.1.18 are not exceeded for 10 minutes.

    ii. The minimum outdoor air damper is closed or the return air damper position is 10% below MRA-P for 10 minutes.

    iii. Outdoor Air Pollution Mode is disabled per Section 5.1.17.

6. When minimum outdoor airflow control is disabled:

    i. MaxRA-P shall be set to 100%.

    ii. Economizer and return air damper positions shall be controlled by the SAT control loop per Section 5.16.2.

Revise Section 5.16.6.3 Minimum Outdoor Air Control with a Single Common Damper for Minimum Outdoor Air and Economizer Functions and Airflow Measurement as follows:

5.16.6.3. Minimum Outdoor Airflow Control Loop

The engineer must specify whether the unit has a return fan, relief damper or relief fans.

If there is a return fan, keep subsection (a) and delete subsection (b).

If there are relief damper or relief fans, keep subsection (b) and delete subsection (a).

Delete this flag note after selections have been made.

a. For units with return fans:

1. The minimum outdoor airflow control loop is enabled when the supply fan is proven ON and the AHU is in Occupied Mode and disabled with output set to 100% otherwise.

The following logic limits the return damper position to ensure that minimum outdoor airflow is maintained during Occupied Mode, while the actual return damper position is modulated by the SAT control loop.

2. The outdoor airflow shall be maintained at the minimum outdoor airflow setpoint MinOAsp by a direct-acting control loop whose output is mapped to the return air damper maximum position endpoint MaxRA-P.

The following logic directly controls the return damper position to ensure that exactly the minimum outdoor airflow – and no more – is provided when economizer lockout conditions are exceeded. When economizer lockout no longer applies, return damper control reverts to the SAT control loop.

3. While the unit is in Occupied Mode, if the economizer high limit conditions in Section 5.1.18 are exceeded for 10 minutes or Outdoor Air Pollution Mode is enabled per Section 5.1.17, outdoor airflow shall be controlled to the minimum outdoor airflow. When this occurs, the normal sequencing of the return air damper by the SAT control loop is suspended, and the return air damper position shall be modulated directly to maintain measured outdoor airflow at MinOAsp (i.e. return damper position shall equal MaxRA-P). The economizer damper shall remain open.

4. If the economizer high limit conditions in Section 5.1.18 are not exceeded for 10 minutes and Outdoor Air Pollution Mode is disabled per Section 5.1.17, or the unit is no longer in Occupied Mode, release return damper to control by the SAT control loop (i.e. return damper position is limited by MaxRA-P endpoint, but is not directly controlled to equal MaxRA-P).

b. For units with relief dampers or relief fans:

1. The minimum outdoor airflow control loop is enabled when the supply fan is proven ON and the AHU is in Occupied Mode and disabled with output set to zero otherwise.

The following logic limits the return and economizer damper positions to ensure that minimum outdoor airflow is maintained during Occupied Mode, while the actual damper positions are modulated by the SAT control loop.

2. The outdoor airflow rate shall be maintained at the minimum outdoor airflow setpoint, MinOAsp, by a reverse-acting control loop whose output is mapped to economizer damper minimum position, MinOA-P, and return air damper maximum position, MaxRA-P, as indicated in Figure 5.16.6.3.

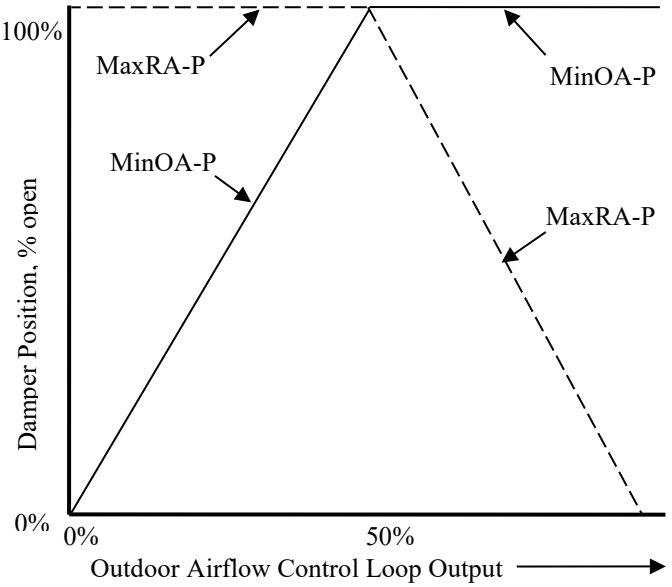

Figure 5.16.6.3 Minimum outdoor airflow control mapping with single damper.

The following logic directly controls the return and economizer damper positions to ensure that exactly the minimum outdoor airflow – and no more – is provided when economizer lockout conditions are exceeded. When economizer lockout no longer applies, return damper control reverts to the SAT control loop.

3. While the unit is in Occupied Mode, if the economizer high limit conditions in Section 5.1.18 are exceeded for 10 minutes or Outdoor Air Pollution Mode is enabled per Section 5.1.17, outdoor airflow shall be controlled to the minimum outdoor airflow setpoint, MinOAsp. When this occurs, the normal sequencing of the return air damper by the SAT control loop is suspended as follows:

    i. Fully open the return air damper

    ii. Wait 15 seconds, then set MaxOA-P equal to MinOA-P

    iii. Wait 3 minutes, then modulate the return air damper to maintain the measured outdoor airflow at MinOAsp (i.e. return air damper position shall equal MaxRA-P).

4. If the economizer high limit conditions in Section 5.1.18 are not exceeded for 10 minutes and Outdoor Air Pollution Mode is disabled per Section 5.1.17, or the unit is no longer in Occupied Mode, set MaxOA-P = 100% and release the return air damper to control by the SAT control loop (i.e. return air damper position is limited by the MaxRA-P endpoint, but is not directly controlled to equal MaxRA-P).

This concludes the section where the minimum outdoor airflow control logic is selected.

When the sequences are complete, only one of Section Error! Reference source not found.**, 0, and 0 should remain. The other two sections should be deleted along with these flag notes.**

Revise Section 5.18.7 as follows:

5.18.7. Economizer Lockout

This section describes economizer lockout logic for a unit with a common minimum OA and economizer damper (i.e., no separate minimum OA damper). Other configurations are possible and would require modifications to the points list (above) and the control logic below.

5.18.7.1. The normal sequencing of the economizer dampers shall be disabled ~~in accordance with~~if the economizer high limit conditions in Section 5.1.18 are exceeded for 10 minutes or Outdoor Air Pollution Mode is enabled per Section 5.1.17.

5.18.7.2. Once the economizer is disabled, it shall not be reenabled within 10 minutes and vice versa.

5.18.7.3. When economizer is enabled, MaxOA-P = 100%. When economizer is disabled, set MaxOA-P equal to MinOA-P. See Section 5.16.5, "Supply Air Temperature Control," and Section 5.18.6, "Minimum Outdoor Air Control," for outdoor air damper minimum setpoint.

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

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.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

ASHRAE · 180 Technology Parkway · Peachtree Corners, GA 30092 · www.ashrae.org

About ASHRAE

Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

To stay current with this and other ASHRAE Standards and Guidelines, visit www.ashrae.org/standards, and connect on LinkedIn, Facebook, Twitter, and YouTube.

Visit the ASHRAE Bookstore

ASHRAE offers its Standards and Guidelines in print, as immediately downloadable PDFs, and via ASHRAE Digital Collections, which provides online access with automatic updates as well as historical versions of publications. Selected Standards and Guidelines are also offered in redline versions that indicate the changes made between the active Standard or Guideline and its previous edition. For more information, visit the Standards and Guidelines section of the ASHRAE Bookstore at www.ashrae.org/bookstore.

IMPORTANT NOTICES ABOUT THIS GUIDELINE

To ensure that you have all of the approved addenda, errata, and interpretations for this Guideline, visit www.ashrae.org/standards to download them free of charge.

Addenda, errata, and interpretations for ASHRAE Standards and Guidelines are no longer distributed with copies of the Standards and Guidelines. ASHRAE provides these addenda, errata, and interpretations only in electronic form to promote more sustainable use of resources.

8/24