Agenda and Objectives

Trane Engineers Newsletter Live Series

ASHRAE Standards 62.1 and 90.1 and VAV Systems

These days many designers want to comply with both Standard 62.1 and Standard 90.1. Requirements from both standards have been incorporated into many building codes, and the minimum requirements of both standards must be met as prerequisites to LEED certification. In attempting to comply with the ventilation requirements of Standard 62.1 AND the energy-limiting requirements of Standard 90.1, some designers have concluded that it's next to impossible to do so using traditional VAV systems. While in some specific cases these designers might be right, in most cases they are not right. In this broadcast, the Chair of SSPC 62.1 (Dennis Stanke), the Chair of SSPC 90.1 (Mick Schwedler), and the primary author of the HVAC sections in the User Manuals for both standards (Steve Taylor), discuss the potentially conflicting requirements and design choices.

By attending this event you will learn:

1. Key VAV system requirements found in both standards
2. How to avoid the potential conflict between the central reheat restrictions of Standard 90.1 and dehumidification requirements of Standard 62.1
3. How to choose VAV box minimum airflow settings to avoid the potential conflict between the local reheat restrictions of and the minimum ventilation at all loads
4. How implement zone-level demand controlled ventilation to save energy while maintaining minimum ventilation

Agenda:

1) Overview – Why are the standards important and why must you comply?
2) Demand-Controlled Ventilation
    a) 62.1
    b) 90.1
    c) Conflicts?
    d) How do you comply?
3) Dehumidification
    a) 62.1
    b) 90.1
    c) Conflicts?
    d) How do you comply?
4) Simultaneous heating and cooling
    a) 90.1 (2004 and 2007)
    b) 62.1 (2004 and 2007)
    c) Conflicts?
    d) How do you comply?

TRANE

Presenters

Ingersoll Rand

Trane Engineers Newsletter Live Series

ASHRAE Standards 62.1 and 90.1 and VAV Systems

(2008)

Steve Taylor | principal | Taylor Engineering

Steve Taylor is the principal of Taylor Engineering, Alameda, CA. He is a registered mechanical engineer specializing in HVAC system design, control system design, indoor air quality engineering, computerized building energy analysis, and HVAC system commissioning. Mr. Taylor graduated from Stanford University with a BS in Physics and a MS in Mechanical Engineering and has over 30 years of commercial HVAC system design and construction experience. He was the primary author of the HVAC sections of ASHRAE Standard 90.1-1989 and 1999 "Energy Conservation in New Non-residential Buildings" and California's Title 24 Energy Standards and Ventilation Standards. Other ASHRAE project and technical committees Mr. Taylor has participated in include Standard 62.1 Indoor Air Quality (chair), ASHRAE Standard 55 Thermal Comfort (member), Guideline 13 Specifying DDC (chair), Guideline 16 Economizer Dampers (chair), TC 1.4 Controls (chair), and TC 4.3 Ventilation (vice-chair).

Mick Schwedler | manager, applications engineering | Trane

Mick joined Trane in 1982 With expertise in system optimization and control, and in chilled-water system design, Mick's primary responsibility is to help designers properly apply Trane products and systems through one-on-one support, technical publications, and seminars. Mick is a past Chair of SSPC 90.1 and holds a B.S. and M.S. degree in mechanical engineering. Mick is a registered professional engineer in the State of Wisconsin.

Dennis Stanke | staff applications engineer | Trane

With a BSME from the University of Wisconsin, Dennis joined Trane in 1973 as a controls development engineer. He is now a Staff Applications Engineer specializing in airside systems including controls, ventilation, indoor air quality, and dehumidification. He has written numerous applications manuals and newsletters, has published many technical articles and columns, and has appeared in many Trane Engineers Newsletter Live broadcasts.

An ASHRAE Fellow, he is a past Chairman for SSPC62.1, the ASHRAE committee responsible for Standard 62.1, "Ventilation for Acceptable Indoor Air Quality," and he serves on the USGBC LEED Technical Advisory Group for Indoor Environmental Quality (the LEED EQ TAG).

ASHRAE Standards 62.1 and 90.1 and VAV Systems

an
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ASHRAE Standards 62.1 and 90.1 and VAV Systems

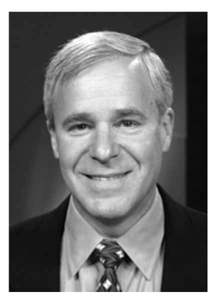
Agenda

- **Demand-controlled ventilation**
- **Dehumidification**
- **Simultaneous heating and cooling**
- **Questions**
- **Summary**

Today's Presenters

Dennis Stanke
staff applications engineer

Mick Schwedler
manager, applications engineering



Steve Taylor
principal, Taylor Engineering

ASHRAE Standards 62.1 and 90.1 and VAV Systems

engineers newsletter LIVE

Demand-controlled ventilation

Std 62.1-2007 Requirements

- **Areas of potential conflict with Standard 90.1 requirements**
  - Ventilation control or dynamic reset options (DCV for zones, VRC for systems)
  - Dehumidification requirements (65% RH analytical limit)
  - Zone minimum airflow in VAV-reheat systems (intake airflow depends on zone airflow)

std 62.1-2007 section 6.2.7

Dynamic Reset

Optional controls may reset zone or intake airflow in response to changing conditions, e.g.:

- Variations in zone occupancy, based on TOD schedule, direct count of occupants, or outdoor air rate per person based on sensed CO_2
- Variations in system ventilation efficiency based on system airflow values
- **Variations in VAV box minimums due to changes in system outdoor air intake flow (when economizing)**

dynamic reset

Operation As Conditions Vary

For this presentation,

- "Demand controlled ventilation" (DCV) resets zone outdoor airflow (Voz) as zone population or effective OA per person varies (zone-level control)
- "Ventilation reset control" (VRC) resets outdoor air intake flow (Vot) in multiple-zone systems as system ventilation efficiency (Ev) varies (system-level control)
- "Ventilation optimization" combines DCV and VRC for multiple-zone (VAV) systems

std 62.1-2007 section 6.2.2

Zone Calculations

1. **Calculate *breathing-zone outdoor airflow*, using Table 6-1 rates (cfm / per, cfm / ft^2)**

   Vbz = Rp × Pz + Ra × Az

2. **Determine *zone air distribution effectiveness*, Ez**

   Look up Ez (typically 1.0) (Table 6-2)

3. **Calculate *zone outdoor airflow***

   Voz = Vbz / Ez

dynamic reset

Zone-Level DCV Approaches

- TOD: Determine Voz using effective population, Pz’, based on time-of-day schedule
- OCC: Determine Voz using Pz’ equal to design or zero population, based on occupancy sensors
- COU: Determine Voz using Pz’ equal to actual population, based on direct count

  Voz=(Rp*Pz’+Ra*Az) / Ez

- CO_2: Maintain effective “people outdoor air rate” Rp’, in breathing zone, based on differential CO_2

  Rp’ = N / (Cr – Co)
  where N = CO_2 cfm / person

dynamic reset

Operation As Conditions Vary

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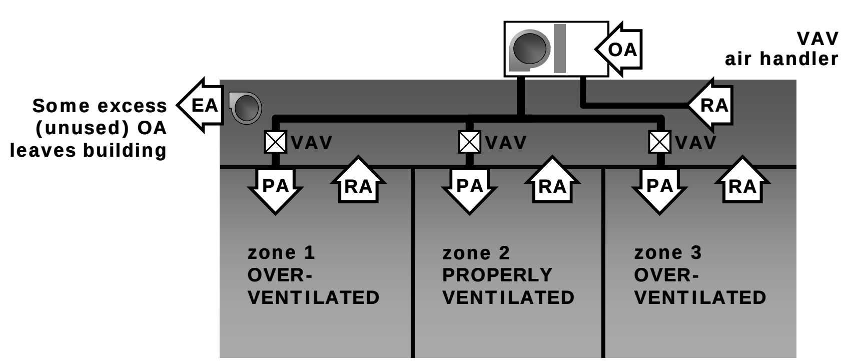
std 62.1 section 6.2.5

Multiple-Zone Systems

Can't deliver OA with 100% efficiency because some excess OA exhausts



std 62.1 section 6.2.5

System Calculations

- **6.2.5 Multiple-Zone Recirculating Systems**
  When one air handler supplies mixed air to many zones (e.g., VAV systems), find *outdoor air intake flow* (Vot) using prescribed equations:

Vot = Vou / Ev

Vou = f(Vbz in all zones) 1

Ev = 1 + Xs – Zd 2

Xs = Vou / Vps 3

Zd = Voz / Vdz 4

system calculations

Ventilation Reset Control

- **Current zone requirements**

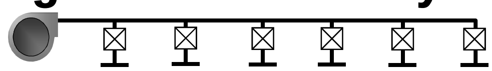
Vbz	**= breathing zone OA flow**	**= (entry)**
Ez	**= air distribution eff.**	**= (entry)**
Voz	**= zone outdoor airflow**	**= Vbz / Ez**
Vdz	**= current discharge airflow**	**= (measured)**
Zd	**= discharge OA fraction**	**= Voz / Vdz**

- **Current system requirements**

Vou	**= uncorrected OA flow**	**= ΣVbz**
Xs	**= average OA fraction**	**= Vou / ΣVdz**
Evz	**= zone vent. efficiency**	**= 1 + Xs – Zd**
Ev	**= system vent. efficiency**	**= smallest (Evz)**
Vot	**= outdoor air intake flow**	**= Vou / Ev**

ventilation reset control

Single-Duct VAV System



								Vot req'd @ design	Vot w/vent reset
100% system load									
disc airflow	Vdz	4,960	5,400	4,000	4,000	500	1,300	**8, 810**	**8,810**
vent rate	Vbz	1,880	1,880	2,190	2,190	85	760		
vent fraction	Zdz	0.379	0.348	0.548	0.548	0.170	0.585		

Vou = D*ΣRp*Pz + ΣRa*Az = 0.65*7,125 + 1860 = 6,500
Xs = Vou/Vps = 6,500/20,160 = 0.322
Ev = 1 + 0.322 – 0.585 = 0.738
Vot = Vou/Ev = 6,500/0.738 = 8,808

w/o VRC ↓   w/ VRC ↓

								Vot req'd @ design	Vot w/vent reset
90% system load									
disc airflow	Vdz	4,000	4,100	4,200	4,300	300	1,300	**8,810**	**8,410**
vent rate	Vbz	1,880	1,880	2,190	2,190	85	760		
vent fraction	Zdz	0.470	0.459	0.521	0. 509	0.283	0.585		

Vou = 6,500
Xs = Vou/Vps = 6,500/18,200 = 0.357
Ev = 1 + 0.357 – 0.585 = 0.772
Vot = Vou/Ev = 6,500/0.772 = **8,410**

Ventilation Reset Control reduces Vot

dynamic reset

Operation As Conditions Vary

For this presentation,

- "Demand controlled ventilation" (DCV) resets zone outdoor airflow (Voz) as zone population or effective OA per person varies (zone-level control)
- "Ventilation reset control" (VRC) resets outdoor air intake flow (Vot) in multiple-zone systems as system ventilation efficiency (Ev) varies (system-level control)
- "Ventilation optimization" combines DCV and VRC for multiple-zone (VAV) systems

ventilation optimization

Combining DCV with VRC

part load

- **For design, no change in Vot calculations**
- **At part load:**
  - Find effective OA rate, Vbz' = Rp*Pz' + Ra*Az
    - For non-DCV zones, use Pz' = design population
    - For non-CO_2 DCV zones, use Pz' = estimated (for TOD, OCC zones) or actual (for COU zones) population
    - For CO_2 DCV zones, disregard population and use controller to find Vbz' based on sensed CO_2
  - For uncorrected OA flow, Vou'
    - For non-DCV zones, use D = design occupant diversity
    - For DCV zones, use D = 1

ventilation optimization (DCV with VRC)

Single-Duct VAV System

				CO_2			TOD	Vot w/vent reset	Vot w/vent & DCV
Design	Pz	**140**	**140**	**260**	**260**	**5**	**40**		
disc airflow	Vdz	5,000	5,[illegible]	[illegible]	[illegible]	5[illegible]	[illegible]	**[illegible]10**	**8,810**
vent rate	Vbz	1,880	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
vent fraction	Zdz	0.376	0.[illegible]	[illegible]	[illegible]	0.1[illegible]	[illegible]		

Vou = D*ΣRp*Pz + ΣRa*Az = [illegible]0 = [illegible]
Xs = Vou/Vps = 6,500/20,200 = [illegible]
Ev = 1 + 0.332 – 0.585 = 0.738
Vot = Vou/Ev = 6,500/0.738 = 8,810

90%	Pz'	**140**	**140**	**50**	**260**	**5**	**20**		
disc airflow	Vdz	4,000	4,100	4,200	4,300	300	1,300	**8,410**	**7,190**
vent rate	Vbz	1,880	1,880	**915**	2,190	85	**560**		
vent fraction	Zdz	0.470	0.459	**0.218**	0. 509	0.283	**0.431**		

Vou' = $D*\Sigma_{NON}Rp*Pz + \Sigma_{NON}Ra*Az+\Sigma_{co2}[Vbz'] + \Sigma_{NON-co2}(Rp*Pz'+Ra*Az)$
= 0.65*(4,780) + 1,260 + 915 + 560 = 5,840
Xs' = Vou/Vps = 5,840/18,200 = 0.321
Ev' = 1 + 0.321 – 0.509 = 0.812
Vot' = Vou'/Ev' = 5,840/0.812 = **7,190**

Sense CO_2, find new Vbz

TOD scheduled population

DCV & VRC

VRC w/zone-level DCV reduces Vot even more

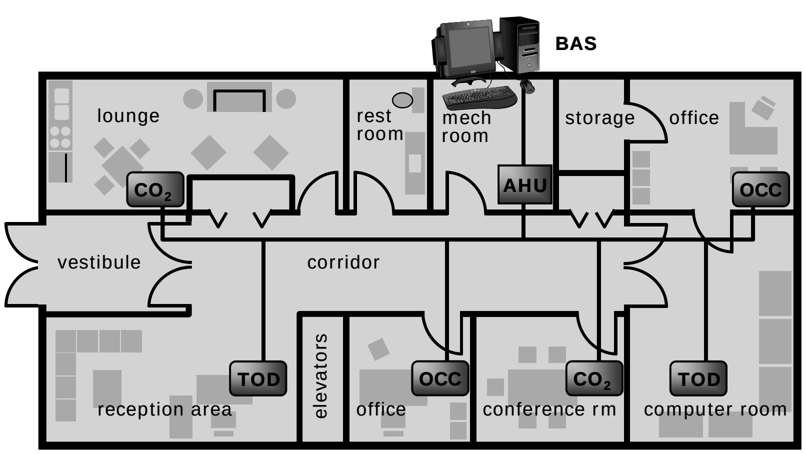
ASHRAE Standards 62.1 and 90.1 and VAV Systems

engineers newsletter LIVE

90.1 Requirements – Demand-Controlled ventilation

ventilation optimization

Zone Level: DCV



ASHRAE 90.1 and Demand-Controlled Ventilation

- **Section 6.4.3.9 Ventilation Controls for High-Occupancy Areas**

  "*Demand control ventilation (DCV) is required for spaces larger than 500 ft^2* ***and*** *with a design occupancy for ventilation of greater than 40 people per 1000 ft^2 of floor area* ***and*** *served by systems with one or more of the following:*

  a. ***An air-side economizer***

  b. ***Automatic modulating control of the outdoor air damper, or***

  c. ***A design outdoor airflow greater than 3000 cfm"***

Section 6.4.3.9 Exceptions

- **Systems with energy recovery complying with Section 6.5.6.1**
- **Multiple-zone systems without DDC of individual zones communicating with a central control panel**
- ***Systems with a design outdoor airflow less than 1200 cfm***

To What Types of Spaces Might 6.4.3.9 Apply?

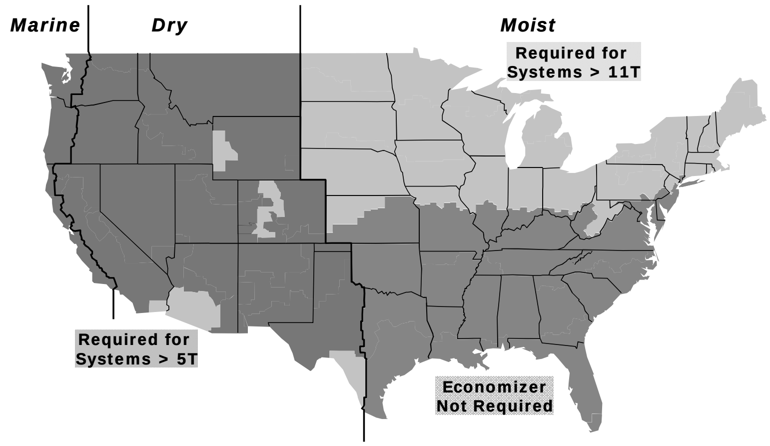
- **High Occupancy**
  - Lecture hall, assembly, cafeteria, lobbies
- **Most likely requirement to apply?**
  - >3,000 cfm of outdoor air or
  - outdoor air economizer
- **Most likely exception?**
  - < 1,200 cfm of system outdoor air

climate and system size determinants

Economizers

Climate zone	Cooling capacity for which an economizer is required
1a, 1b, 2a, 3a, 4a (Miami, St. Louis, Charlotte)	**Economizer unnecessary**
2b, 5a, 6a, 7, 8 (Yuma, Chicago, Edmonton)	**≥ 135,000 Btu/h**
3b, 3c, 4b, 4c, 5b, 5c, 6b (Denver, Lubbock, Vancouver)	**≥ 65,000 Btu/h**

Advanced Energy Design Guides
Climate Zone Map



Does 6.4.3.9 Apply to a Middle School Classroom?

- **62.1 defaults**
  - 35 people / 1000 ft^2
  - Combined outdoor air rate 13 cfm/person
- **Default is < 40 people/1000 ft^2**
- **Ventilation controls not required**

DCV – Conflicts between Standards 62.1 and 90.1?

- **There are no conflicts in theory**
  - 90.1 requires DCV for certain applications
  - 62.1 allows DCV for any application
- **But specifics are lacking in both standards so demonstrating compliance is difficult**

DCV Techniques Not Well Defined

- **Standard 90.1**
  - Demand control ventilation (DCV): a ventilation system capability that provides for the automatic reduction of outdoor air intake below design rates when the actual occupancy of spaces served by the system is less than design occupancy.

DCV Techniques Not Well Defined

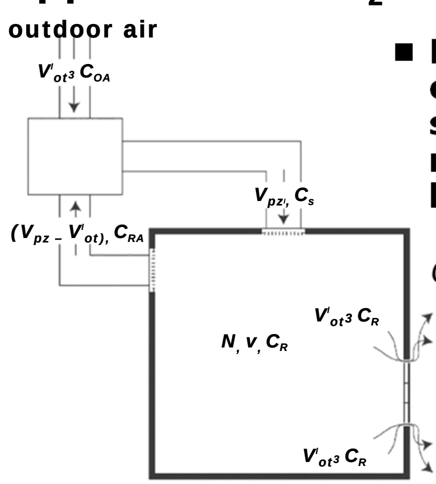
- **Standard 62.1**
  - ***6.2.7 Dynamic Reset:*** **the system may be designed to reset the design *outdoor air intake flow* (*Vot*) and/or space or zone airflow as operating conditions change.**

    These conditions include but are not limited to:

    1. Variations in occupancy or ventilation airflow in one or more individual zones for which ventilation airflow requirements will be reset.

    Note: **Examples of measures for estimating such variations include: occupancy scheduled by time-of-day, a direct count of occupants, or an estimate of occupancy or ventilation rate per person using occupancy sensors such as those based on indoor CO_2 concentrations.**

Standard 62.1 User's Manual Appendix A: CO_2-Based DCV



- **Equation to correlate CO_2 setpoints to OA rate derived from basic principals**

$$C_R - C_{OA} = \frac{8400 E_z m}{R_p + \frac{R_a A_z}{P_z}}$$

Standard 62.1 User's Manual Appendix A: CO_2-Based DCV

- **Key assumptions: CO_2 generation rate**
  - Is proportional to bioeffluent generation rate
  - Is proportional to activity level and activity level is predictable

CO_2 Concentration and Ventilation Rate

$$C_R - C_{OA} = \frac{8400 E_z m}{R_p + \frac{R_a A_z}{P_z}}$$

C_R = room CO_2 concentration
C_{OA} = outdoor air CO_2 concentration
E_z = zone ventilation effectiveness
R_p = people component
R_a = area or building component
A_z = zone floor area
P_z = design number of people
m = activity level (met)

Steady State CO_2 Concentration

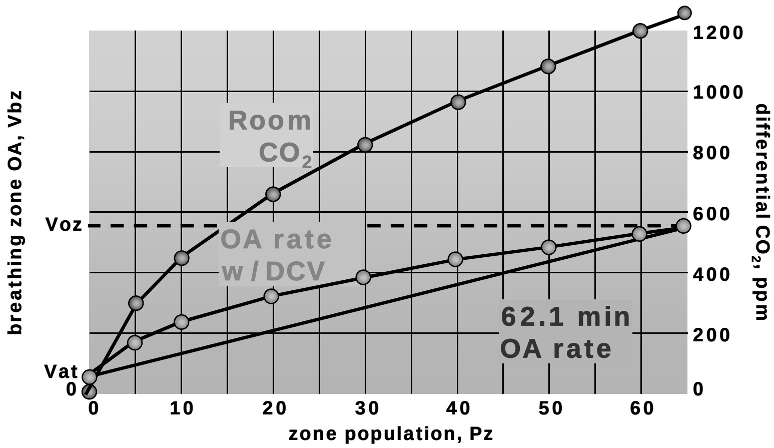
Occupancy Category	Activity Level	Steady State CO_2 Concentration
Classrooms (age 9 plus)	1.0 met	1025 ppm
Restaurant Dining Rooms	1.4 met	1570 ppm
Conference/Meeting	1.0 met	1755 ppm
Lobbies/Prefunction	1.5 met	1725 ppm
Office Space	1.2 met	990 ppm
Sales	1.5 met	1210 ppm

Based on 400 ppm CO_2
outdoor air concentration

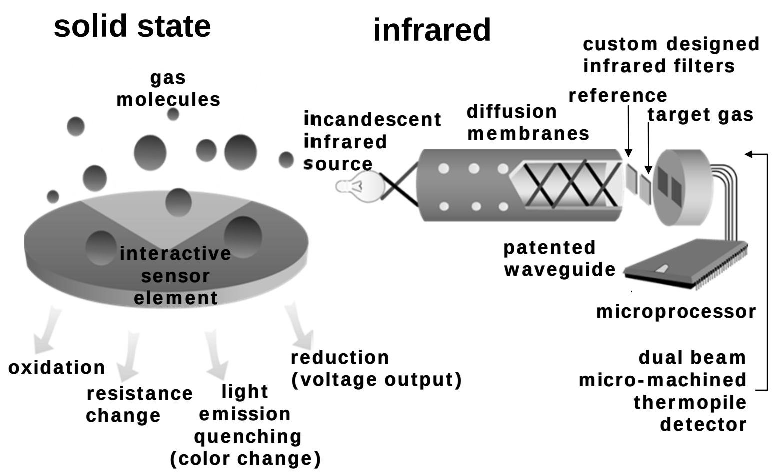
Constant Volume Single Zone CO_2 DCV Procedure

- **Calculate the *Vot* at design occupancy**
- **Using the same equations, calculate the outdoor air rate with no occupants (*Vat*)**
- **Determine the steady-state CO_2 concentration (CO_2max)**
- **Provide a CO_2 sensor / relay adjusted to send**
  - Maximum output signal when room CO_2 is at CO_2max
  - Minimum output signal when room CO_2 is ambient (400 ppm)
- **Adjust outdoor air damper actuator so that**
  - At maximum output signal, outdoor air rate = *Vot*
  - At minimum output signal, outdoor air rate = *Vat*

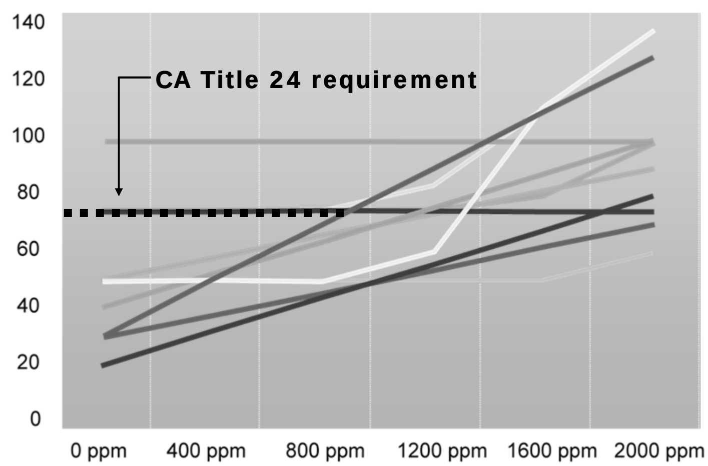
Constant Volume CO_2 DCV Performance



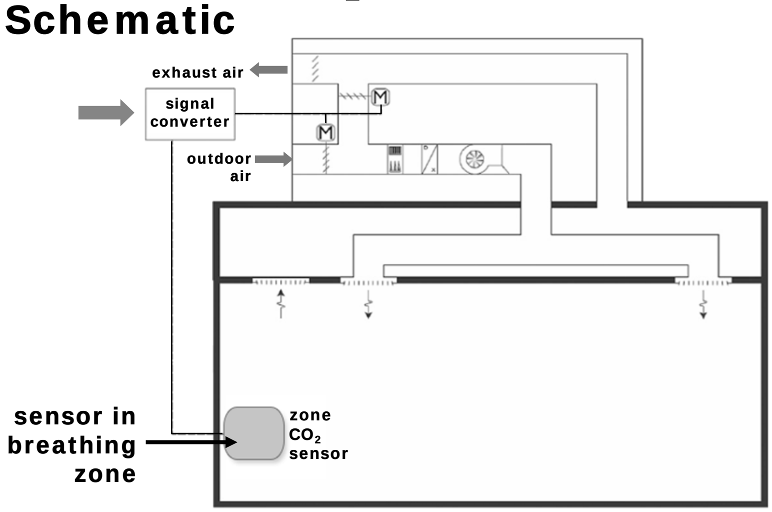
Types of CO_2 Sensors



CO_2 Sensor Accuracy NBCIP Product Test



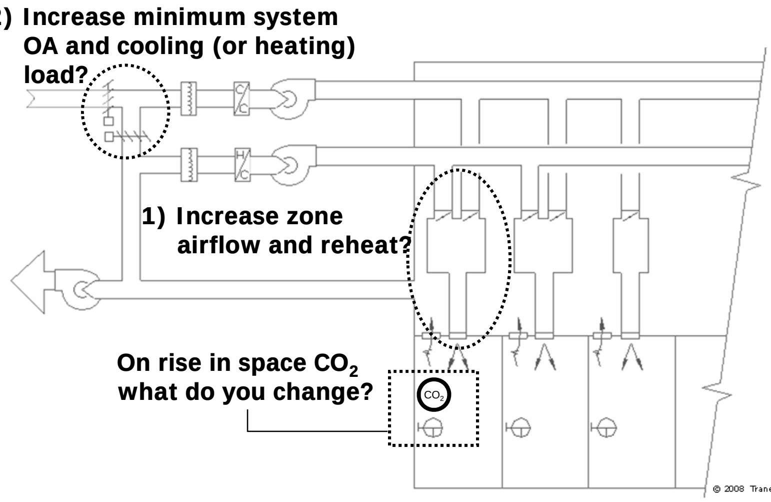
Single Zone CO_2 DCV Control Schematic



CO_2 DCV with Multiple Zone Systems

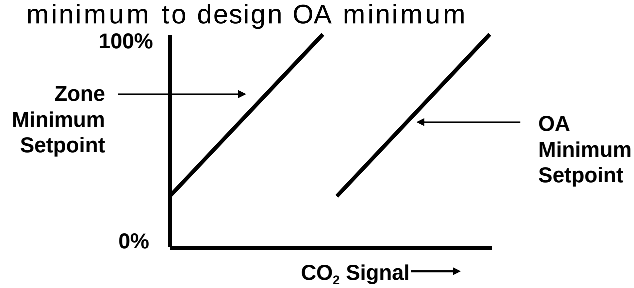
- Exact technique for optimum energy usage and to ensure 62.1 compliance has not yet been determined
- ASHRAE Research Project RP 1547 work statement being developed – results probably in late 2010

CO_2 DCV with Multiple Zone Systems



Multiple Zone System CO_2 DCV

- **One Approach (TBD by ASHRAE RP 1547)**
  - Increase the zone damper up to 100% of zone maximum
  - Then stage the OA damper open from unoccupied minimum to design OA minimum



ASHRAE Standards 62.1 and 90.1 and VAV Systems

Dehumidification

Std 62.1-2007 Requirements

- **Areas of potential conflict with Standard 90.1 requirements**
  - Ventilation control or dynamic reset options (DCV for zones, VRC for systems)
  - Dehumidification requirements (65% RH analytical limit)
  - Zone minimum airflow in VAV-reheat systems (intake airflow depends on zone airflow)

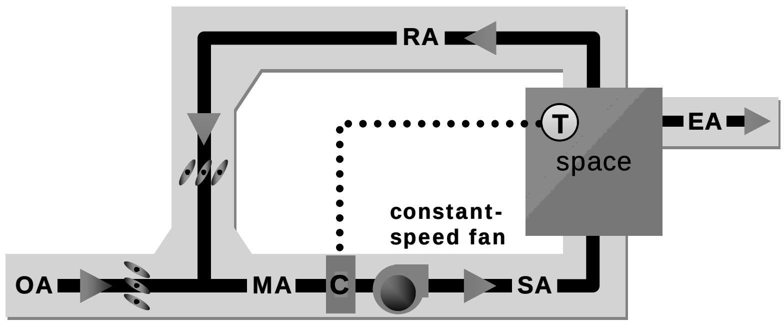
std 62.1-2007 section 5.10

Dehumidification

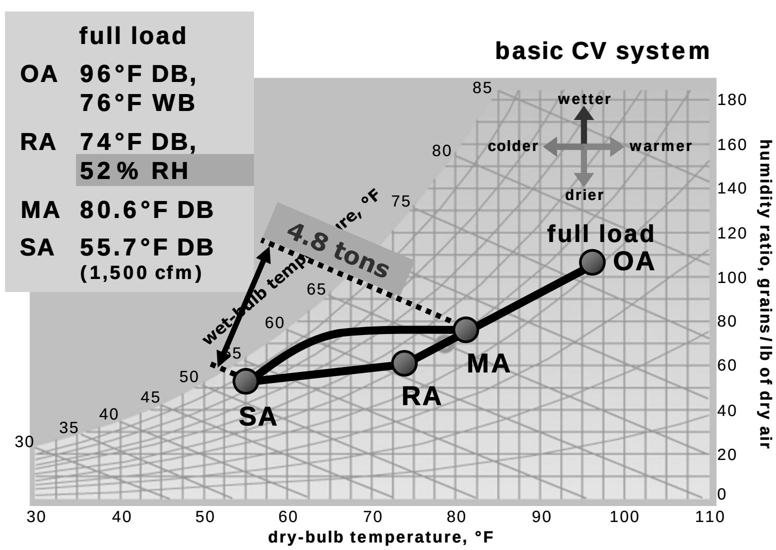
- **Std 62.1-2007 limits space relative humidity to 65% or less, analyzed at dew point design (design dew point, mean coincident dry bulb)**
- **System type, configuration and controls impact ability to meet the Std 62.1 limit**

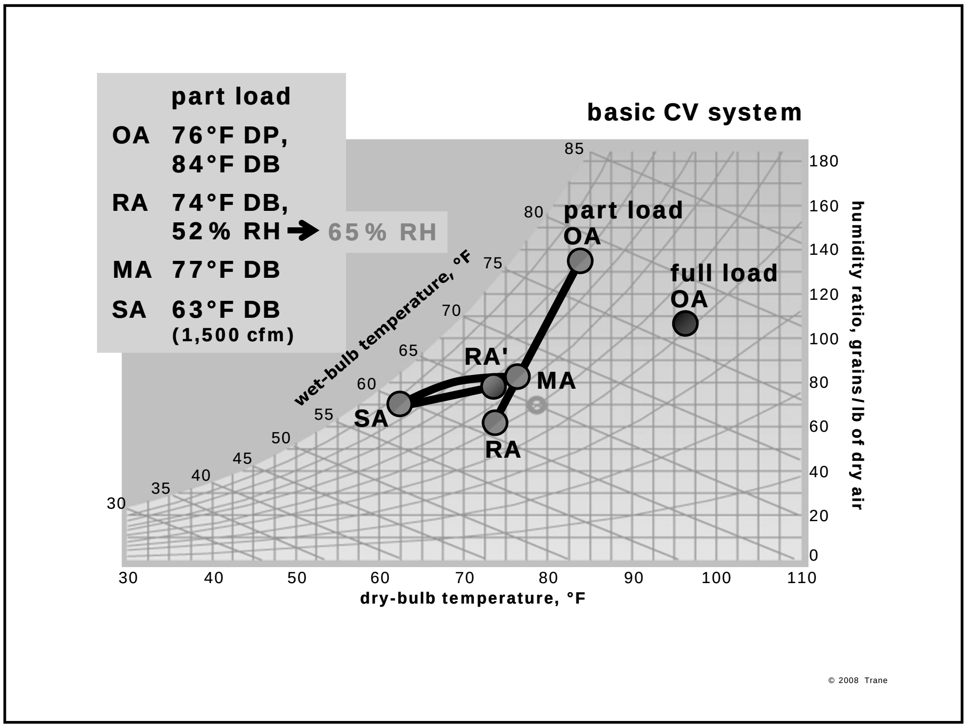
single-zone system

Basic Constant Volume



space temperature determines cooling capacity




basic CV system
part load
OA 76°F DP, 84°F DB
RA 74°F DB, 52% RH → 65% RH
MA 77°F DB
SA 63°F DB (1,500 cfm)
part load OA
full load OA
RA'
MA
SA
RA
wet-bulb temperature, °F
dry-bulb temperature, °F
humidity ratio, grains/lb of dry air
30
35
40
45
50
55
60
65
70
75
80
85
90
100
110
0
20
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60
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100
120
140
160
180
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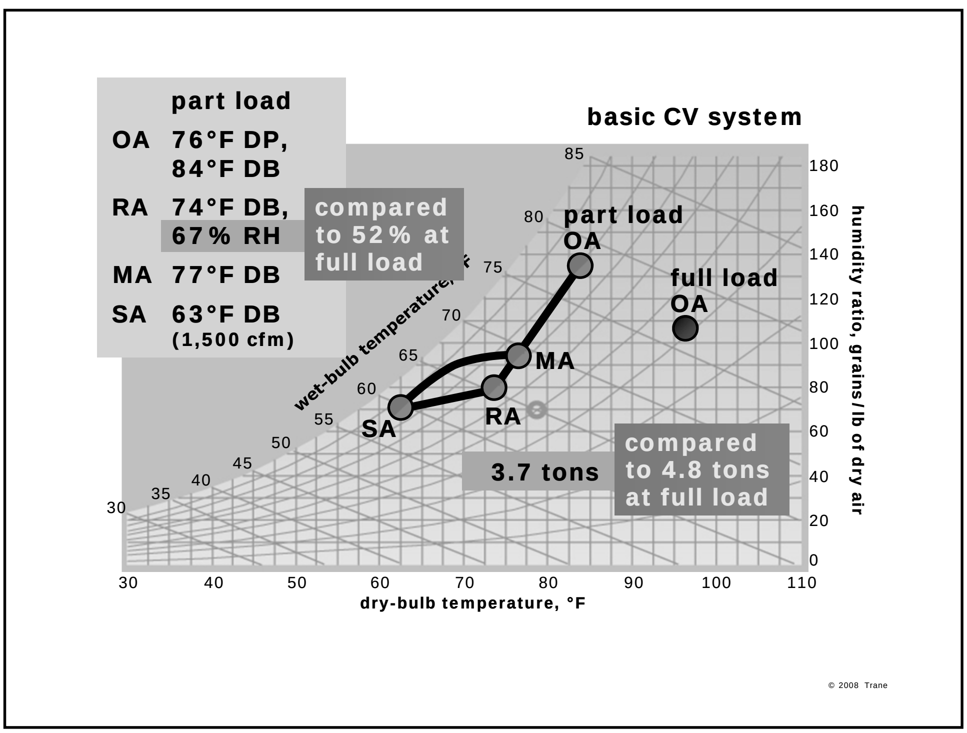
basic CV system
part load
OA 76°F DP, 84°F DB
RA 74°F DB, 67% RH
compared to 52% at full load
MA 77°F DB
SA 63°F DB (1,500 cfm)
part load OA
full load OA
MA
SA
RA
3.7 tons
compared to 4.8 tons at full load
wet-bulb temperature, °F
dry-bulb temperature, °F
humidity ratio, grains/lb of dry air
30
35
40
45
50
55
60
65
70
75
80
85
90
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160
180
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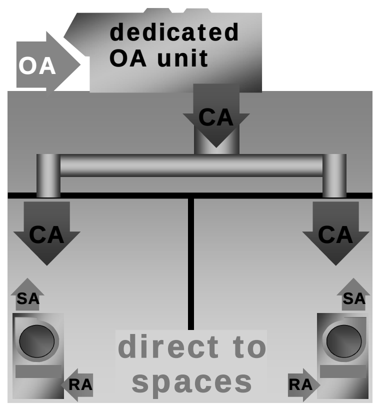
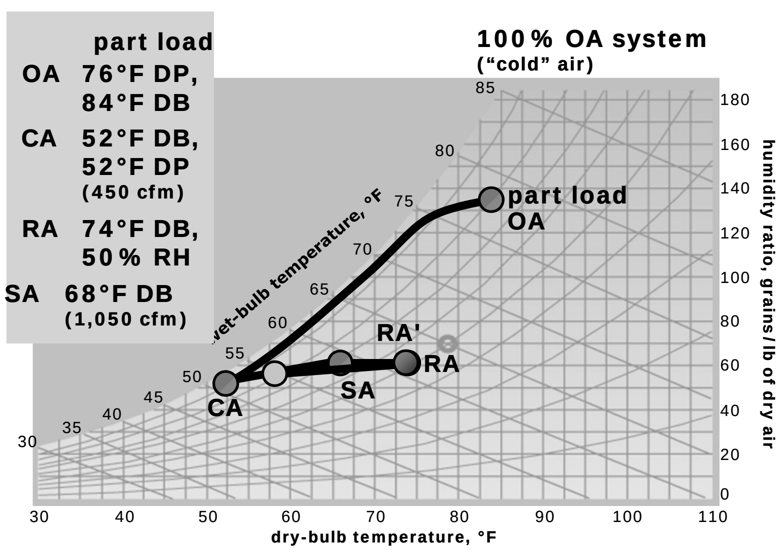
100% outdoor air system

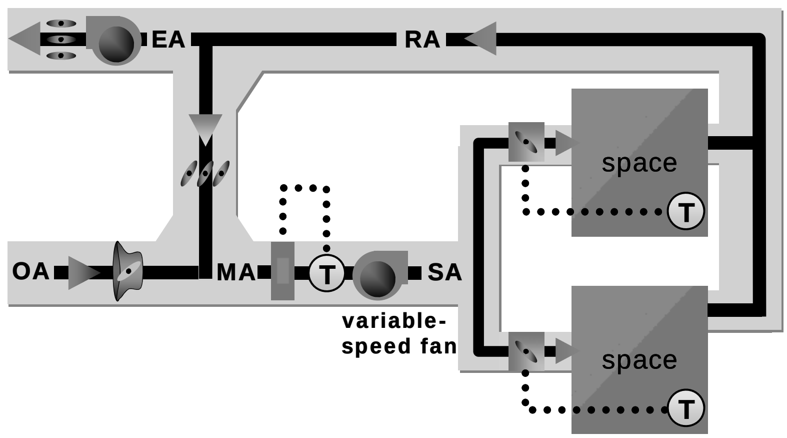
Dedicated Outdoor Air

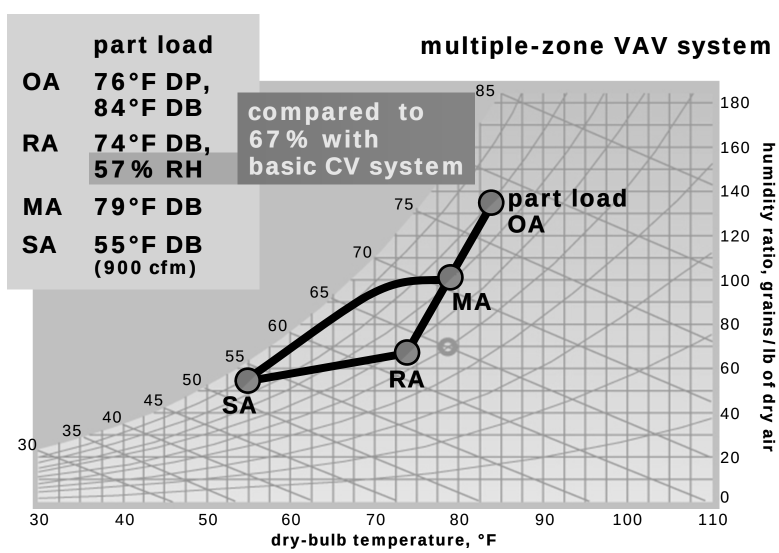




multiple-zone recirculating system

Single-Path VAV





comparison of dehumidification in humid climate

Classroom Relative Humidity

system type	peak DB	peak DP	mild,rainy	comment
basic CV system	52%	67%	73%	watch out
+ total-energy recovery	50%	65%	70%	not so good
+ mixed-air bypass	52%	65%	68%	not so good
+ 2-speed fan	52%	60%	68%	works OK
+ return-air bypass	52%	55%	60%	works well
+ reheat (direct)	52%	55%	55%	works well*
100% OA (DOAS, direct)	50%	53%	55%	works well*
VAV w/local reheat	52%	57%	60%	works well

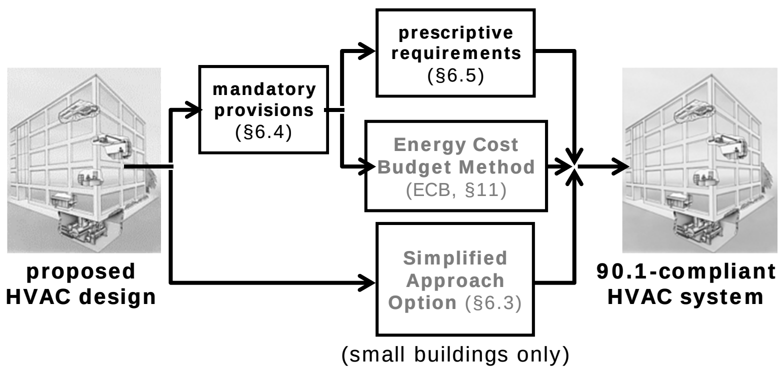
Std 62.1 requires 65% RH or less at peak DP

*Std 90.1 reheat rules apply

6.5.2 Simultaneous Heating and Cooling Limitation

- 6.2.5.1 Zone Controls
- 6.2.5.3 Dehumidification

section 6: HVAC
Mandatory Provisions



prescriptive HVAC requirements
90.1-2007 Section 6.5.2.3 Dehumidification

Dehumidification

Prevent:

- Reheating
- Mixing of hot and cold airstreams
- Heating and cooling the same airstream

simultaneous heating–cooling

Dehumidification Exceptions

a) Reducing supply airflow to 50%, or minimum ventilation rate specified by 62.1
b) Systems < 6.67 tons that can unload at least 50%
c) Systems smaller than 3.3 tons
d) Systems with specific humidity requirements for process needs (e.g. museums, surgical suites, supermarkets)
e) 75% of reheat/recool energy is site-recovered or site-solar
f) Desiccant systems where 75% of the heat added is removed by a heat exchanger using energy recovery

Most Likely Exceptions for Dehumidification Reheat

- **Reducing airflow to 50%**
- **Using recovered heat for 75% of reheat**

Dehumidification Conflicts between Standards 90.1 and 62.1?

- No conflicts – compliance with both is possible
- 90.1 simply limits how dehumidification can be done to limit energy waste from simultaneous heating and cooling

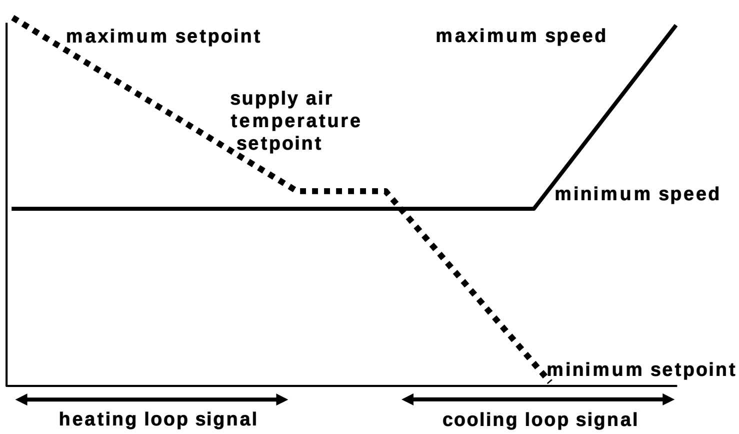
Compliance Techniques

- VAV Systems
  - Except in unusual applications with high space latent loads, humidity control is inherent
  - Limit supply air temperature reset upper limit
- Dedicated OA Systems (DOAS)
  - Any type of reheat is allowed by 90.1
  - Reheat using exhaust air sensible heat recovery or refrigerant hot gas

Compliance Techniques

- **Single zone systems**
  - Reheat allowed for small units
  - Use variable speed or two-speed motors
    - To be required for single zone systems ≥7.5 tons by Addendum 90.1n in 2012
    - Consider ECMs for small fan motors
  - Don't oversize constant volume systems!
    - Or: always use variable volume systems

Single Zone VAV



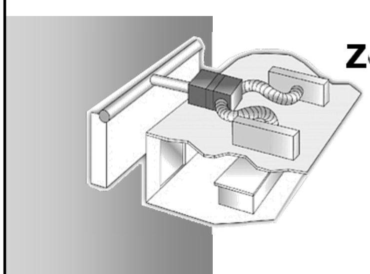
ASHRAE Standards 62.1 and 90.1 and VAV Systems

engineers newsletter LIVE

Simultaneous Heating and Cooling

prescriptive HVAC requirements

Section 6.2.5.1 Zone Controls



Zone controls

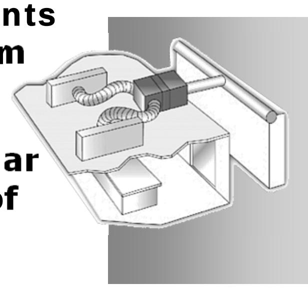
- No reheating
- No recooling
- No mixing or simultaneously supplying mechanically (or economizer) cooled and mechanically heated air

simultaneous heating–cooling
Zone-Control Exceptions

a) Reduce zone airflow to prescribed limit

b) Zones with special pressurization requirements or code-required minimum circulation rates

c) Site-recovered or site-solar energy provides ≥ 75% of reheat energy

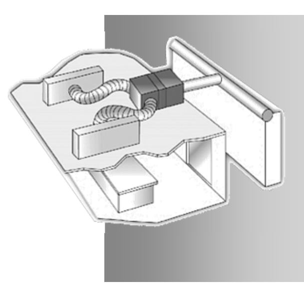


simultaneous heating–cooling
Zone-Control Exceptions

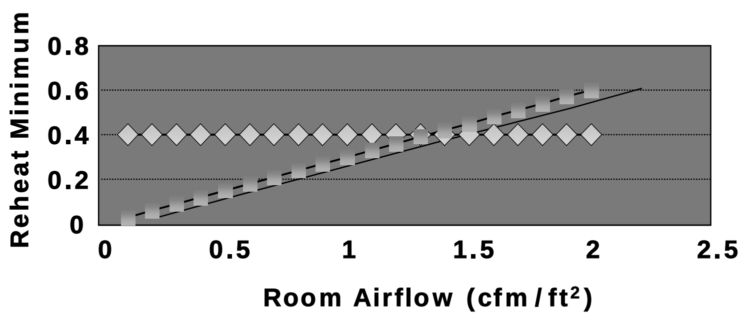
Zone airflow does not exceed whichever is largest:

a) ASHRAE Standard 62's zone requirements for outdoor air

b) 0.4 cfm/ft^2



Airflow at which Reheat is Allowed



simultaneous heating–cooling

Zone-Control Exceptions

Zone airflow does not exceed whichever is largest:

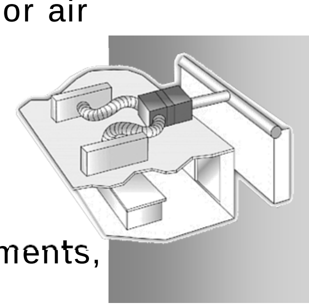
a) ASHRAE Standard 62's zone requirements for outdoor air

b) 0.4 cfm/ft²

c) 30% of supply air

d) 300 cfm

e) ASHRAE Standard 62's multiple-space requirements, if approved by AHJ

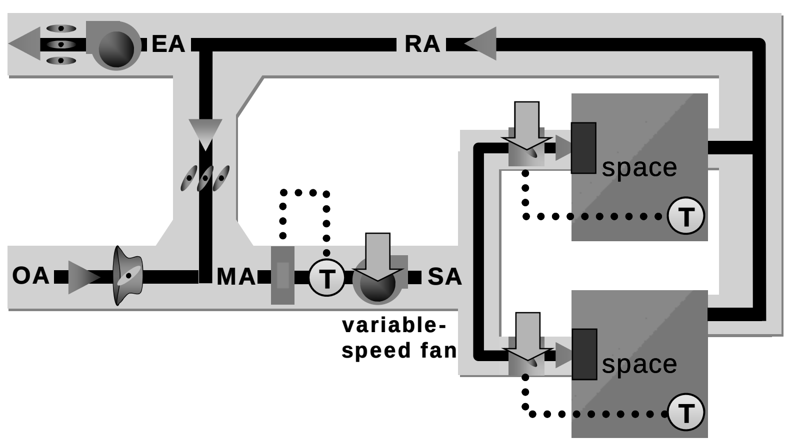


Std 62.1-2007 Requirements

- **Areas of potential conflict with Standard 90.1 requirements**
  - Ventilation control or dynamic reset options (DCV for zones, VRC for systems)
  - Dehumidification requirements (65% RH analytical limit)
  - Zone minimum airflow in VAV-reheat systems (intake airflow depends on zone airflow)

multiple-zone recirculating system

Single-Path VAV Reheat



std 62.1-2007 requirements

Ventilation Rate Procedure

- **5.4 Ventilation System Controls**
  - Provide at least minimum OA required by Section 6 at any load condition (all conditions)
- **6.2.2 Zone Calculations**
  - Prescribes minimum zone outdoor airflow rates for 63 “typical” occupancy categories
- **6.2.5 Multiple-Zone Recirculating Systems**
  - Prescribes procedures and equations to find minimum *outdoor air intake flow* for the system

std 62.1-2007 section 6.2.2

Zone Calculations

1. **Calculate *breathing-zone outdoor airflow*, using Table 6-1 rates (cfm / per, cfm / ft^2)**

   $Vbz = Rp \times Pz + Ra \times Az$ **(6-1)**

2. **Determine *zone air distribution effectiveness***

   Look up *Ez* (typically 1.0) **(Table 6-2)**

3. **Calculate *zone outdoor airflow***

   $Voz = Vbz / Ez$ **(6-2)**

std 62.1-2007 section 6.2.5

Multiple-Zone Systems

4. **Find *discharge outdoor air fraction* (each zone)**

   $Zd = Voz / Vdz$ **(6-5)**

   $Vdz = Vdz\text{-}exp$ **at condition analyzed**

5. **Find *uncorrected outdoor airflow***

   $Vou = D * \Sigma(Rp \times Pz) + \Sigma(Ra \times Az)$ **(6-6)**

   $D = Ps / \Sigma Pz$

6. **Find *system ventilation efficiency***

   $Xs = Vou / Vps$

   $Vps = Vps\text{-}exp$ **at condition analyzed**

   $Evz = 1 + Xs - Zd$ **(App A)**

   $Ev = lowest(Evz)$

7. **Find *outdoor air intake flow*:**

   $Vot = Vou / Ev$ **(6-8)**

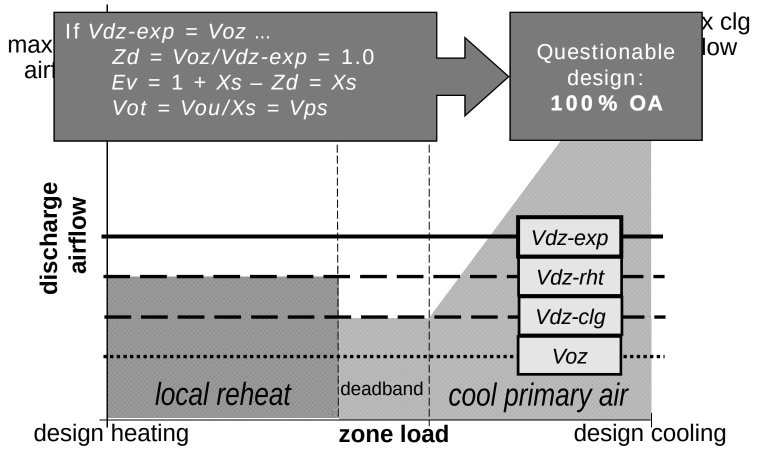
std 62.1-2007 section 6.2.5

Multiple-Zone Systems

- **Step 4 (find *Zd = Voz / Vdz*), use "minimum expected" value (*Vdz = Vdz-exp*)**
- **Potential conflict arises. Why?**
  - Designer must determine the minimum primary airflow expected at the condition being analyzed for design purposes
    - Is it the minimum *zone outdoor airflow* for ventilation (*Vdz-exp = Voz*) per Std 62.1?
    - Is it the "reheat-minimum" setting (*Vdz-exp = Vdz-rm*) per Std 90.1, Exception a?
    - Is it some other value (*Vdz-exp ≥ Vdz-rm ≥Voz*)?

typical “single-supply” VAV-reheat

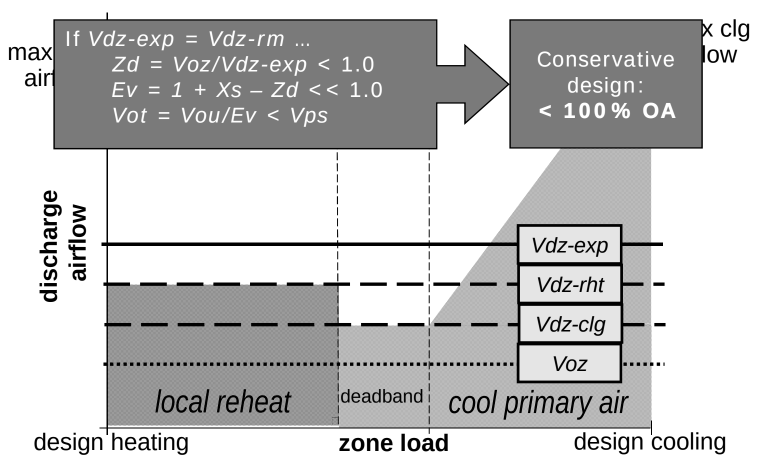
Primary* Airflow Minimums



* Vpz = Vdz for single-supply systems

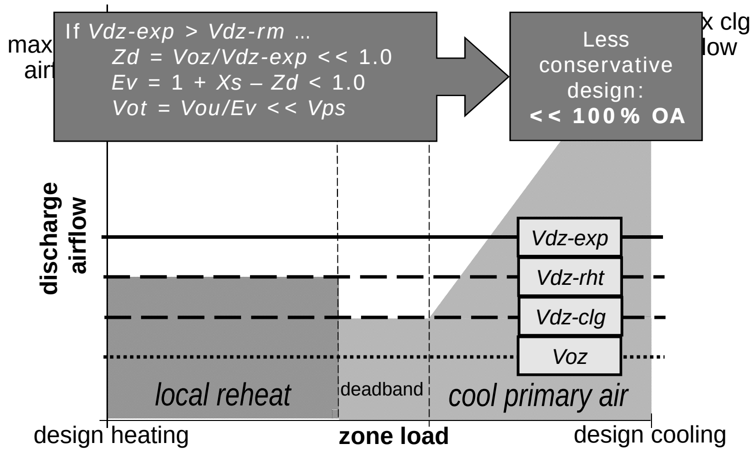
typical “single-supply” VAV-reheat

Primary* Airflow Minimums



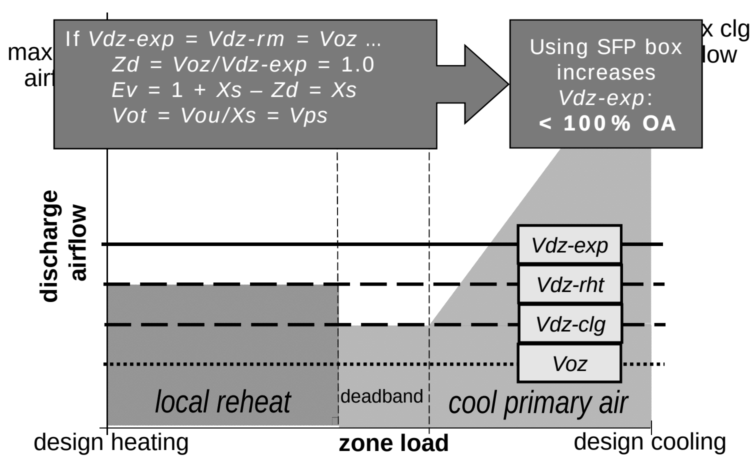
* Vpz = Vdz for single-supply systems

typical “single-supply” VAV-reheat
Primary* Airflow Minimums



* Vpz = Vdz for single-supply systems

typical “single-supply” VAV-reheat
Primary* Airflow Minimums



* Vpz = Vdz for single-supply systems

simultaneous heating and cooling

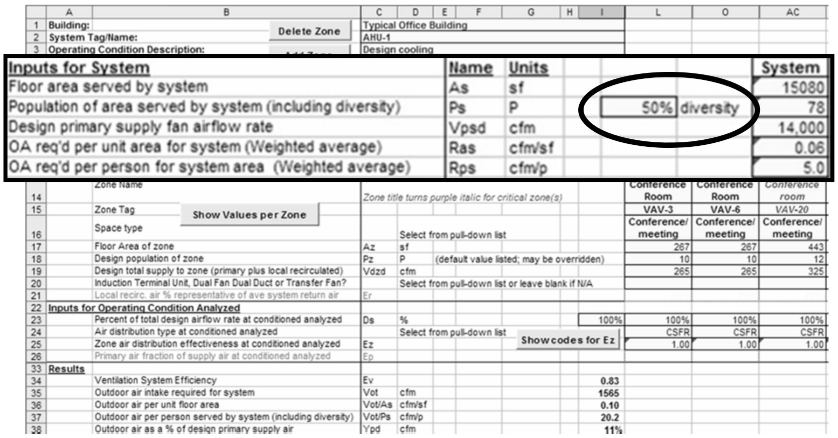
Conflicts between Standards 90.1 and 62.1?

- **No conflicts – compliance with both is possible**
- **But some common VAV system design and control options will not work well**
  - Traditional single-duct VAV reheat systems are limited
  - But VAV is still a viable option!
  - DOAS is not required and may not be the most efficient option!

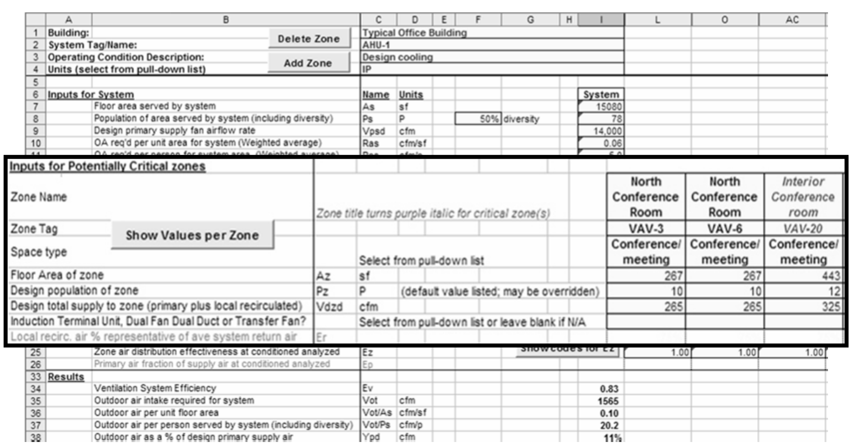
Compliance Techniques for VAV Systems

- **Use the Multiple Spaces Spreadsheet "62MZCalc"**
  - Model only realistic supply airflow scenarios
    - E.g. interior conference room will not be at minimum airflow if fully occupied
  - Include population diversity
    - This can completely offset system inefficiency compared to DOAS
  - Provide transfer air (e.g. fan-powered boxes, dual fan dual duct) to potentially critical zones
    - Low or even zero VAV minimums are possible

62MZCalc Spreadsheet



62MZCalc Spreadsheet



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62MZCalc Spreadsheet

	A / B	C	D	E–H	I	L	O	AC
1	Building:	Typical Office Building						
2	System Tag/Name:	AHU-1						
3	Operating Condition Description:	Design cooling						
4	Units (select from pull-down list)	IP						
5								
6	**Inputs for System**	**Name**	**Units**		**System**			
7	Floor area served by system	As	sf		15080			
8	Population of area served by system (including diversity)	Ps	P	50% diversity	78			
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000			
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06			
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0			
13	**Inputs for Potentially Critical zones**							
14	Zone Name	*Zone title turns purple italic for critical zone(s)*				North Conference Room	North Conference Room	*Interior Conference room*
15	Zone Tag					VAV-3	VAV-6	*VAV-20*
16	Space type		Select from pull-down list			Conference/ meeting	Conference/ meeting	Conference/ meeting
17	Floor Area of zone	Az	sf			267	267	443
18	Design population of zone	Pz	P	(default value listed; may be overridden)		10	10	12
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			265	265	325
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					
	Inputs for Operating Condition Analyzed							
	Percent of total design airflow rate at conditioned analyzed	Ds	%		100%	100%	100%	100%
	Air distribution type at conditioned analyzed		Select from pull-down list			CSFR	CSFR	CSFR
	Zone air distribution effectiveness at conditioned analyzed	Ez				1.00	1.00	1.00
	Primary air fraction of supply air at conditioned analyzed	Ep						
34	Ventilation System Efficiency	Ev			**0.83**			
35	Outdoor air intake required for system	Vot	cfm		**1565**			
36	Outdoor air per unit floor area	Vot/As	cfm/sf		**0.10**			
37	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		**20.2**			
38	Outdoor air as a % of design primary supply air	Ypd	cfm		**11%**			

Delete Zone | Add Zone | Show Values per Zone | Showcodes for Ez

62MZCalc Spreadsheet

	A / B	C	D	E–H	I	L	O	AC
1	Building:	Typical Office Building						
2	System Tag/Name:	AHU-1						
3	Operating Condition Description:	Design cooling						
4	Units (select from pull-down list)	IP						
5								
6	**Inputs for System**	**Name**	**Units**		**System**			
7	Floor area served by system	As	sf		15080			
8	Population of area served by system (including diversity)	Ps	P	50% diversity	78			
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000			
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06			
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0			
13	**Inputs for Potentially Critical zones**							
14	Zone Name	*Zone title turns purple italic for critical zone(s)*				North Conference Room	North Conference Room	*Interior Conference room*
15	Zone Tag					VAV-3	VAV-6	*VAV-20*
16	Space type		Select from pull-down list			Conference/ meeting	Conference/ meeting	Conference/ meeting
17	Floor Area of zone	Az	sf			267	267	443
18	Design population of zone	Pz	P	(default value listed; may be overridden)		10	10	12
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			265	265	325
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					
	Results							
	Ventilation System Efficiency	Ev			**0.83**			
	Outdoor air intake required for system	Vot	cfm		**1565**			
	Outdoor air per unit floor area	Vot/As	cfm/sf		**0.10**			
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		**20.2**			
	Outdoor air as a % of design primary supply air	Ypd	cfm		**11%**			

Delete Zone | Add Zone | Show Values per Zone

62MZCalc Spreadsheet

	A–B	C	D	E–H	I	L	O	AC
1	Building: (Delete Zone)	Typical Office Building						
2	System Tag/Name:	AHU-1						
3	Operating Condition Description: (Add Zone)	Design cooling						
4	Units (select from pull-down list)	IP						
5								
6	Inputs for System	Name	Units		System			
7	Floor area served by system	As	sf		15080			
8	Population of area served by system (including diversity)	Ps	P	50% diversity	78			
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000			
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06			
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0			
13	Inputs for Potentially Critical zones							
14	Zone Name	Zone title turns purple italic for critical zone(s)				North Conference Room	North Conference Room	*Interior Conference room*
15	Zone Tag (Show Values)					VAV-3	VAV-6	*VAV-20*
16	Space type		Select from pull-down list			meeting	meeting	meeting
17	Floor Area of zone	Az	sf			267	267	443
18	Design population of zone	Pz	P	(default value listed; may be overridden)		10	10	12
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			265	265	325
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					
21	Local recirc. air % representative of ave system return air	Er						
22	Inputs for Operating Condition Analyzed							
23	Percent of total design airflow rate at conditioned analyzed	Ds	%		100%	100%	100%	100%
24	Air distribution type at conditioned analyzed		Select from pull-down list	Show codes for Ez		CSFR	CSFR	CSFR
25	Zone air distribution effectiveness at conditioned analyzed	Ez				1.00	1.00	1.00
26	Primary air fraction of supply air at conditioned analyzed	Ep						
33	Results							
34	Ventilation System Efficiency	Ev			0.83			
35	Outdoor air intake required for system	Vot	cfm		1565			
36	Outdoor air per unit floor area	Vot/As	cfm/sf		0.10			
37	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		20.2			
38	Outdoor air as a % of design primary supply air	Ypd	cfm		11%			

VAV Reheat System – Heating Condition with 30% Minimums

	A–B	C	D	E–H	I	L	O
1	Building: (Delete Zone)	Typical Office Building					
2	System Tag/Name:	AHU-1					
3	Operating Condition Description: (Add Zone)	Design heating					
4	Units (select from pull-down list)	IP					
5							
6	Inputs for System	Name	Units		System		
7	Floor area served by system	As	sf		15080		
8	Population of area served by system (including diversity)	Ps	P	50% diversity	78		
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000		
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06		
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0		
13	Inputs for Potentially Critical zones						
14	Zone Name	Zone title turns purple italic for critical zone(s)				*North Conference Room*	*North Conference Room*
15	Zone Tag (Show Values per Zone)					*VAV-3*	*VAV-6*
16	Space type		Select from pull-down list			Conference/ meeting	Conference/ meeting
17	Floor Area of zone	Az	sf			267	267
18	Design population of zone	Pz	P	(default value listed; may be overridden)		10	10
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			265	265
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select fr				
21	Local recirc. air % representative of ave system return air	Er					
22	Inputs for Operating Condition Analyzed						
23	Percent of total design airflow rate at conditioned analyzed	Ds	%		46%	30%	30%
24	Air distribution type at conditioned analyzed		Select fr	es for Ez		CSCRH	CSCRH
25	Zone air distribution effectiveness at conditioned analyzed	Ez				0.80	0.80
26	Primary air fraction of supply air at conditioned analyzed	Ep					
33	Results						
34	Ventilation System Efficiency	Ev			#VALUE!		
35	Outdoor air intake required for system	Vot	cfm		#VALUE!		
36	Outdoor air per unit floor area	Vot/As	cfm/sf		#VALUE!		
37	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		#VALUE!		
38	Outdoor air as a % of design primary supply air	Ypd	cfm		#VALUE!		

VAV Reheat System – Heating Condition with 30% Minimums

	A / B	C	D	E–H	I	L	O
1	Building:	Typical Office Building					
2	System Tag/Name:	AHU-1					
3	Operating Condition Description:	Design heating					
4	Units (select from pull-down list)	IP					
5							
6	Inputs for System	Name	Units		System		
7	Floor area served by system	As	sf		15080		
8	Population of area served by system (including diversity)	Ps	P	50% diversity	78		
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000		
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06		
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0		
13	Inputs for Potentially Critical zones						
14	Zone Name	Zone title turns purple italic for critical zone(s)				*North Conference Room*	*North Conference Room*
15	Zone Tag					*VAV-3*	*VAV-6*
16	Space type		Select from pull-down list			Conference/ meeting	Conference/ meeting
17	Floor Area of zone	Az	sf			267	267
18	Design population of zone	Pz	P	(default value listed; may be overridden)		10	10
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			265	265
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A				
21	Local recirc. air % representative of ave system return air	Er					
22	Inputs for Operating Condition Analyzed						
23	Percent of total design airflow rate at conditioned analyzed	Ds	%			30%	30%
24	Air distribution type at conditioned analyzed		Select from pull-down list			CSCRH	CSCRH
25	Zone air distribution effectiveness at conditioned analyzed	Ez				0.80	0.80
26	Primary air fraction of supply air at conditioned analyzed	Ep					
33	Results						
34	Ventilation System Efficiency	Ev			#VALUE!		
35	Outdoor air intake required for system	Vot	cfm		#VALUE!		
36	Outdoor air per unit floor area	Vot/As	cfm/sf		#VALUE!		
37	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		#VALUE!		
38	Outdoor air as a % of design primary supply air	Ypd	cfm		#VALUE!		

Delete Zone
Add Zone
Show Values per Zone
Sh

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VAV Reheat System – Heating Condition with 30% / 0.4 cfm / ft^2 Minimums

	A / B	C	D	E–H	I	L	O	Q
1	Building:	Typical Office Building						
2	System Tag/Name:	AHU-1						
3	Operating Condition Description:	Design heating						
4	Units (select from pull-down list)	IP						
5								
6	Inputs for System	Name	Units		System			
7	Floor area served by system	As	sf		15080			
8	Population of area served by system (including diversity)	Ps	P	50% diversity	78			
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000			
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06			
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0			
13	Inputs for Potentially Critical zones							
14	Zone Name	Zone title turns purple italic for critical zone(s)				North Conference Room	North Conference Room	*Corner Conference Room*
15	Zone Tag					VAV-3	VAV-6	*VAV-8*
16	Space type		Select from pull-down list			Conference/ meeting	Conference/ meeting	Conference/ meeting
17	Floor Area of zone	Az	sf			267	267	290
18	Design population of zone	Pz	P	(default value listed; may be overridden)		10	10	12
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			265	265	390
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					
21	Local recirc. air % representative of ave system return air	Er						
22	Inputs for Operating Condition Analyzed							
23	Percent of total design airflow rate at conditioned analyzed	Ds	%					
24	Air distribution type at conditioned analyzed		Select					
25	Zone air distribution effectiveness at conditioned analyzed	Ez						
26	Primary air fraction of supply air at conditioned analyzed	Ep						
33	Results							
34	Ventilation System Efficiency	Ev			0.37			
35	Outdoor air intake required for system	Vot	cfm		3524			
36	Outdoor air per unit floor area	Vot/As	cfm/sf		0.23			
37	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		45.5			
38	Outdoor air as a % of design primary supply air	Ypd	cfm		25%			
39								

48%	40%	40%	30%
es for Ez	CSCRH	CSCRH	CSCRH
	0.80	0.80	0.80

Delete Zone
Add Zone
Show Values per Zone

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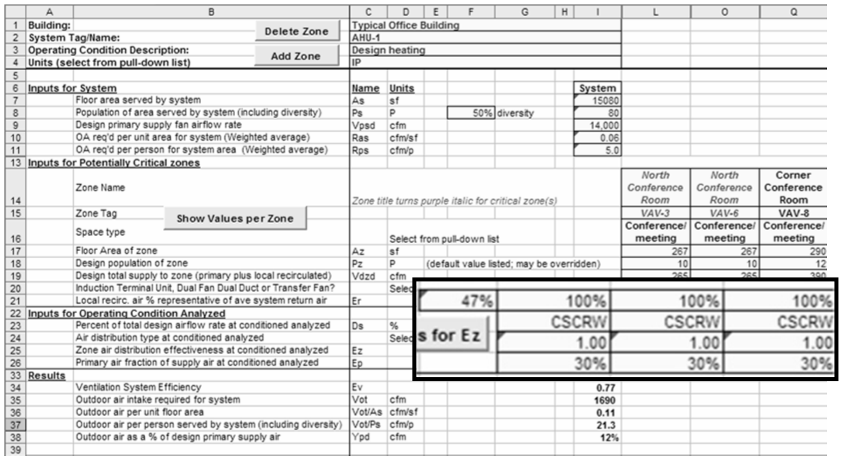
VAV Reheat System – Heating Condition with 30% / 0.4 cfm / ft² Minimums

Row	Item	Name	Units	Notes	System (I)	L	O	Q
1	Building: (Delete Zone)	Typical Office Building						
2	System Tag/Name:	AHU-1						
3	Operating Condition Description: (Add Zone)	Design heating						
4	Units (select from pull-down list)	IP						
5								
6	Inputs for System	Name	Units		System			
7	Floor area served by system	As	sf		15080			
8	Population of area served by system (including diversity)	Ps	P	50% diversity	78			
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000			
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06			
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0			
13	Inputs for Potentially Critical zones							
14	Zone Name			Zone title turns purple italic for critical zone(s)		North Conference Room	North Conference Room	*Corner Conference Room*
15	Zone Tag (Show Values per Zone)					VAV-3	VAV-6	*VAV-8*
16	Space type		Select from pull-down list			Conference/ meeting	Conference/ meeting	Conference/ meeting
17	Floor Area of zone	Az	sf			267	267	290
18	Design population of zone	Pz	P	(default value listed; may be overridden)		10	10	12
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm			265	265	390
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					
21	Local recirc. air % representative of ave system return air	Er						
22	Inputs for Operating Condition Analyzed							
23	Percent of total design airflow rate at conditioned analyzed	Ds	%		48%	40%	40%	30%
24	Air distribution type at conditioned analyzed		Select from pull-down list			CSCRH	CSCRH	CSCRH
25	Zone air distribution effectiveness at conditioned analyzed	Ez		Show cod…		0.80	0.80	0.80
26	Primary air fraction of supply air at conditioned analyzed	Ep						
33	Results							
34	Ventilation System Efficiency	Ev			0.37			
35	Outdoor air intake required for system	Vot	cfm		3524			
36	Outdoor air per unit floor area	Vot/As	cfm/sf		0.23			
37	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		45.5			
38	Outdoor air as a % of design primary supply air	Ypd	cfm		25%			
39								

Impact of Series Fan-Powered VAV Boxes

Row	Item	Name	Units	Notes	System (I)	L	O	Q
1	Building: (Delete Zone)	Typical Office Building						
2	System Tag/Name:	AHU-1						
3	Operating Condition Description: (Add Zone)	Design heating						
4	Units (select from pull-down list)	IP						
5								
6	Inputs for System	Name	Units		System			
7	Floor area served by system	As	sf		15080			
8	Population of area served by system (including diversity)	Ps	P	50% diversity	80			
9	Design primary supply fan airflow rate	Vpsd	cfm		14,000			
10	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf		0.06			
11	OA req'd per person for system area (Weighted average)	Rps	cfm/p		5.0			
13	Inputs for Potentially Critical zones							
14	Zone Name			Zone title turns purple italic for critical zone(s)		*North Conference Room*	*North Conference Room*	Corner Conference Room
15	Zone Tag (Show Values per Zone)					*VAV-3*	*VAV-6*	VAV-8
16	Space type		Select from pull-down list			Conference/ meeting	Conference/ meeting	Conference/ meeting
17	Floor Area of zone	Az	sf			267	267	290
18	Design population of zone	Pz	P	(default va…		[illegible]	[illegible]	[illegible]
19	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm					
20	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-dow…			ITU	ITU	ITU
21	Local recirc. air % representative of ave system return air	Er				75%	75%	75%
22	Inputs for Operating Condition Analyzed							
23	Percent of total design airflow rate at conditioned analyzed	Ds	%		47%	100%	100%	100%
24	Air distribution type at conditioned analyzed		Select from pull-down list			CSCRW	CSCRW	CSCRW
25	Zone air distribution effectiveness at conditioned analyzed	Ez		Show codes for Ez		1.00	1.00	1.00
26	Primary air fraction of supply air at conditioned analyzed	Ep				30%	30%	30%
33	Results							
34	Ventilation System Efficiency	Ev			0.77			
35	Outdoor air intake required for system	Vot	cfm		1690			
36	Outdoor air per unit floor area	Vot/As	cfm/sf		0.11			
37	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p		21.3			
38	Outdoor air as a % of design primary supply air	Ypd	cfm		12%			
39								

Impact of Series Fan-Powered VAV Boxes



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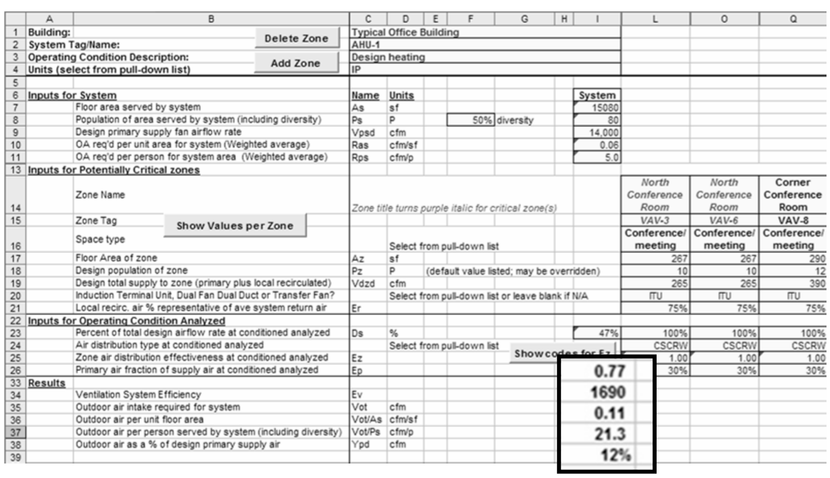
Impact of Series Fan-Powered VAV Boxes



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Low Minimums Possible with Fan-Powered Boxes

	A	B	C	D	E	F	G	H	I	L	R	S	T	U	V
1	**Building:**	Delete Zone	Typical Office Building												
2	**System Tag/Name:**		AHU-1												
3	**Operating Condition Description:**	Add Zone	Design heating												
4	**Units (select from pull-down list)**		IP												
5															
6	**Inputs for System**		**Name**	**Units**					**System**						
7		Floor area served by system	As	sf					15080						
8		Population of area served by system (including diversity)	Ps	P		50%	diversity		80						
9		Design primary supply fan airflow rate	Vpsd	cfm					14,000						
10		OA req'd per unit area for system (Weighted average)	Ras	cfm/sf					0.06						
11		OA req'd per person for system area (Weighted average)	Rps	cfm/p					5.0						
13	**Inputs for Potentially Critical zones**														
14		Zone Name	*Zone title turns purple italic for critical zone(s)*							*North Conference Room*	East Open Office	East Open Office	Corner Open Office	South Open Office	South Open Office
15		Zone Tag	Show Values per Zone							*VAV-3*	VAV-9	VAV-10	VAV-11	VAV-12	VAV-13
16		Space type		Select from pull-down list						Conference/ meeting	Office space	Office space	Office space	Office space	Office space
17		Floor Area of zone	Az	sf						267	873	615	484	1435	1435
18		Design population of zone	Pz	P	(default value listed; may be overridden)					10	6	4	8	10	8
19		Design total supply to zone (primary plus local recirculated)	Vdzd	cfm						265	990	700	710	1900	1835
20		Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A						ITU	ITU	ITU	ITU	ITU	ITU
21		Local recirc. air % representative of ave system return air	Er							75%	75%	75%	75%	75%	75%
22	**Inputs for Operating Condition Analyzed**														
23		Percent of total design airflow rate at c													
24		Air distribution type at conditioned analy													
25		Zone air distribution effectiveness at c													
26		Primary air fraction of supply air at cond													
33	**Results**														
34		Ventilation System Efficiency													
35		Outdoor air intake required for system	Vot	cfm					**1691**						
36		Outdoor air per unit floor area	Vot/As	cfm/sf					**0.11**						
37		Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p					**21.3**						
38		Outdoor air as a % of design primary supply air	Ypd	cfm					**12%**						
39															

CSCRW	CSCRH	CSCRH	CSCRH	CSCRH	CSCRH
1.00	0.80	0.80	0.80	0.80	0.80
15%	0%	0%	0%	0%	0%

Answers to Your Questions

engineers newsletter LIVE

ASHRAE Standards 62.1 and 90.1 and VAV Systems

This concludes the American Institute of Architects Continuing Education System Program

Do ASHRAE Standards 62.1 and 90.1 Conflict?

- **Demand Controlled Ventilation**
  - 62.1 allows
  - 90.1 requires in some cases
  - No conflict
    - CO_2 sensing is often used
    - System controls are important

Do ASHRAE Standards 62.1 and 90.1 Conflict?

- **Dehumidification**
  - 62.1 requires specific humidity levels
    - VAV systems inherently control humidity
  - 90.1 allows reheat via exceptions
  - No conflict
    - Use VAV or two-speed fans
    - Consider recovering energy, even if not required

Do ASHRAE Standards 62.1 and 90.1 Conflict?

- **Zone controls and reheat**
  - 90.1 requires reduction of zone airflows prior to using new energy for reheat
  - 62.1 requires specific ventilation airflows
  - No conflict, but…
    - Challenges must be met through proper system selection, design and operation

references for this broadcast

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- Control strategies
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- Energy and the environment
- Acoustics
- Ventilation
- Dehumidification

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- May 13
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- November 4
  Air-Handling Systems, Energy, and IAQ

ASHRAE Standards 62.1 and 90.1 and VAV Systems

an
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