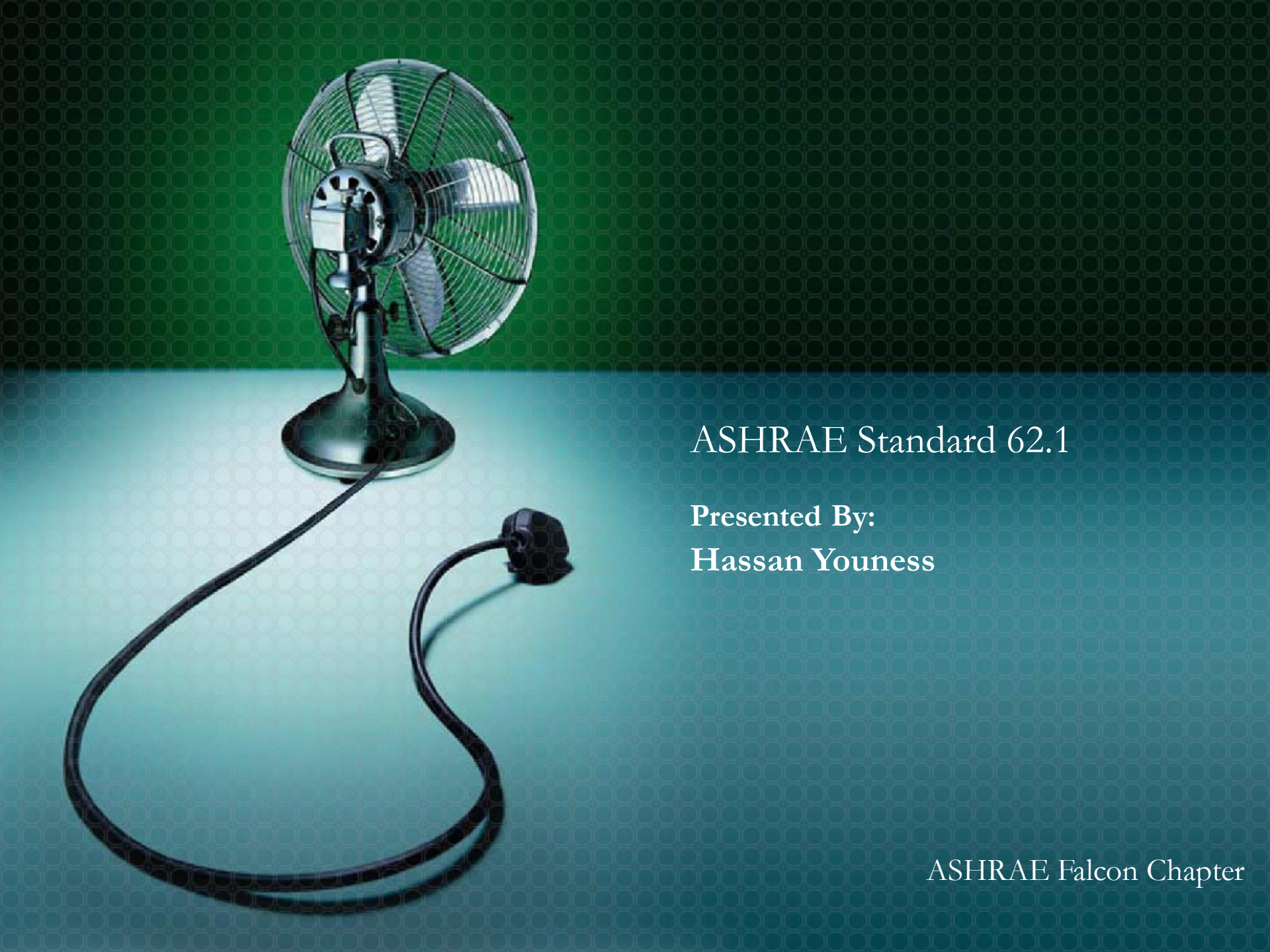

ASHRAE Standard 62.1

Presented By:
Hassan Youness

ASHRAE Falcon Chapter

ASHRAE Standard 62.1

❖ ASHRAE Standard 62.1 Overview :

- "The purpose of this standard is to specify minimum ventilation rates and other measures intended to provide indoor air quality that is acceptable to human occupants and that minimizes adverse health effects"
- It is used and/or is a requirement of:

NFPA 5000 **(Building Construction and Safety Code)**	Sections 15.5.6.2 and 49.2.2.1 (ventilation rates)
LEED **(Leadership in Energy & Environmental Design)**	IEQ Prereq.1 (4 to 7) , Credits 1(appendix c) & 2
ESTIDAMA	LB r6 (5.1), LB 12 (6.2), LB 15 (t 6.4) , LB 23 (7)
IMC 2009 **(International Mechanical Code)**	Section 403.3.2.3.2 (System ventilation effectiveness)
Dubai Green Building Regulations	

ASHRAE Standard 62.1

❖ History of the standard :

• **1973** First Issued,	office 15 cfm/person
• **1981** Lower Rates,	office 5 cfm/person
• **1989** Higher Rates,	office 20 cfm/person
• **1999** Little Change,	office 20 cfm/person
• **2001** More Mandatory Language,	office 20 cfm/person
• **2004** Key Changes new formula	office~17 cfm/ person
• **2007** Many Addenda added	office~17 cfm/ person

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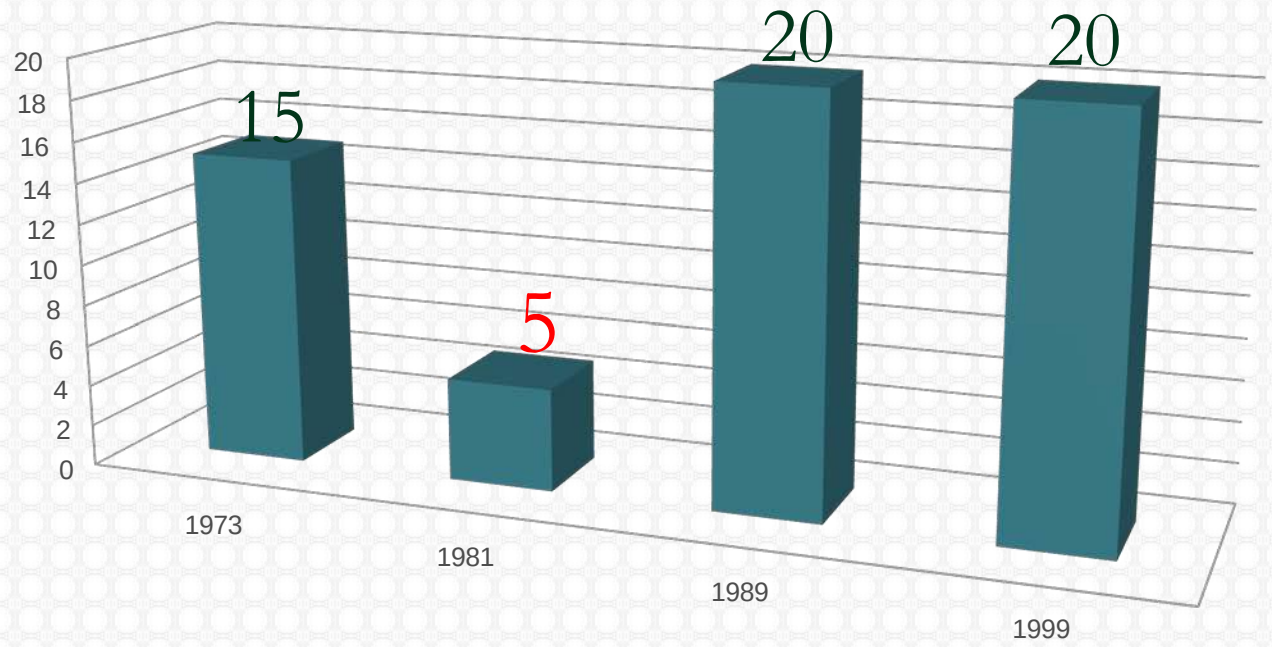
Office Minimum Fresh Air Requirement in CFM



ASHRAE Standard 62.1

❖ New in 2004 and 2007 :

- No thermal comfort requirements (Refer to **ASHRAE 55**)
- Minimum Ventilation Rate Table revised (applies only to non smoking spaces)
- New calculation procedure
- Upper Relative humidity

ASHRAE Standard 62.1

❖ Sections :

1. **Purpose :**
   States the purpose of the standard
2. **Scope:**
   States where 62.1 can or cannot be applied
3. **Definitions:**
   Provides definitions of terms
4. **Outdoor Air Quality :**
   Requires that the site and the quality of outdoor air be evaluated in order to decide if air cleaning is required
5. **Systems and Equipment :**
   Specific requirements for the design of ventilation systems in buildings, as well as the building envelope.

■

ASHRAE Standard 62.1

❖ Sections (Cont.) :

6. **Procedures :**
   The most referred to part of the standard, presents two procedures to determine the required fresh air, as well as requirements for filtration and cleaning of this fresh air
7. **Construction and System Start-up:**
   Contains requirements that apply during the construction and startup phase of new construction projects
8. **Operation and Maintenance :**
   Contains requirements for the operation and maintenance of building ventilation systems after they are commissioned.
9. **References**

ASHRAE Standard 62.1

- **Section 5 Systems and Equipment – Highlights:**

(1) Mechanical Ventilation System Controls

(2) Outdoor Air Intakes

(3) Particulate Matter Removal

(4) Relative Humidity & Exfiltration

(5) Energy Recovery

ASHRAE Standard 62.1

(1) Mechanical Ventilation System Controls:

Systems shall include controls **manual or automatic** that enable the fresh air fan system to operate whenever the space is **occupied** and to maintain the **minimum flow required by section 6** (ASHRAE recommends the use of dedicated fresh air handling unit to comply with this point)

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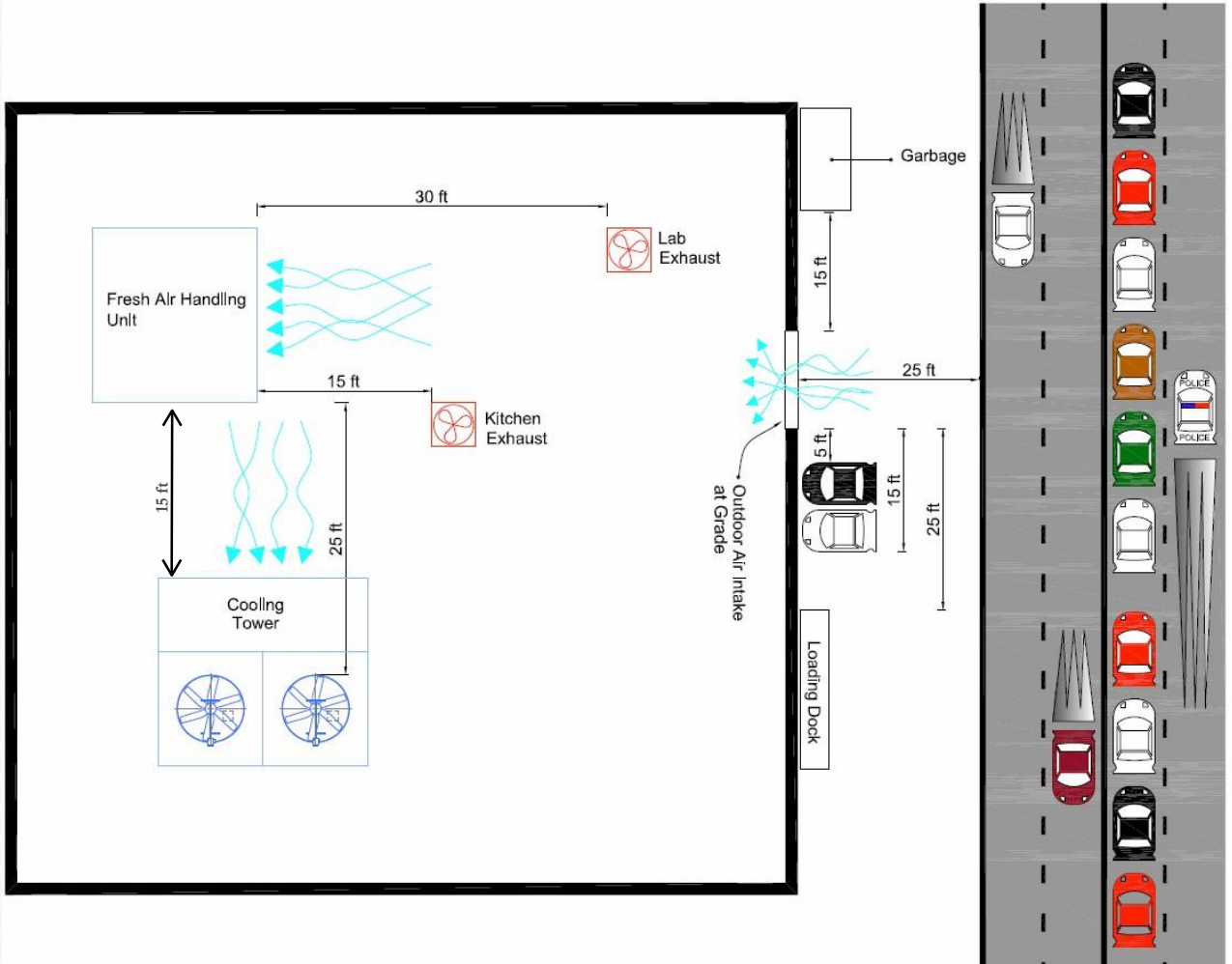
(2) Outdoor Air Intakes:



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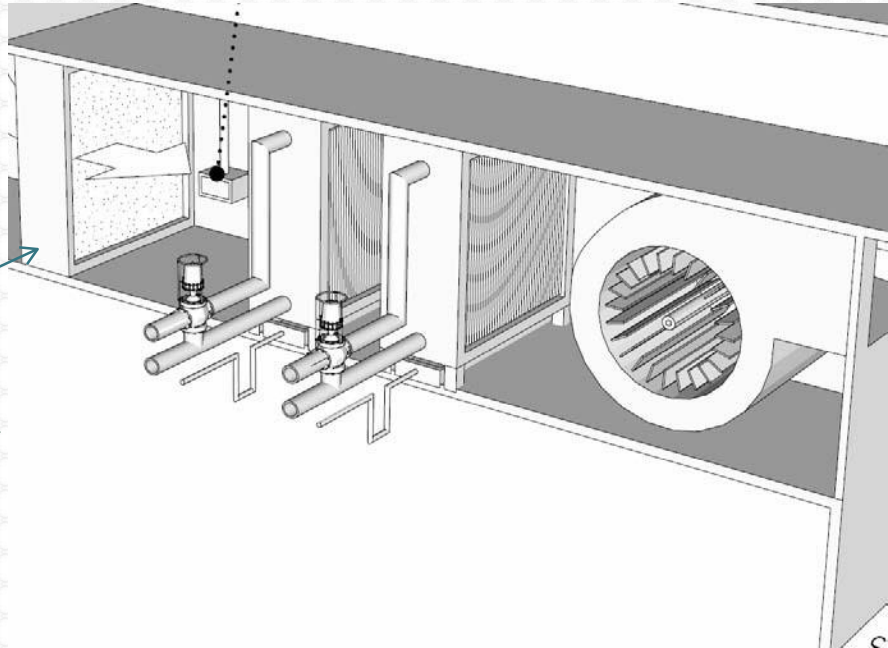
(3) Particulate Matter Removal

The Standard requires that particulate filters or air cleaners with a minimum efficiency reporting value (MERV) of not less than **6** when tested in accordance with **ASHRAE Standard 52.2**, be provided upstream of all **cooling coils** or other devices with wetted surfaces through which air is supplied to an occupied space

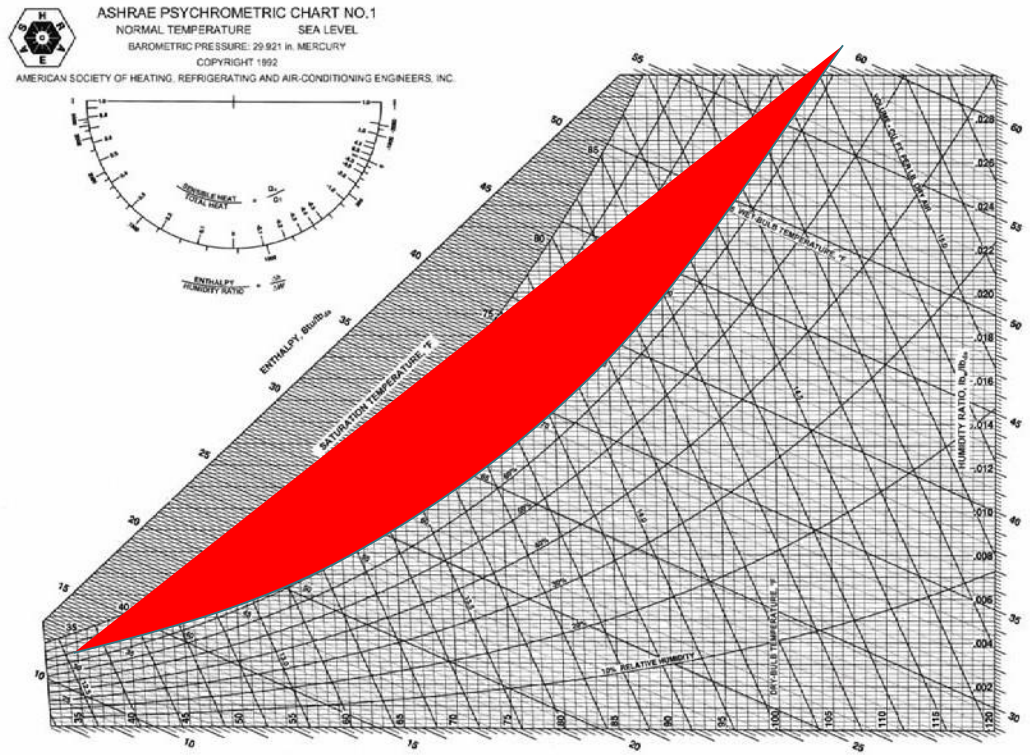


Filter Minimum Efficiency Reporting Value = 6

ASHRAE Standard 62.1

(4) Relative Humidity & Exfiltration

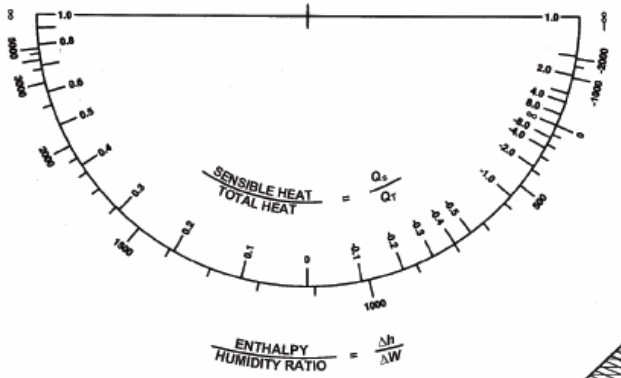
The standard specifies a **65%** upper design limit on relative humidity for mechanical systems with dehumidifying capability and their served buildings shall have a positive pressure



ASHRAE PSYCHROMETRIC CHART NO.1

NORMAL TEMPERATURE SEA LEVEL

BAROMETRIC PRESSURE: 29.921 in. MERCURY



ENTHALPY, Btu/lb$_{da}$

SATURATION TEMPERATURE, °F

VOLUME - CU FT PER LB DRY AIR

WET-BULB TEMPERATURE, °F

HUMIDITY RATIO, lb$_w$/lb$_{da}$

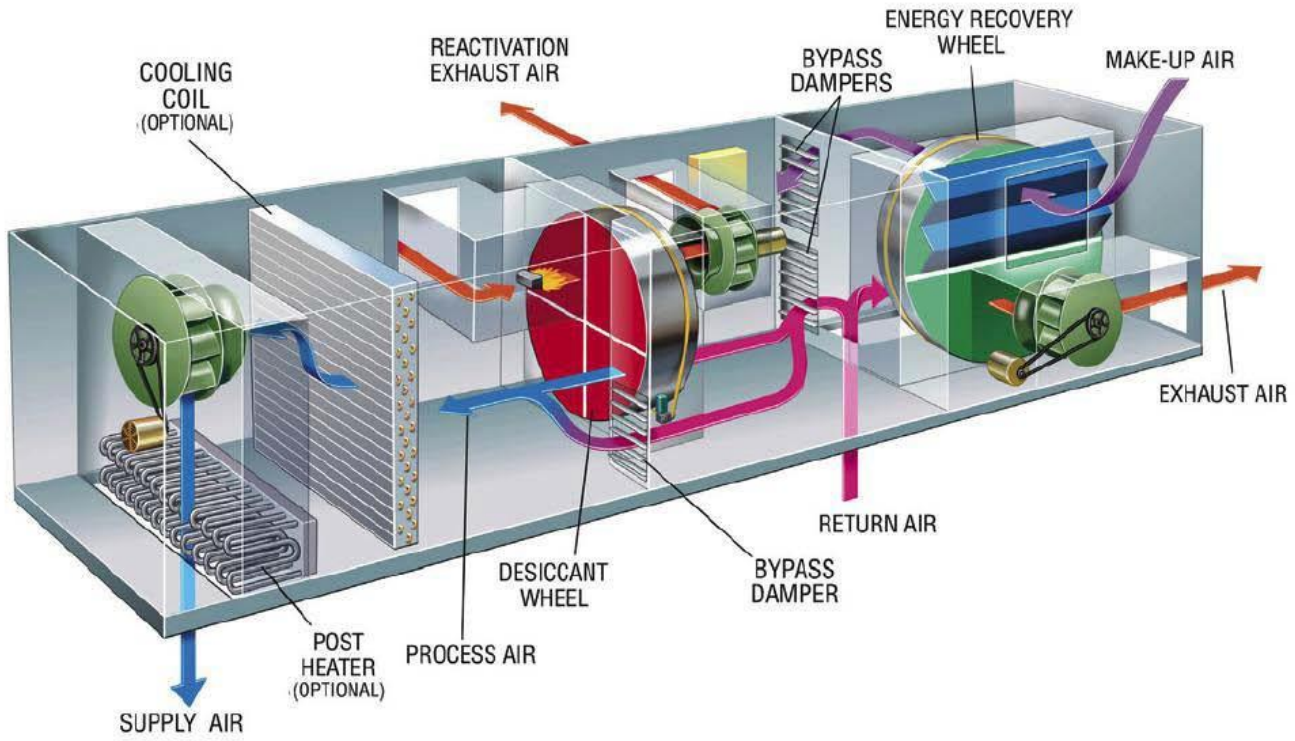
DRY-BULB TEMPERATURE, °F

10% RELATIVE HUMIDITY

ASHRAE Standard 62.1

(5) Energy Recovery :

Energy recovery resulting in **10%** or less cross-contamination from Class 2 air (kitchens, toilets …) or **5%** or less from Class 3 air (Trash room …) does not affect the classification of Class



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- **Section 6 Procedures :**

(1) The Ventilation Rate Procedure (VRP)

(2) The Indoor Air Quality Procedure (IAQ)

ASHRAE Standard 62.1

(1) The ventilation rate procedure(VRP):

- Is the most widely used procedure
- It is a prescriptive procedure where outdoor air intake rates are determined according to the space type, its area and its population. This method is required by LEED and ESTIDAMA and DM.

ASHRAE Standard 62.1

(2) The indoor air quality procedure

- Intention is to maintain concentrations of specific contaminants below target concentration limits through source control, air cleaning ...

- This procedure often leads to a reduction in fresh air intake than the ventilation rate procedure resulting in a more efficient system but is more complex and not guaranteed. Validation is by **design approach justification** Or **Validation by contaminant monitoring**

ASHRAE Standard 62.1

❖VRP

- The ventilation rate procedure :
- **$V_{bz} = R_p * P_z + R_a * A_z$** (Breathing Zone Fresh Air)

  Where :

  A_z = zone floor area

  P_z = zone population (if unknown estimated from table 6-1) R_p = outdoor airflow rate required per person as determined from Table 6-1 (to dilute human bio-effluents and their activities like printing)

  R_a = outdoor airflow rate required per unit area as determined from Table 6-1 (to dilute Off-gassing from building materials and furnishings)

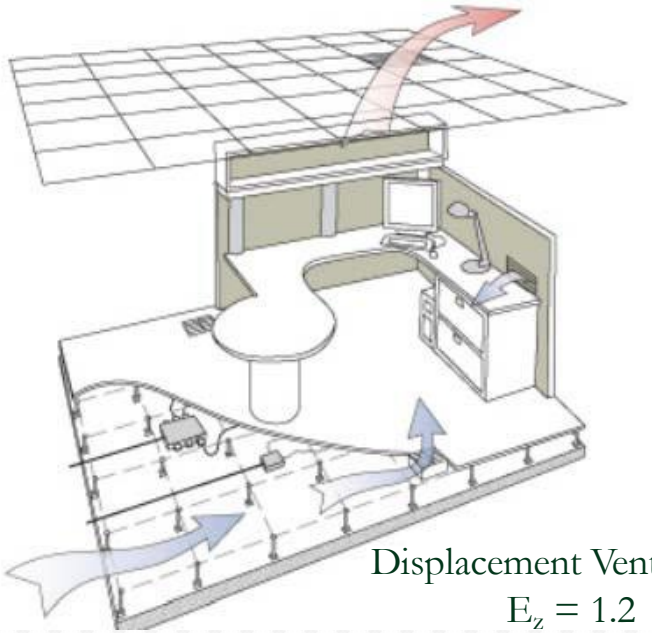
ASHRAE Standard 62.1

❖VRP (Cont.)

- $\mathbf{V_{oz} = V_{bz}/E_z}$

  Where V_{oz} is the minimum zone outdoor air flow and E_z is the ventilation efficiency $0.5 < Ez < 1.2$

Cold Ceiling Supply
$E_z = 1$



Displacement Ventilation
$E_z = 1.2$

ASHRAE Standard 62.1

❖ VRP (Cont.)

- For dedicated fresh air handling units
- $\mathbf{V_{ot} = \sum V_{oz}}$

  Where V_{ot} is the total outdoor air intake flow

➢ Example:

An office building has a 100 zones, each zone has an area of 200 ft^2 and has one occupant (the fresh air is delivered by a dedicated fresh air handling unit next to each fan coil unit that serves each zone)

-Each zone would need Voz = [1* 5(cfm/p)+ 200 *0.06 cfm/ft^2)/1] = 17 cfm

-Vot = Total Fresh Air = 100 * 17 = 1700 cfm

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❖ VRP (Cont.)

- Exhaust Ventilation :

  Exhaust airflow shall be provided in accordance with the requirements in **Table 6-4**

- Ventilation in smoking areas :

  Ventilation in smoking areas **shall be higher** than those without smoking

ASHRAE Standard 62.1

❖ Demand Control Ventilation:

- Best used in high and highly transient occupancy (such as a **classrooms** that change between full and empty). CO2 based DCV or other way of detecting occupancy levels such as people counters is ideal to avoid wasting cooling and ventilation energy
- When **density≥25 people/1000 ft2** [27 people/100m2] at peak with intermittent or variable population some building certification programs give a point for DCV and some codes require DCV when **density ≥40 people/1000 ft2 and space area > 500 ft²**
- The Usual assumed setpoint is **1000 ppm** that is around **600 ppm** above outside CO2 concentration level which is around **400 ppm** (this assumption wastes a lot of energy saving potential)

ASHRAE Standard 62.1

❖ Demand Control Ventilation (Cont.):

- For a lecture hall the upper limit as calculated based on ASHRAE 62.1 Appendix C is **1460 ppm** yet for a health club it is **790 ppm**

- The set point **1000 ppm** wastes a lot of energy saving potential for some areas and leads to unsatisfactory indoor air quality in other

- Instead of the **1000 ppm** the setpoint should be **90%** of the calculated amount in order to allow for control system response times and sensor inaccuracy (which is in the order of ± 50 to 75 ppm)