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Chapter

Shaping Tomorrow's Global
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ASHRAE
Guideline 36-2024
Introduction & Use Cases

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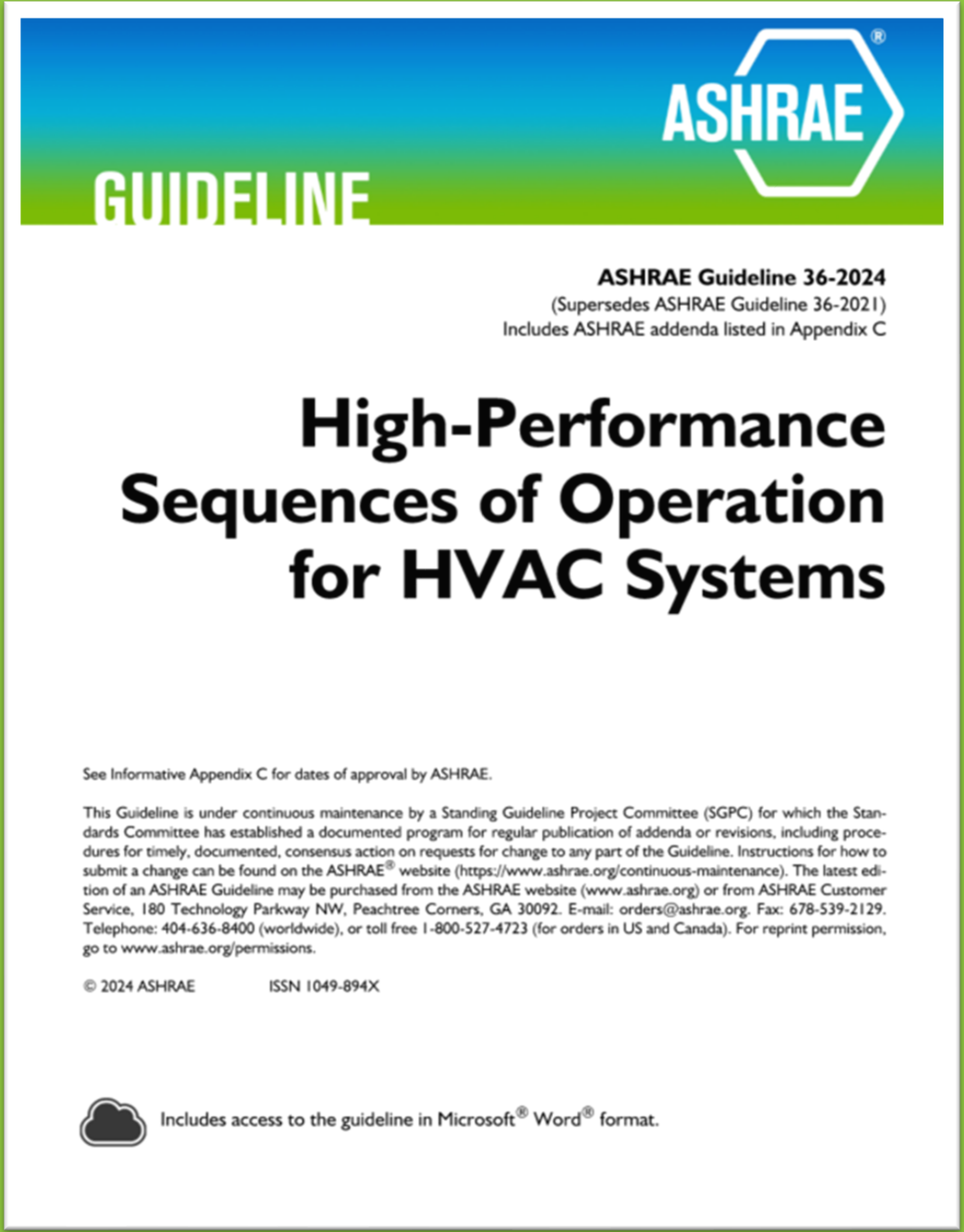

GUIDELINE

ASHRAE

ASHRAE Guideline 36-2024
(Supersedes ASHRAE Guideline 36-2021)
Includes ASHRAE addenda listed in Appendix C

High-Performance Sequences of Operation for HVAC Systems

See Informative Appendix C for dates of approval by ASHRAE.

This Guideline is under continuous maintenance 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 (https://www.ashrae.org/continuous-maintenance). The latest edition of an ASHRAE Guideline may be purchased from the ASHRAE website (www.ashrae.org) or from ASHRAE Customer Service, 180 Technology Parkway NW, 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.

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United We Stand!

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Agenda

1. ASHRAE Guideline 36. What? Why? Who?
2. High Performance Sequence of Operations
3. How Manufacturers are Supporting G36
4. Benefits to Building Owners
5. Q&A

1. What is Guideline 36-2024?

- ASHRAE Guideline 36 provides high-performance control sequences for HVAC systems
  - Hardwired points lists
  - Sequences of operation
  - Control diagrams
- Designed to deliver energy-efficient, consistent, and reliable operation of equipment
- Helps standardize BAS logic across manufacturers and facilities

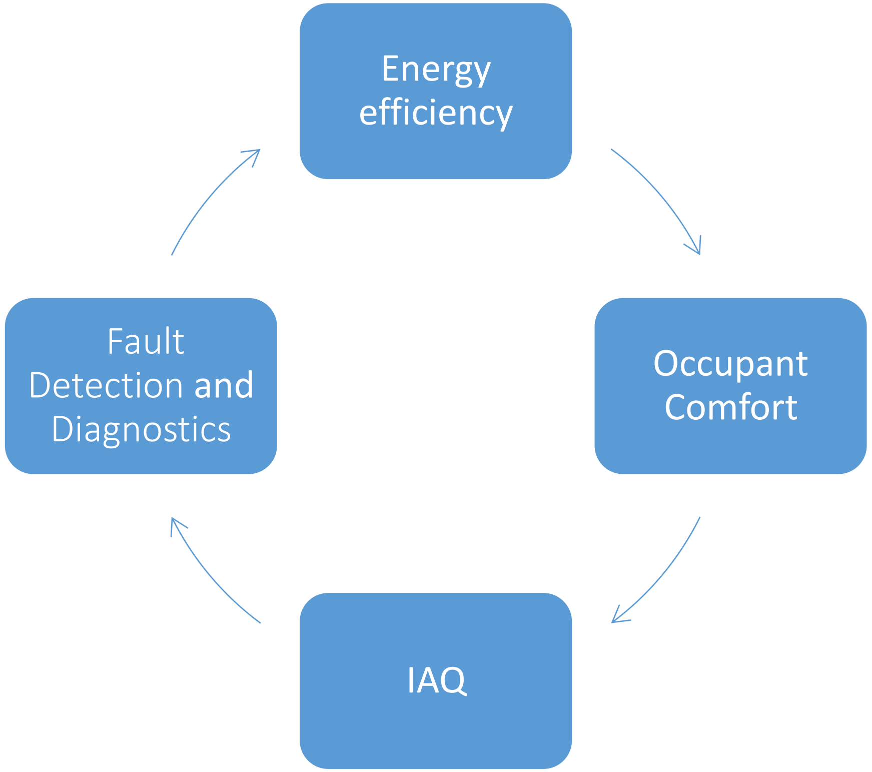
1. Guideline 36 History

- HVAC control sequences used to vary widely, causing inefficiency and inconsistent performance
- ASHRAE committees and research groups consolidated best practices in the 2000s–2010s
- Formal guideline released in 2018 with standardized, high-performance sequences
- Updated through the 2020s to expand coverage and improve optimization and FDD
- Now widely adopted as the industry benchmark for modern HVAC control logic
- Takeaway? It is time to implement it on all BMS installations!

1. Why ASHRAE Guideline 36?

- ASHRAE Guideline 36 was created to standardize advanced HVAC control sequences, replacing often oversimplified, and inefficient, custom-programmed routines.

- It aims to maximize energy efficiency, enhance occupant comfort, improve indoor air quality (IAQ), and enable automated fault detection and diagnostics (AFDD)



1. Why ASHRAE Guideline 36?

Building Owners

- Must drive the requirements to the team
- Lower energy costs and better ROI
- Improved occupant comfort and satisfaction
- Reduced operational issues and maintenance costs
- Future-ready buildings with better data and analytics
- Standardization

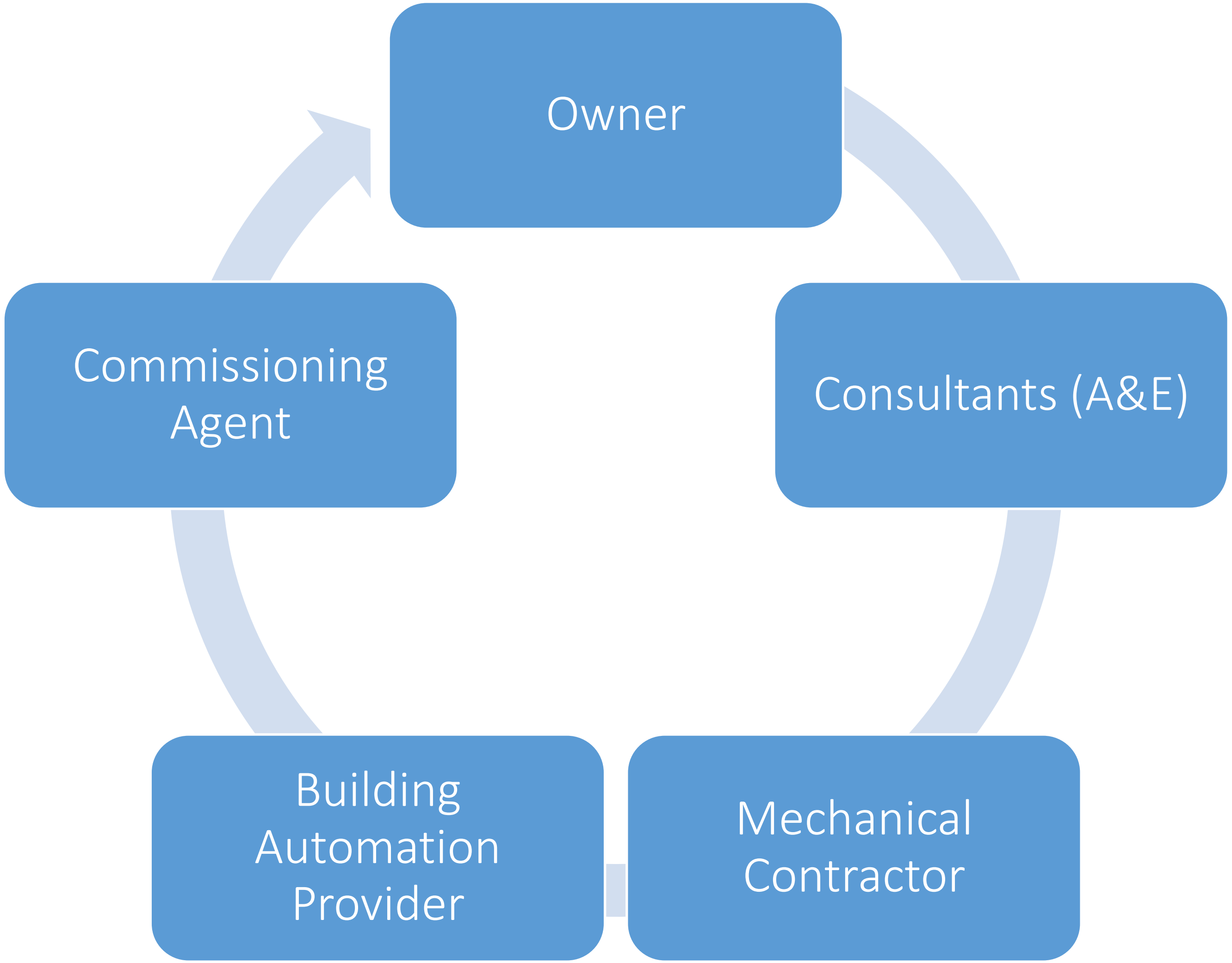
A&E Consultants

- Standardized high-performance sequences
- Improved energy efficiency and operational performance
- Reduce design time and coordination risk
- Sets up future potential for FDD & AI programs
- Better design for building owners

Mech and BAS Contractors

- Clear, standardized sequences reduce ambiguity
- Faster programming and deployment through standardization
- Consistency across projects and clients
- More consistent commissioning and preventative maintenance practices

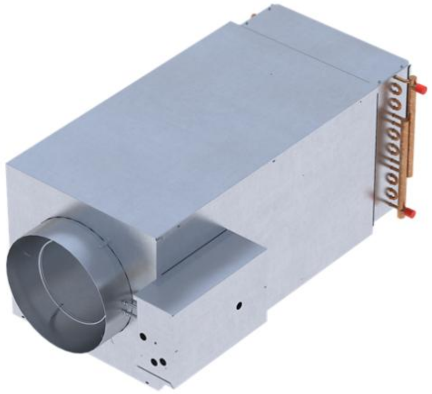
1. The Who of ASHRAE Guideline 36



2. High Performance Sequence of Operations

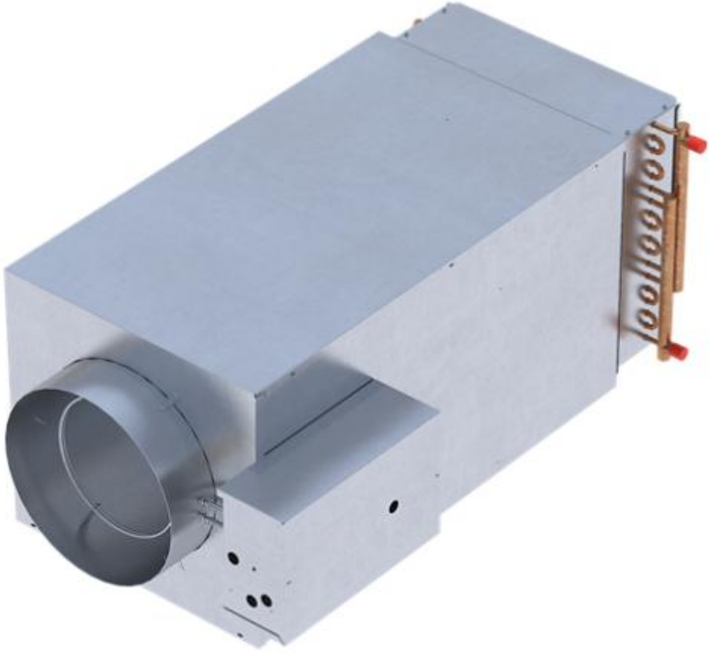
2. Examples of ASHRAE Guideline 36?

1. VAV Box & Reheat Example



2. Air Handling Unit Example

2.1 VAV Box & Reheat Example



2.1 VAV Controls Schematic

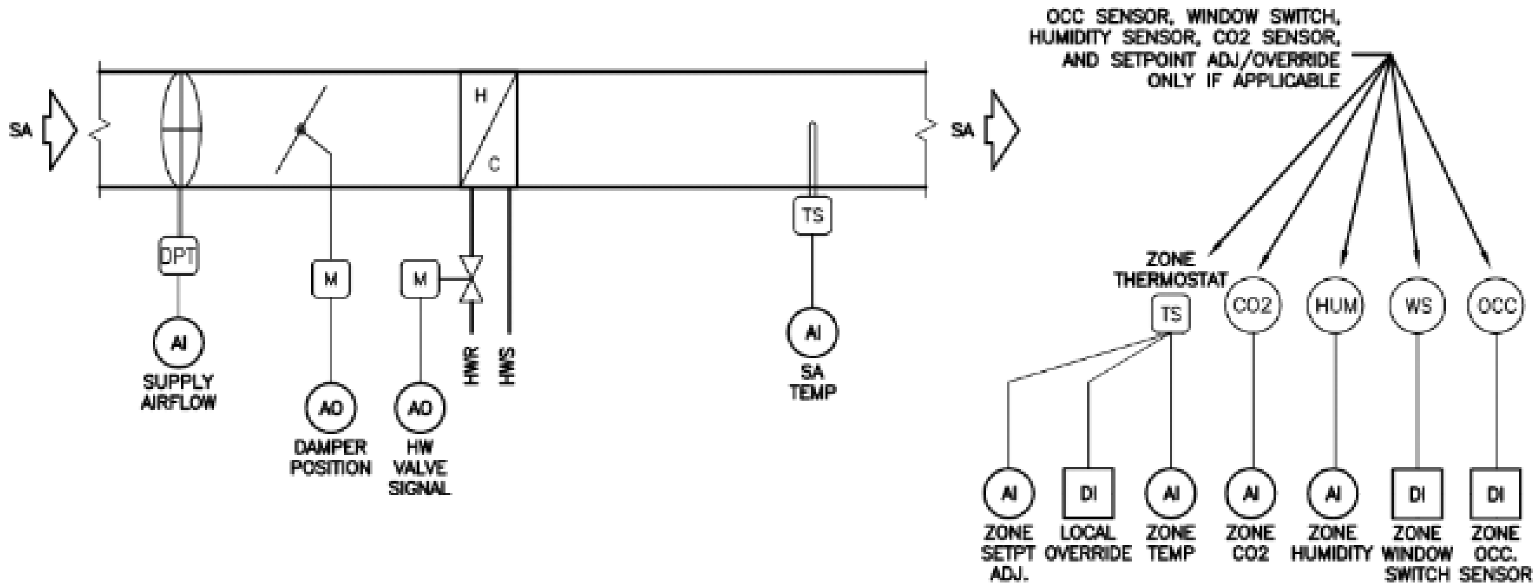


Figure A-2 VAV Terminal unit with reheat.

2.1 VAV Controls Points List

4.2 VAV Terminal Unit with Reheat

Required?	Description	Type	Device
R	VAV box damper position	AO OR two DOs	Modulating actuator OR Floating actuator
R	Heating signal	AO OR two DOs	Modulating valve OR Floating actuator OR Modulating electric heating coil
R	Discharge airflow	AI	DP transducer connected to flow sensor
R	Discharge air temperature (DAT)	AI	Duct temperature sensor (probe or averaging at designer's discretion)
R	Zone temperature	AI	Room temperature sensor
A	Local override (if applicable)	DI	Zone thermostat override switch
A	Occupancy sensor (if applicable)	DI	Occupancy sensor
A	Window switch (if applicable)	DI	Window switch
A	Zone temperature setpoint adjustment (if applicable)	AI	Zone thermostat adjustment
A	Zone CO_2 level (if applicable)	AI	Room CO_2 sensor
A	Zone dew point (if applicable)	AI	Room dew point sensor (or RH converted to DPT)

2.1 VAV Space Temperature Setpoints

Table 3.1.1.1-1 Default Setpoints

Zone Type	Occupied		Unoccupied	
	Heating	Cooling	Heating	Cooling
VAV	21°C (70°F)	24°C (75°F)	16°C (60°F)	32°C (90°F)
Mechanical/electrical rooms	18°C (65°F)	29°C (85°F)	18°C (65°F)	29°C (85°F)
Networking/computer	18°C (65°F)	24°C (75°F)	18°C (65°F)	24°C (75°F)

2.1 VAV Operating Modes

Table 5.6.4 Endpoints as a Function of Zone Group Mode

Endpoint	Occupied	Cooldown	Setup	Warmup	Setback	Unoccupied
Cooling maximum	Vcool-max	Vcool-max	Vcool-max	0	0	0
Cooling minimum	Vmin*	0	0	0	0	0
Minimum	Vmin*	0	0	0	0	0
Heating minimum	Max (Vheat-min, Vmin*, Vm)	Vheat-min	0	Vheat-max	Vheat-max	0
Heating maximum	Max (Vheat-max, Vmin*)	Vheat-max	0	Vcool-max	Vcool-max	0

2.1 VAV Control Logic

5.6.5. Control logic is depicted schematically in Figure 5.6.5 and described in the following subsections.

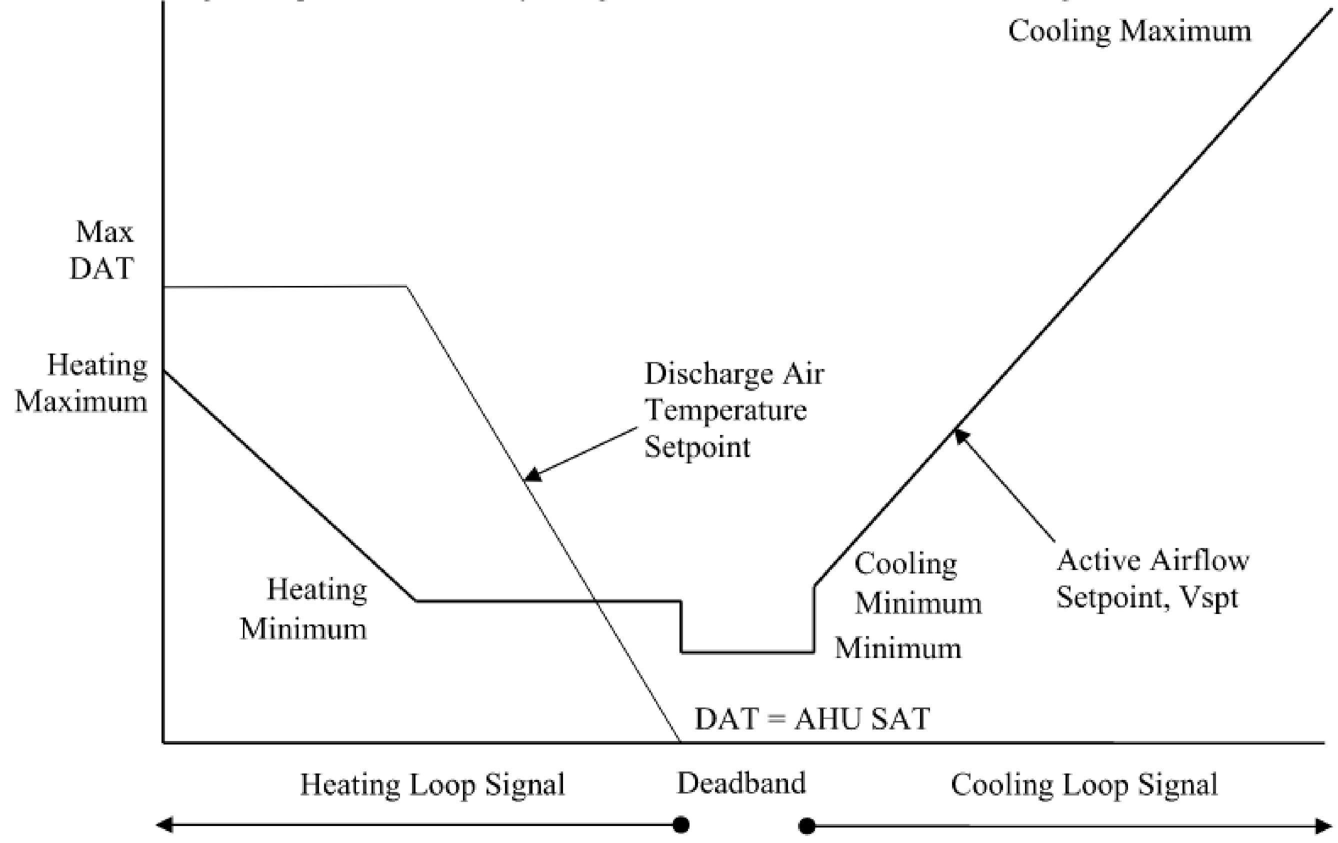


Figure 5.6.5 Control logic for VAV reheat zone.

2.2 Air Handling Unit Example

2.2 AHU Controls Schematic

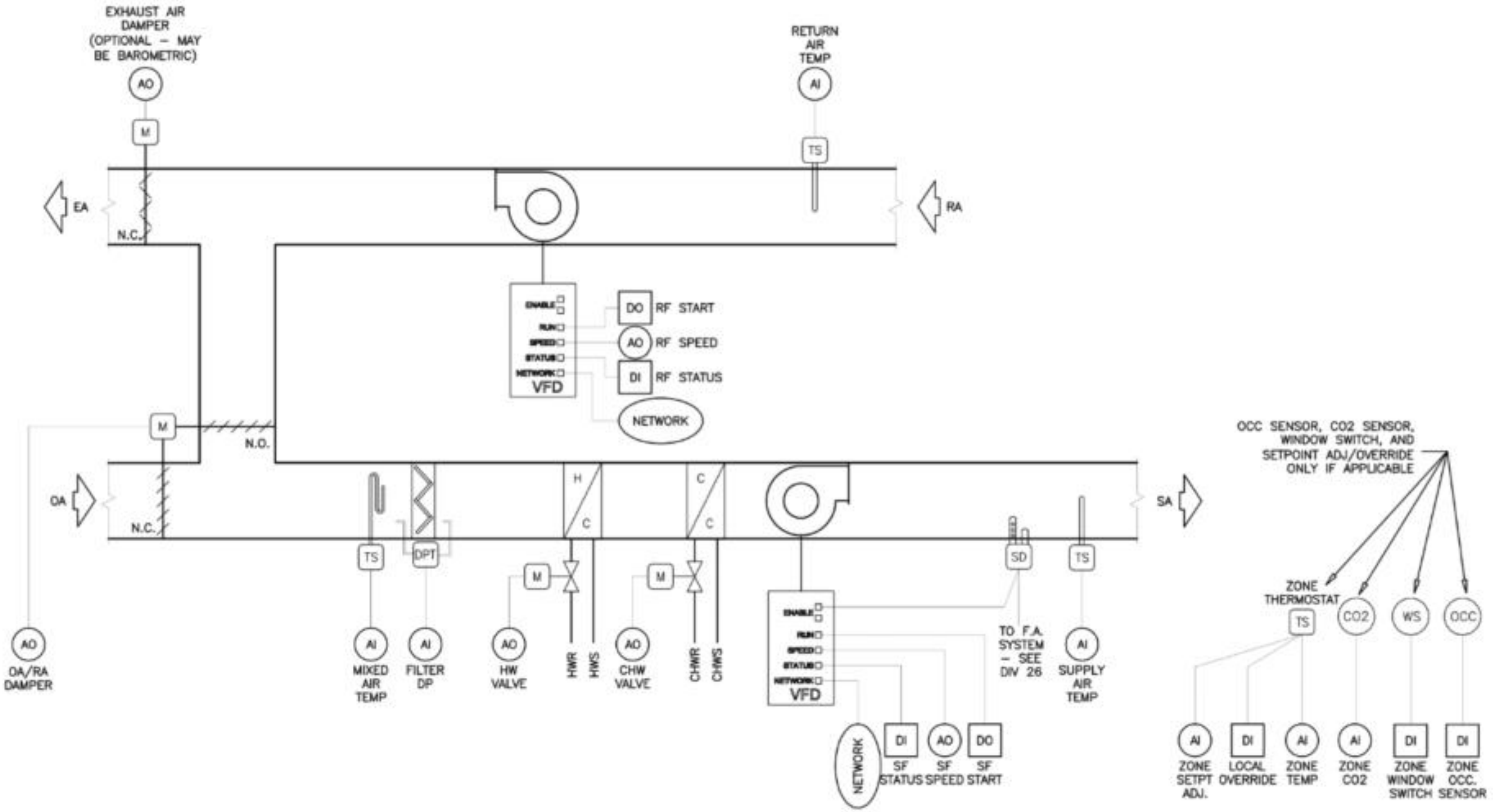


Figure A-12 Single zone VAV air handling unit (return fan option).

2.2 AHU Controls Points List

4.8 Single-Zone VAV Air-Handling Unit

Required?	Description	Type	Device
R	Supply fan start/stop	DO	Connect to VFD Run
R	Supply fan speed	AO	Connect to VFD Speed
O	Supply fan status	DI	Connect to VFD Status
R	Supply air temperature	AI	Duct temperature sensor (probe or averaging at designer's discretion)
R	Outdoor/return air damper	AO	Modulating actuators
R	Outdoor air temperature	AI	Temperature sensor at outdoor air intake
O	Mixed air temperature	AI	Averaging temperature sensor
O	Return air temperature	AI	Duct temperature sensor
O	Filter pressure drop	AI	DP transducer across filter

Required?	Description	Type	Device
R	Cooling signal	AO	Modulating CHW valve OR Variable-capacity compressor
A	Heating signal	AO	Modulating HW valve OR Modulating electric heating coil
R	Zone temperature	AI	Room temperature sensor
A	Local override (if applicable)	DI	Zone thermostat override switch
A	Occupancy sensor (if applicable)	DI	Occupancy sensor
A	Window switch (if applicable)	DI	Window switch

A	Zone temperature setpoint adjustment (if applicable)	AI	Zone thermostat adjustment
A	Zone CO_2 level (if applicable)	AI	Room CO_2 sensor
For units with an AFMS, include the following point			
A	Outdoor Airflow	AI	Airflow measurement station
For units with actuated relief dampers but no relief fan, include the following points.			
A	Relief damper	AO	Modulating actuator
For units with a relief fan, include the following four points			
A	Relief-fan start/stop	DO	Connect to VFD Run
O	Relief-fan status	DI	Connect to VFD Status
A	Relief-fan speed	AO	Connect to VFD Speed
A	Relief-damper open/close	DO	Two position actuator
For units with a return fan, include the following three points.			
A	Return fan start/stop	DO	Connect to VFD Run
O	Return-fan status	DI	Current VFD Status
A	Return-fan speed	AO	Connect to VFD Speed
For units with a return fan and speed tracking control, include the following point.			
A	Exhaust air damper (if applicable—damper may be barometric)	DO	Two position actuator
For units with a return fan and direct building pressure control, include the following two points.			
A	Return Fan Discharge Static Pressure	AI	Differential pressure transducer at fan

2.2 AHU System Modes

5.15 Air-Handling Unit System Modes

5.15.1. AHU system modes are the same as the mode of the Zone Group served by the system. When Zone Group served by an air-handling system are in different modes, the following hierarchy applies (highest one sets AHU mode):

5.15.1.1. Occupied Mode

5.15.1.2. Cooldown Mode

5.15.1.3. Setup Mode

5.15.1.4. Warmup Mode

5.15.1.5. Setback Mode

5.15.1.6. Unoccupied Mode

2.2 AHU Operating States

Table 5.16.14.4 VAV AHU Operating States

Operating State	Heating Valve Position	Cooling Valve Position	Outdoor Air Damper Position
#1: Heating	> 0	= 0	= MinOA-P
#2: Free cooling, modulating OA	= 0	= 0	MinOA-P < x < 100%
#3: Mechanical + economizer cooling	= 0	> 0	= 100%
#4: Mechanical cooling, minimum OA	= 0	> 0	= MinOA-P
#5: Unknown or dehumidification	No other OS applies		

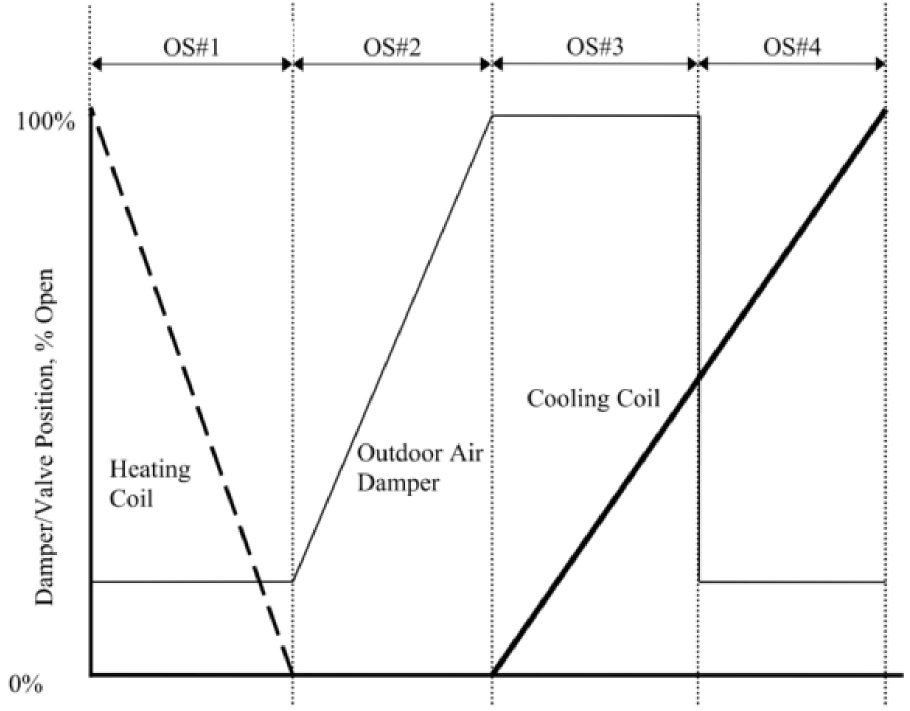


Figure 5.16.14.4 VAV AHU operating states.

2.2 AHU Economizer Limits

The engineer must specify the code basis of the economizer high limit and the high-limit control device being used. See Sections 3.1.4.3 and 3.1.6.2.

5.1.17.2. ASHRAE 90.1

Device Type	Allowed only in these ASHRAE Climate Zones	Required High Limit (Economizer OFF when)
Fixed dry bulb	1b, 2b, 3b, 3c, 4b, 4c, 5b, 5c, 6b, 7, 8	TOA > 24°C (75°F)
	5a, 6a	TOA > 21°C (70°F)
	1a, 2a, 3a, 4a	TOA > 18°C (65°F)
Differential dry bulb	1b, 2b, 3b, 3c, 4b, 4c,5a, 5b, 5c, 6a, 6b, 7, 8	TOA > TRA
Fixed enthalpy + fixed dry bulb	All	hOA > 66 kJ/kg (28 Btu/lb) or TOA > 24°C (75°F)
Differential enthalpy + fixed dry bulb	All	hOA > hRA or TOA > 24°C (75°F)

2.3 Defines Scope, Who Does What?

2.3 Scope - Setpoints – By the Engineer

3.1.4. Multiple-Zone VAV Air-Handler Design Information

3.1.4.1. Temperature Setpoints

AHU setpoints required by the designer are best conveyed in equipment schedules because the setpoints vary for each AHU.

a. Min_ClgSAT, lowest cooling supply air temperature setpoint

The Min_ClgSAT variable should be set no lower than the design coil leaving air temperature to prevent excessive CHW temperature reset requests, which will reduce chiller plant efficiency.

b. Max_ClgSAT, highest cooling supply air temperature setpoint

The Max_ClgSAT variable is typically 18°C (65°F) in mild and dry climates and 16°C (60°F) or lower in humid climates. It should not typically be greater than 18°C (65°F) because this may lead to excessive fan energy that can offset the mechanical cooling savings from economizer operation.

c. OAT_Min, the lower value of the OAT reset range

d. OAT_Max, the higher value of the OAT reset range

2.3 Scope - Setpoints – By the Balancing Contractor

3.2.3. Chilled Water Plant

Retain the following parameter for plants with DP controlled variable speed pumps. Delete otherwise.

3.2.3.1. CHW-DPmax, the maximum chilled water differential pressure setpoint, in psi

Instructions for establishing CHW-DPmax should be provided in the Test and Balance Specification. For example:

1. *Fully open all control valves serving coils that are located downstream of the differential pressure sensor.*
2. *Close the minimum flow bypass valve (if applicable).*
3. *Fully close all control valves serving coils that are located upstream of the differential pressure sensor.*
4. *Start pump(s). Manually adjust speed slowly until design flow (or design pressure drop, for coils without calibrated balance valves) is just achieved through all open coils without modulating any balance valves. One coil should be just at design flow, while others should be at or above design flow.*
5. *Once flow condition in previous step is achieved, note the BAS differential pressure sensor and handheld digital pressure sensor readings to verify accuracy of BAS reading; report BAS reading to controls contractor.*

2.3 Scope - Setpoints – By the Controls Contractor

1. Option 1: Determine the minimum velocity vm for each VAV box size and model. If the VAV box manufacturer provides an amplification factor F for the flow pickup, calculate the minimum velocity vm as:

$$vm = 1.28\sqrt{\frac{VPm}{F}} \qquad \text{(SI)}$$

$$vm = 4005\sqrt{\frac{VPm}{F}} \qquad \text{(I-P)}$$

2.3 Scope - Alarms - Standardization

5.1.12.1. There shall be 4 levels of alarm

a. Level 1: Life-safety message

b. Level 2: Critical equipment message

c. Level 3: Urgent message

d. Level 4: Normal message

5.1.12.2. Maintenance Mode. Operators shall have the ability to put any device (e.g., AHU) in/out of maintenance mode.

a. All alarms associated with a device in maintenance mode will be suppressed. *Exception:* Life safety alarms shall not be suppressed.

b. If a device is in maintenance mode, issue a daily Level 3 alarm at a scheduled time indicating that the device is still in maintenance mode.

5.1.12.4. Latching. A latching alarm requires acknowledgment from the operators before it can return to normal, even if the exit deadband has been met. A nonlatching alarm does not require acknowledgment. Default latching status is as follows:

a. Level 1 alarms: latching

b. Level 2 alarms: latching

c. Level 3 alarms: nonlatching

d. Level 4 alarms: nonlatching

5.1.12.5. Post-exit Suppression Period. To limit alarms, any alarm may have an adjustable suppression period such that once the alarm is exited, its post-exit suppression timer is triggered and the alarm may not trigger again until the post-exit suppression timer has expired. Default suppression periods are as follows:

a. Level 1 alarms: 0 minutes

b. Level 2 alarms: 5 minutes

c. Level 3 alarms: 24 hours

d. Level 4 alarms: 7 days

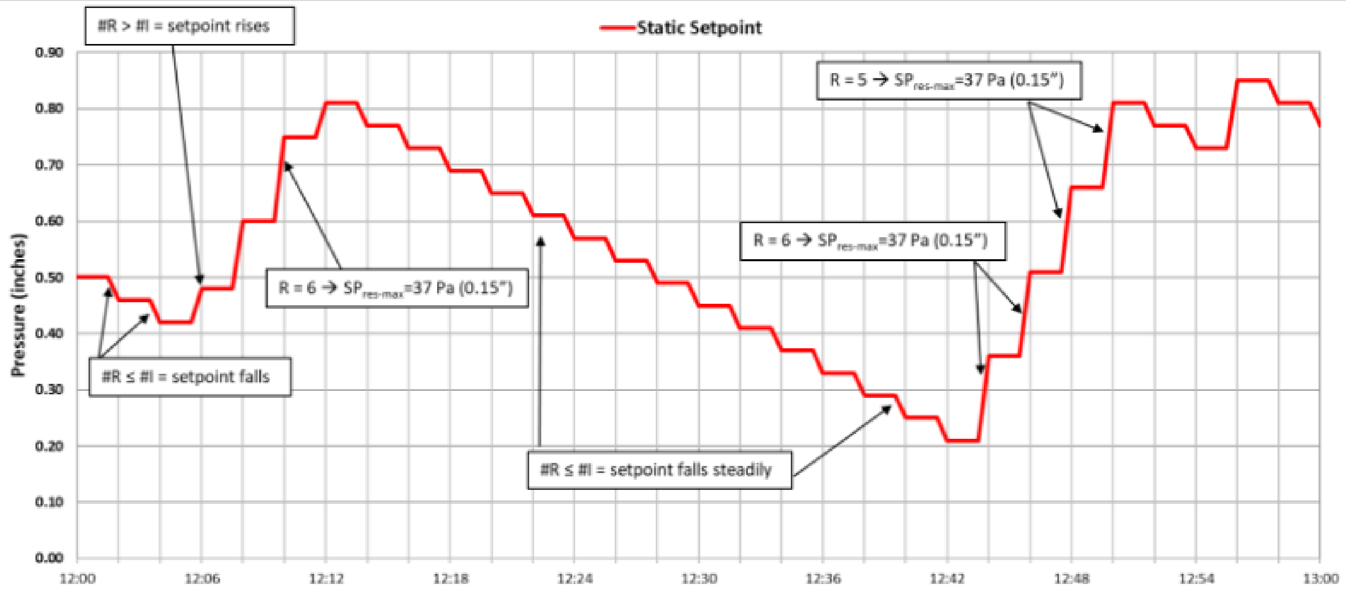
2.4 Demand Based Building Controls
(Trim & Respond)

2.4 DBBC Purpose

- Core strategy in ASHRAE 36-2024 for optimizing system setpoints.
- Dynamically adjusts (resets) setpoints based on real-time demand.
- Prevents over-conditioning by avoiding fixed or overly aggressive setpoints.
- Supports energy efficiency, comfort stability, and smooth equipment operation.

2.4 DBBC - How it Works

- System continuously collects “requests” from zones or devices (e.g., VAV boxes).
- If few or no zones request more capacity, the system trims the setpoint (reduces load).
- If many zones request more capacity, the system responds by adjusting setpoints upward or downward (depending on variable).
- Adjustments are incremental and time-spaced, preventing sudden changes or oscillations



2.4 DBBC - What are its applications?

Supply Air Temperature (Cooling Mode)

- Trim SAT upward when few zones request cooling, Respond downward when many zones call for cooling.
- Result: improves comfort stability and reduces mechanical cooling energy.

Duct Static Pressure

- Trim fan static pressure when most VAV boxes are at low damper positions, Respond upward when many dampers near full open.
- Result: Reduces fan energy and noise while maintaining airflow.

Hot Water Supply Temperature Reset

- Trim HWST downward when heating demand is low across terminal units, Respond upward when multiple zones require heating simultaneously.
- Result: Reduces boiler energy use and increases condensing operation efficiency.

Chilled Water Supply Temperature Reset

- Trim CHWST upward when cooling coil valves are lightly loaded, Respond downward as cooling demand increases.
- Result: Improves chiller efficiency through higher lift when possible.

Pump Differential Pressure Reset

- Trim pump DP setpoint when most valves are partially closed, Respond upward when valves approach wide-open conditions.
- Result: Saves pump energy through reduced speed and avoids unnecessary over-pressurization.

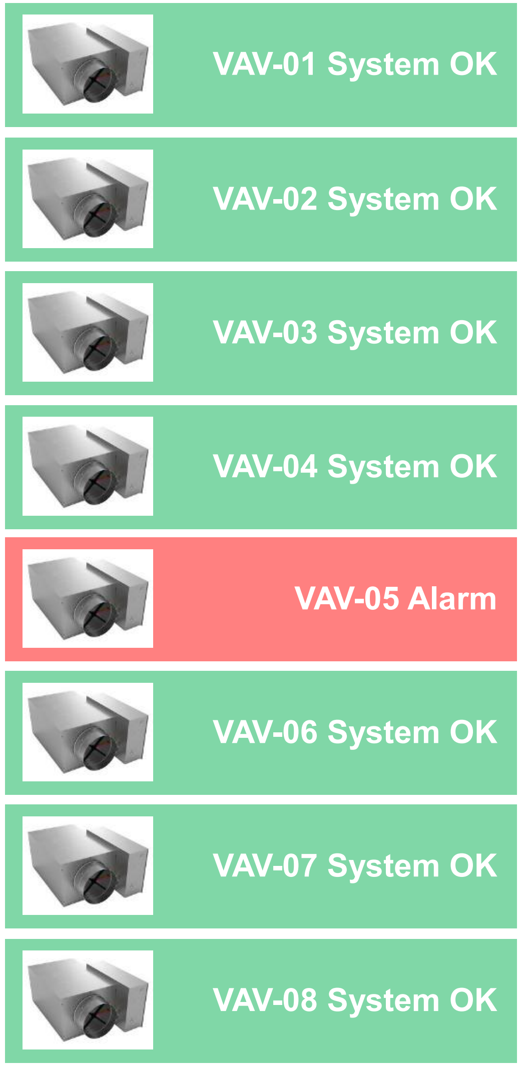
2.4 Demand Based Building Controls - Summary

- Reduces energy use by pushing setpoints toward the lowest energy position when possible.
- Improves comfort through responsive yet stable system control.
- Minimizes equipment wear by avoiding rapid or unnecessary changes.
- Enables scalable, consistent control sequences across BAS platforms.

2.5 Next-Generation Building Operation

(Manitoba Has Yet to Adopt)

2.5 NGBO - SystemOK Flags



Each interior space is a load to its associated VAV box.

5.1.19.2. For each system as defined in Section 5.1.19.1.d, there shall be a SystemOK flag, which is either TRUE or FALSE.

5.1.19.3. SystemOK shall be TRUE when all of the following are true:

a. The system is proven ON.

b. The system is achieving its temperature and/or pressure setpoint(s) for at least 5 minutes

c. The system is ready and able to serve its load

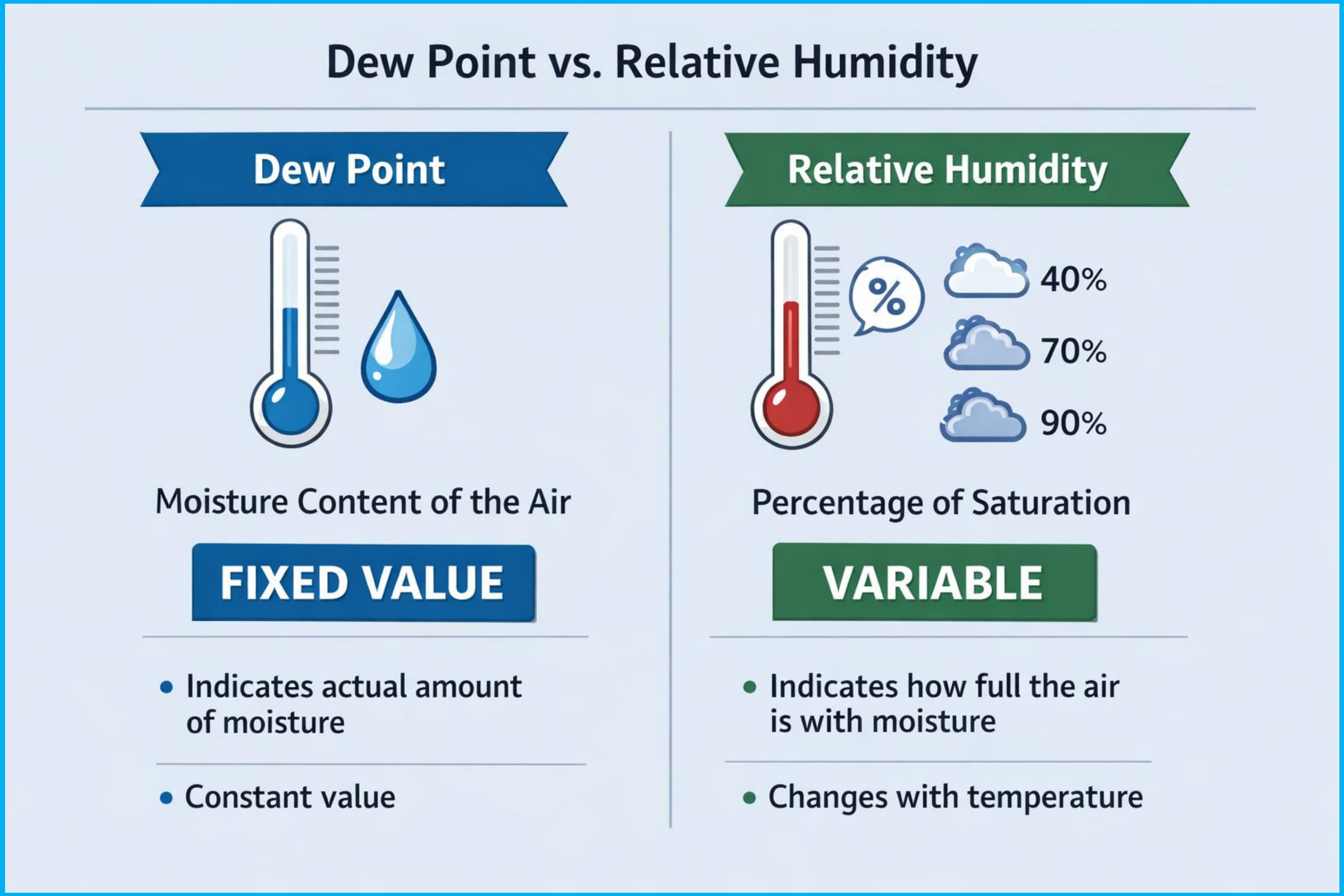
5.1.19.4. SystemOK shall be FALSE while the system is starting up (i.e., before reaching setpoint) or when enough of the system's components are unavailable (in alarm, disabled, or turned OFF) to disrupt the ability of the system to serve its load. This threshold shall be defined by the design engineer for each system.

a. By default, Level 1 through Level 3 component alarms (indicating equipment failure) shall inhibit SystemOK. Level 4 component alarms (maintenance and energy efficiency alarms) shall not affect SystemOK.

2.5 NGBO - Dew Point Control, Not Relative Humidity

Dew point is used as the humidity variable, rather than relative humidity, based on the dew point high limits prescribed in Standard 62.1-2022 addendum k, which in turn were largely based on ASHRAE Handbook – Applications Chapter 64 Moisture and Mold which recommends controlling dew point temperature (rather than relative humidity) to mitigate mold growth. It is anticipated that Standard 90.1 will also limit the use of active dehumidification based on dew point temperature to correspond to Standard 62.1 limits. However, almost all commercial humidity sensors measure relative humidity; to determine dew point temperature, concurrent drybulb temperature must also be measured, and either the sensors must include psychrometric algorithms in firmware to generate a dew point signal, or psychrometric algorithms residing in the digital control system must make this conversion. Both are readily available although not yet commonly used.

2.5 NGBO - What is Dew Point?



2.5 NGBO - Dew Point High Limits

Table 3.1.1.4 Dew Point Temperature High Limits for Zones

Zone Tag or Zone Type	Occupied	Unoccupied
Room #x	15.6°C (60°F) DPT	15.6°C (60°F) DPT
Room #y	15.6°C (60°F) DPT	15.6°C (60°F) DPT
Operating Room	11.7°C (53°F) DPT	15.6°C (60°F) DPT

b. A dew point high limit value shall not be assigned to the zones not listed above, or to zones which do not have a local humidity sensor.

See Guideline 36-2024 page 4 for full list of conditions

2.5 NGBO - Dew Point Control & Setpoints

Retain the following two parameters for humidity control that limits supply air temperature reset based on return air dew point temperature. Delete otherwise.

c. RADPT_Min, the lower value of the return air dew point reset range.

d. RADPT_Max, the higher value of the return air dew point reset range.

When limiting humidity based on return air conditions, RADPT_Min and RADPT_Max define the range of return air dew point temperatures used in the humidity-limiting reset logic.

Typical values are RADPT_Min = 55°F and RADPT_Max = 60°F, though application-specific requirements may dictate different values.

Note that control based on return air only responds to the average condition across the building. Individual zones with high humidity will most likely not be detected.

2.5 NGBO - Demand Limiting

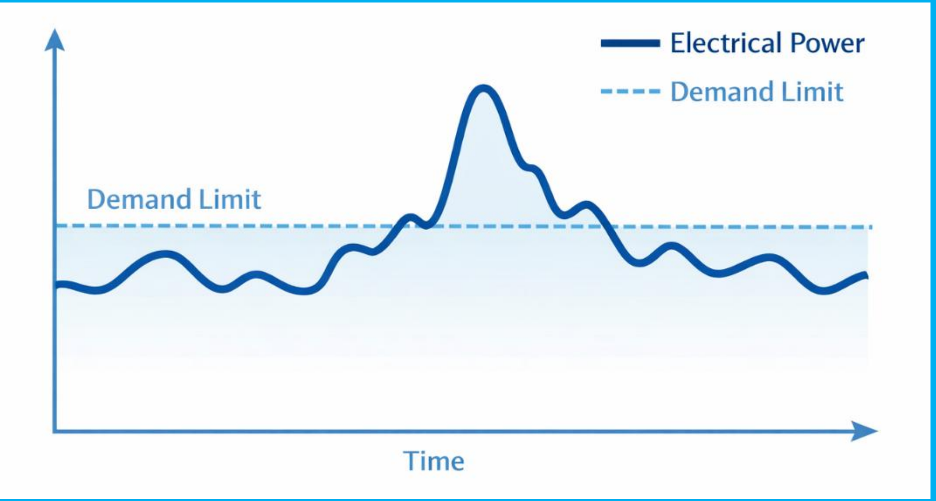


Table 3.1.1.1-2 Default Demand Limit Offsets

Zone Type	Heating			Cooling		
	DL #1	DL #2	DL #3	DL #1	DL #2	DL #3
General (unless listed below)	0.5°C (1°F)	1°C (2°F)	2°C (4°F)	0.5°C (1°F)	1°C (2°F)	2°C (4°F)
Laboratory spaces	0°C (0°F)	0.5°C (1°F)	1°C (2°F)	0°C (0°F)	0.5°C (1°F)	1°C (2°F)
Transient, gallery, restrooms	1°C (2°F)	1.5°C (3°F)	2°C (4°F)	1°C (2°F)	1.5°C (3°F)	2°C (4°F)
IDF/MDF **(IT/Server Room)**	0°C (0°F)	0°C (0°F)	0°C (0°F)	0°C (0°F)	0°C (0°F)	0°C (0°F)

2.5 NGBO - Fault Detection & Diagnostics (FDD)

FC#7 (omit if no heating coil)	**Equation**	$SAT_{AVG} < SATSP - \varepsilon_{SAT}$ and $HC \geq 99\%$	**Applies to OS #1**
	Description	SAT too low in full heating	
	Possible Diagnosis	SAT sensor error Cooling coil valve leaking or stuck open Heating coil valve stuck closed or actuator failure Fouled or undersized heating coil HW temperature too low or HW unavailable Gas or electric heat unavailable DX cooling stuck on Leaking or stuck economizer damper or actuator	

FC#15	**Equation**	$HCLT_{AVG} - HCET_{AVG} \geq \sqrt{\varepsilon_{HCET}^2 + \varepsilon_{HCLT}^2} + \Delta T_{SF}^*$ *Fan heat factor included or not depending on location of sensors used for HCET and HCLT	**Applies to OS #2 – #4**
	Description	Temperature rise across inactive heating coil	
	Possible Diagnosis	HCET sensor error HCLT sensor error Heating coil valve stuck open or leaking.	

2.5 NGBO - Fault Detection & Diagnostics (FDD)

Table 5.16.14.6 VAV AHU AFDD Internal Variables

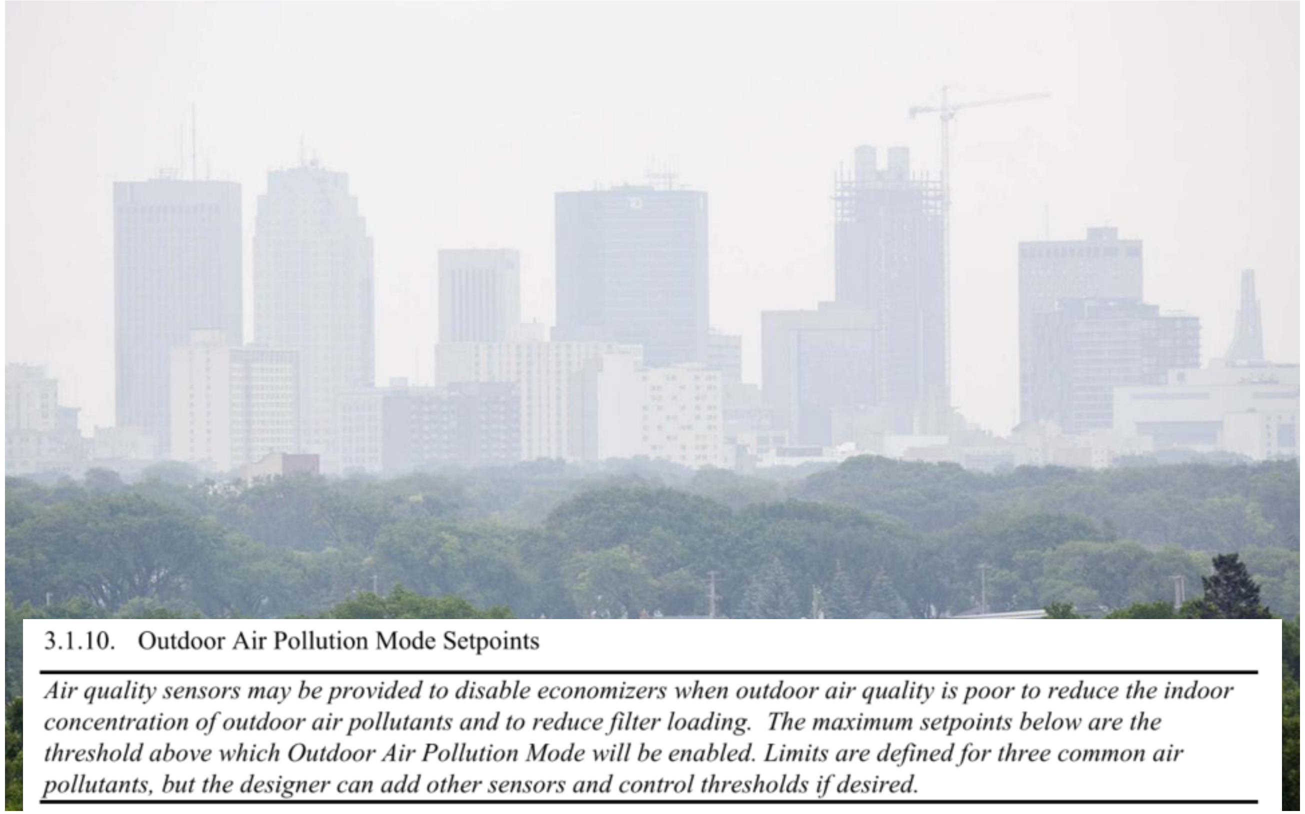
Variable Name	Description	Default Value
ΔT_{SF}	Temperature rise across supply fan	1°C (2°F)
ΔT_{MIN}	Minimum difference between OAT and RAT to evaluate economizer error conditions (FC#6)	6°C (10° F)
ε_{SAT}	Temperature error threshold for SAT sensor	1°C (2°F)
ε_{RAT}	Temperature error threshold for RAT sensor	1°C (2°F)
ε_{MAT}	Temperature error threshold for MAT sensor	3°C (5°F)
ε_{OAT}	Temperature error threshold for OAT sensor	1°C (2°F) if local sensor @ unit. 3°C (5°F) if global sensor.
ε_{F}	Airflow error threshold	30%
ε_{VFDSPD}	VFD speed error threshold	5%
ε_{DSP}	Duct static pressure error threshold	25 Pa (0.1")
ε_{CCET}	Cooling coil entering temperature sensor error. Equal to ε_{MAT} or dedicated sensor error	ε_{MAT} or error of dedicated sensor
ε_{CCLT}	Cooling coil leaving temperature sensor error. Equal to ε_{SAT} or dedicated sensor error	ε_{SAT} or error of dedicated sensor
ε_{HCET}	Heating coil entering temperature sensor error; equal to ε_{MAT} or dedicated sensor error	ε_{MAT} or error of dedicated sensor
ε_{HCLT}	Heating coil leaving temperature sensor error. Equal to ε_{SAT} or dedicated sensor error	ε_{SAT} or error of dedicated sensor

2.5 NGBO - Outdoor Air Pollution Mode

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 $\mu g/m^3$*
8	*27.1%*	*48 $\mu g/m^3$*
10	*31.5%*	*51 $\mu g/m^3$*
11	*49.0%*	*69 $\mu g/m^3$*
12	*66.4%*	*104 $\mu g/m^3$*
13	*68.9%*	*113 $\mu g/m^3$*
14	*71.4%*	*122 $\mu g/m^3$*
15	*83.9%*	*217 $\mu g/m^3$*
16	*96.3%*	*946 $\mu g/m^3$*

The EPA has established primary and secondary standards for annual mean $PM_{2.5}$ at 12.0 $\mu g/m^3$ and 15.0 $\mu g/m^3$ respectively; 24-hour standards with 98th percentile forms and levels of 35.0 $\mu g/m^3$. 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 $\mu g/m^3$. $PM_{2.5}$ 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. 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.

See Guideline 36-2024, page 63 for Sequence of Operations

3. How Are Manufacturers Supporting G36

Active Participation in Guideline Development

- BAS manufacturers actively participate in the Guideline 36 Guideline Project Committee (GPC) and related technical activities
- Provide technical review, implementation feedback, and field experience to inform guideline development, interpretation, and periodic updates
- Support continuous maintenance of the guideline to ensure ease of adaptation and alignment with current control system capabilities

Product and System Architecture Alignment

- Development of integrated product portfolios supporting Guideline 36 sequences
- BAS architectures aligned for consistent multi-scale implementation
- Support continuous maintenance to ensure adaptability and quality of execution

Validation, Testing, and Research Support

- Field validation through pilot projects and applied implementations
- Support for model-based validation and sequence verification tools

3. How Are Manufacturers Supporting G36

Design and Documentation Templates

Templates including application guides and control diagrams simplify specification and design aligned with G36.

- Reduced engineering labour
- Designers do not have to start from scratch for every project

Pre-Written Control Programs

Ready-to-use G36-aligned control programs reduce engineering effort and implementation risk by using tested logic blocks.

- Reduced programming labour
- Easier to troubleshoot as all programs are consistent
- California Title 24 ASHRAE 36 certified SOOs

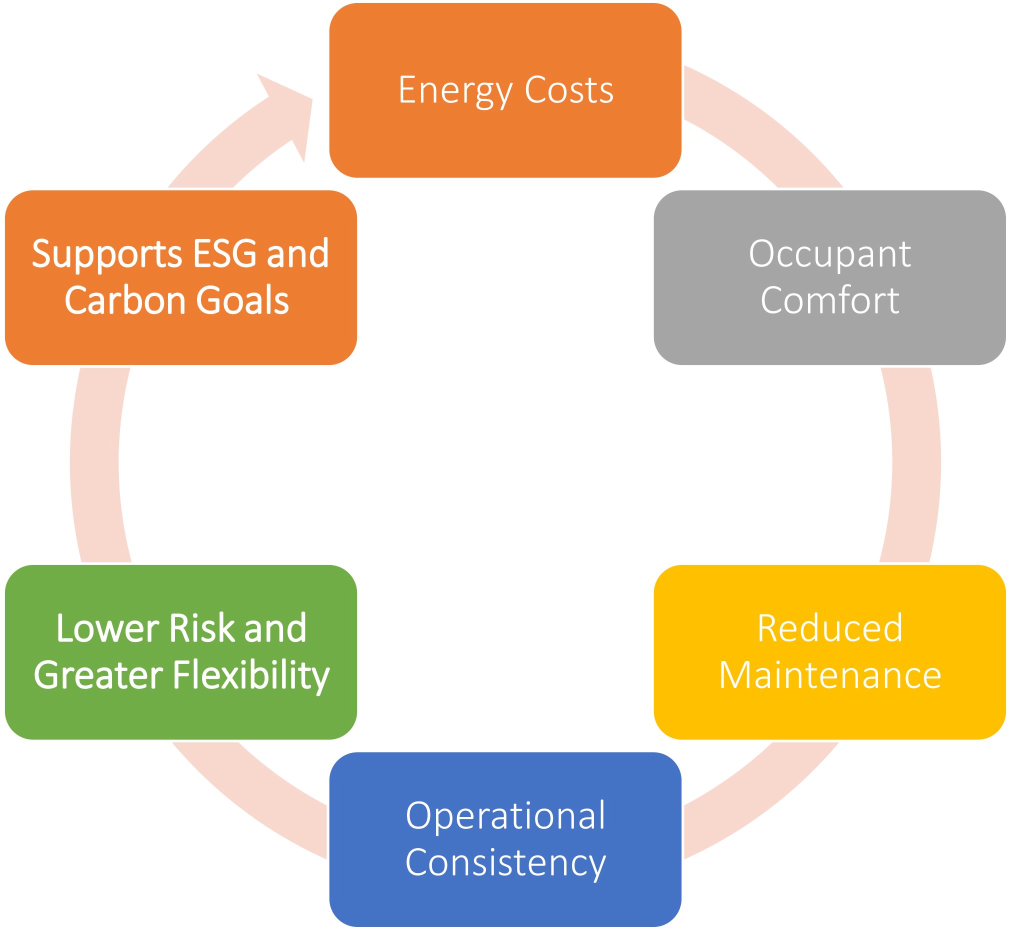
Predefined HMI Graphics

Standardized HMI graphics improve operator understanding and troubleshooting with consistent visual system representations.

- Reduced graphics labour
- Reduced commissioning labour
- Consistency in graphics

4. ASHRAE Guideline 36: Benefits to Building Owners

Enhancing building performance through optimized control strategies



4. Benefits to Owner - Lower Energy Costs

Energy Waste Reduction

ASHRAE Guideline 36 reduces energy waste by targeting simultaneous heating and cooling and excessive airflow.

Optimized Control Strategies

Guideline 36 uses optimized reset strategies for supply air temperature, duct pressure, and ventilation rates.

Cost-Effective Savings

Energy savings of 10-30% are achieved mainly through improved control logic, not equipment replacement.

Lower Peak Demand

Reduced energy use lowers peak demand, decreasing utility charges and improving grid resilience.

Average 31% Savings Multizone AHU in a medium commercial building

Berkeley Labs
https://eta.lbl.gov/publications/estimating-ashrae-guideline-36-energy

Average 42% Savings
Roof Top Unit and VAV Control Based on Energy Model

Oak Ridge National Laboratory
https://www.ornl.gov/publication/energy-performance-evaluation-ashrae-guideline-36-control-and-reinforcement-learning

4. Benefits to Owner - Improved Comfort and Stability

Stable Comfort Control
Guideline 36 emphasizes occupant-focused control to reduce temperature swings and drafts for better comfort.

Coordinated System Responses
Better coordination between zone-level and system-level controls ensures consistent indoor conditions.

Enhanced Occupant Satisfaction
Reducing comfort complaints improves tenant satisfaction, retention, and overall building reputation.

Energy Efficient Ventilation
Improved ventilation control supports indoor air quality without excessive energy consumption.

4. Benefits to Owner - Reduced Maintenance and Longer Equipment Life

Stable Comfort Control
Guideline 36 emphasizes occupant-focused control to reduce temperature swings and drafts for better comfort.

Coordinated System Responses
Better coordination between zone-level and system-level controls ensures consistent indoor conditions.

Enhanced Occupant Satisfaction
Reducing comfort complaints improves tenant satisfaction, retention, and overall building reputation.

Energy Efficient Ventilation
Improved ventilation control supports indoor air quality without excessive energy consumption.

4. Benefits to Owner

Lower Risk and Greater Flexibility

Vendor-Neutral Standard
ASHRAE Guideline 36 is vendor-neutral and openly published, reducing operational and financial risks for building owners.

Enhanced Flexibility
Standardized sequences allow easier renovations, expansions, and retrofits, lowering future costs and complexity.

Simplified Commissioning
Clear functional intent enables objective testing, reducing disputes and risks during project delivery and occupancy.

Resilient Operational Foundation
Guideline 36 supports adaptation to evolving needs, technologies, and regulations over the building's lifetime.

Supports ESG and Carbon Goals

Energy Consumption Reduction
ASHRAE Guideline 36 reduces HVAC energy use, lowering greenhouse gas emissions and supports corporate sustainability goals.

Operational Transparency
The guideline improves transparency through data-driven performance management and continuous verification of HVAC operations.

Compliance and Reporting
Guideline 36 facilitates compliance with energy and carbon regulations by enabling accurate emissions data disclosure.

Sustainability Asset Transformation
Adopting the guideline turns HVAC operations into measurable sustainability assets that enhance reputation and financing opportunities.

Bottom Line for Building Owners

Energy and Cost Savings
Improved control logic reduces energy costs and maintenance expenses without expensive upgrades.

Enhanced Comfort and Performance
Guideline 36 ensures HVAC systems perform consistently, improving occupant comfort and satisfaction.

Risk Reduction and Flexibility
The guideline reduces operational risks and increases system flexibility for easier building management.

Long-Term Sustainability
Supports sustainability goals by extending equipment life and optimizing resource use.

Where Can You Find Guideline 36-2024?

- ASHRAE Website
  https://www.ashrae.org/technical-resources/standards-and-guidelines/read-only-versions-of-ashrae-standards

- 36 ASHRAE Standards available

- This presentation will be made available at: ASHRAEManitoba.ca

ASHRAE® Manitoba Chapter

Thanks For Attending!

Open Q&A