ERRATA SHEET FOR ASHRAE GUIDELINE 36-2021
High-Performance Sequences of Operation for HVAC Systems

November 9, 2023

The corrections listed in this errata sheet apply to all copies of ASHRAE Guideline 36-2021. The first printing is identified as "Product code: 86870 7/21" on the outside back cover. Shaded items have been added since the previously published errata sheet dated December 11, 2021 was distributed.

Page	**Erratum**
Inside Cover	**ASHRAE Guideline Project Committee 36.** Change the name of the *Vice-Chair* from "Gwenlen Paliaga" to "Gwelen Paliaga".

21 **3.2.3.3.** Revise the note following Section 3.2.3.3 as shown below.
(Note: Additions are shown in underline.)

Retain the following parameter for water-cooled plants with fixed speed condenser water pumps or variable speed condenser water pumps and a waterside economizer. Delete otherwise.

25 **3.3.1.1.** Revise Section 3.3.1.1 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

3.3.1.1.
[…]
b. Next, determine minimum setpoint Vm using either of the following:

1. Option 1:~~.~~
[…]
~~e.~~ Calculate the minimum airflow setpoint allowed by the controls (Vm) for each VAV box size as

$$Vm = vmA$$

2. Option 2: Use airflow vs. signal pressure data published by the manufacturer of the VAV box velocity pressure probe. Select a pair of values of airflow and velocity pressure signal as the rated operating point for the calculation, V_{rated} and VP_{rated}. Use these values and the minimum controllable signal pressure to calculate the minimum controllable flow as
[…]

46 **5.1.14.4.** Revise the note following Section 5.1.14.4 as shown below. Changes are highlighted in yellow.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

Example

(Note: for the example below, the net result for each time step is separately calculated using the variables in Pascal units and in units of inches of water column, in order to facilitate following the example in either units. Thus, the unit conversion of the net result is not exact at each time step.)

System starts at 11:55. Initial setpoint is 120 Pa (0.5 in. of water). At 12:00 (Td after start time), the reset *begins.*

*At 12:02 (i.e., 1*T after reset begins), there is one request (i.e., R = 1). Since R<~~1~~I, trim component reduces setpoint by SPtrim, which is 10 Pa (0.04 in. of water). Net result: setpoint is 110 Pa (0.46 in. of water).*

*At 12:04 (i.e., 2*T), there are two requests (i.e., R = 2). Since R=~~1~~I, trim component reduces setpoint by 10 Pa (0.04 in. of water). Net result: setpoint is 100 Pa (0.42 in. of water).*

*At 12:06 (i.e., 3*T), there are three requests (i.e., R = 3~~):~~). ~~Trim component reduces setpoint by 10 Pa (0.04 in. of water); because~~ Since R – I = 1, response component increases setpoint by 15 Pa (0.06 in. of water) (i.e., 1*SPres). Net result: setpoint is 115 Pa (0.48 in. of water).*

*At 12:08 (i.e., 4*T), there are four requests (i.e., R = 4). Because R – I = 2, response component increases setpoint by 30 Pa (0.12 in. of water) (i.e., 2*SPres). Net result: setpoint is 145 Pa (0.60 in. of water).*

*At 12:10 (i.e., 5*T), there are six requests (i.e., R = 6). Because R – I = 4, but SPres max = 37 Pa (0.15 in. of water), response component increases setpoint by the maximum of 37 Pa (0.15 in. of water) (i.e., not 4*SPres = 60 Pa [0.24 in. of water]). Net result: setpoint is 182 Pa (0.75 in. of water).*

*At 12:12 (i.e., 6*T), there are three requests (i.e., R = 3). Because R – I = 1, response component increases setpoint by 15 Pa (0.06 in. of water) (i.e., 1*SPres). Net result: setpoint is 197 Pa (0.81 in. of water).*

*At 12:14 (i.e., 7*T), there are zero requests (i.e., R = 0). Because R<~~1~~I, trim component reduces setpoint by 10 Pa (0.04 in. of water). Net result: setpoint is 187 Pa (0.77 in. of water).*

Informative Figure 5.1.14.4 shows a trend graph of the example above, continued for a period of an hour.

70 **5.4.6.5.** Move the first sentence in the note following Section 5.4.6.5 to add Section 5.4.6.6 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

5.4.6.6. Setup Mode. During unoccupied mode, if any 5 zones (or all zones if fewer than 5) in the zone group rise above their unoccupied cooling set points, or if the average zone temperature of the zone group rises above the average unoccupied cooling set point, the zone group shall enter setup mode until all spaces in the zone group are 1°C (2°F) below their unoccupied set points.

~~Setup Mode. During unoccupied mode, if any 5 zones (or all zones if fewer than 5) in the zone group rise above their unoccupied cooling set points, or if the average zone temperature of the zone group rises above the average unoccupied cooling set point, the zone group shall enter setup mode until all spaces in the zone group are 1°C (2°F) below their unoccupied set points~~.

Zones where the window switch indicates that a window is open shall be ignored. Setback and setup modes are used to keep zone temperatures (and mass) from straying excessively far from occupied set points so that the cooldown and warm-up modes can achieve set point when initiated. The minimum number of zones (set at 5 here) are to ensure that the central systems (fans, pumps, heating sources, or cooling sources) can operate stably. Obviously, the size of the zones and the characteristics of the central systems are a factor in choosing the correct number of zones in each group.

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76 **5.6.7.** Revise the note following Section 5.6.7 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.11, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden together at a zone-group level, per Section

5.4.5.

For example, the CxA can check for leaking dampers by forcing all VAV boxes in a Zone Group closed and then recording airflow at the AHU.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and AHU demands.~~

80 **5.7.7.** Revise the note following Section 5.7.7 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.11, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden together at a zone-group level, per Section 5.4.5.

For example, the CxA can check for leaking dampers by forcing all VAV boxes in a Zone Group closed and then recording airflow at the AHU.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and AHU demands.~~

85 **5.8.7.** Revise the note following Section 5.8.7 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.11, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden together at a zone-group level, per Section 5.4.5.

For example, the CxA can check for leaking dampers by forcing all VAV boxes in a Zone Group closed and then recording airflow at the AHU.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and AHU demands.~~

88 **5.9.7.** Revise the note following Section 5.9.7 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.11, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden together at a zone-group level, per Section 5.4.5.

For example, the CxA can check for leaking dampers by forcing all VAV boxes in a Zone Group closed and then recording airflow at the AHU.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and AHU demands.~~

92 **5.10.7.** Revise the note following Section 5.10.7 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.11, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden together at a zone-group level, per Section 5.4.5.

For example, the CxA can check for leaking dampers by forcing all VAV boxes in a Zone Group closed and then recording airflow at the AHU.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and AHU demands.~~

113 **5.16.2.3.** Revise the note before Figure 5.16.2.3-2 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

For AHUs with return fans and airflow tracking control, the SAT control loop makes the economizer outdoor air damper open fully whenever the AHU is on, while the return air damper modulates to maintain supply air temperature as shown below. Relief/exhaust damper position tracks inversely with the return damper position.

Outdoor air dampers on air handlers with return fans have no impact on the outdoor airflow rate into the mixing plenum. Instead, the return-fan and return-damper controls dictate outdoor air flow. See ASHRAE Guideline 16.

Note that the economizer will close ~~(~~if there is a separate minimum outdoor air damper~~) or modulate to minimum position (if there is a single outdoor air damper) whenever~~ <u>and</u> minimum outdoor air control is active. See logic for Minimum Outdoor Air Control below.

113 **5.16.2.3.** Revise the note before Figure 5.16.2.3-3 as shown below.
(Note: Additions are shown in <u>underline</u> and deletions are shown in ~~strikethrough~~.)

For AHUs with return fans and airflow tracking control, the SAT control loop makes the economizer outdoor air damper open fully whenever the AHU is on, while the return air damper modulates to maintain supply air temperature as shown below. Relief/exhaust damper position ~~tracks inversely with the return damper position~~<u>is controlled by the building pressure control loop</u>.

Outdoor air dampers on air handlers with return fans have no impact on the outdoor airflow rate into the mixing plenum. Instead, the return-fan and return-damper controls dictate outdoor air flow. See ASHRAE Guideline 16.

Note that the economizer will close ~~(~~if there is a separate minimum outdoor air damper~~) or modulate to minimum position (if there is a single outdoor air damper) whenever~~ <u>and</u> minimum outdoor air control is active. See logic for Minimum Outdoor Air Control below.

129 **5.16.10.5.** Revise Section 5.16.10.5 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

5.16.10.5. A single P-only control loop for each pressure zone shall modulate to maintain the building pressure at a setpoint of 12 Pa (0.05 in. of water) with an output ranging from 0% to 100%. The loop shall be enabled when the supply and return fans for any unit within the pressure zone are proven ON and the minimum outdoor air damper is open. The exhaust dampers shall be closed with loop output set to zero otherwise. All exhaust damper and return fan static pressure setpoints for units in an associated pressure zone shall be sequenced based on building pressure control loop output signal, as shown in Figure 5.16.10.5.~~setpointsetpoint~~

143 **5.16.15.** Revise the note following Section 5.16.15 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.11, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden together at a zone-group level, per Section 5.4.5.

For example, the CxA can check for leaking dampers by forcing all VAV boxes in a Zone Group closed and then recording airflow at the AHU.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and AHU demands~~.

145 **5.17.2.2.** Revise Section 5.17.2.2 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

5.17.2.2. Supply Air Temperature Setpoint
a. During Occupied Mode, ~~(Table 5.17.2.2). Setpoint~~ setpoint shall be reset using T&R logic (see Section 5.1.14) between 21°C (70°F) and Max_HtgSAT. See Section 3.1.5.1 for Max_HtgSAT.

149 **5.17.5.** Revise the note following Section 5.17.5 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.11, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden together at a zone-group level, per Section 5.4.5.

For example, the CxA can check for leaking dampers by forcing all VAV boxes in a Zone Group closed and then recording airflow at the AHU.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

149 **5.17.5.** Delete duplicate Table 5.17.4.5 immediately following Section 5.17.5. Table 5.17.4.5 is correctly located in Section 5.17.4.5.

168 **5.18.14.** Revise the note following Section 5.18.14 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.10, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden as a group on a plant level.

For example, the CxA can check for valve leakage by simultaneously forcing closed all CHW valves at all AHUs served by the chiller plant and then recording flow at the chiller.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the chiller or heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Chilled-water and hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and AHU demands.~~

221 **5.20.18.2.** Revise the column heading in the table in Section 5.20.18.2 as shown below.
(Note: Additions are shown in underline and deletions are shown in ~~strikethrough~~.)

Chiller
Bypass
Valve

(if primary-only ~~or~~and WSE)

267 **5.22.7.** Revise the note following Section 5.22.7 as shown below.
(Note: Deletions are shown in ~~strikethrough~~.)

Per Section 5.1.10, all hardware points can be overridden through the BAS. Each of the following points is interlocked so that they can be overridden as a group on a plant level.

For example, the CxA can check for valve leakage by simultaneously forcing closed all CHW valves at all coils served by the chiller plant and then recording flow at the chiller.

~~Central plant sequences are not part of the initial scope of Guideline 36, but control logic for plant requests are being included for future use, when central plant sequences are added.~~

~~Typically, the chiller or heating hot-water plant will start when there is at least one request for 5 minutes, and stop when there are no requests for 5 minutes, after a minimum run-time has elapsed.~~

~~Chilled-water and hot-water reset requests are used in T&R loops to control supply water temperature and/or pump DP setpoints based on zone and FCU demands.~~

