Comfort, Air Quality, Mechanical Duty
Chap 6

"Met" - amount of energy flux given by occupants performing a duty
Average male person 154 lbs 68" tall

350 Btu/hr "at rest"
Surface area = 19.4 ft²

\[
\frac{350}{19.4} = 18.4 \frac{\text{Btu}}{\text{hr ft}^2} \equiv 1 \text{ met}
\]

Table 6.1 has a summary of several metabolic rates --

Equation 6.1 - \( A_D = 0.108 \text{ m}^2 \)

\( m = \text{body mass in lbs} \)
\( h = \text{height in inches} \)
\( A_D = \text{Surface area} \)

Example 1 - Find heat loss from basketball player 6' 10" 260 lbs during peak activity.
Peak activity $\rightarrow$ 140 Btu/hr-ft$^2$ Table 6.1

$A_0 \rightarrow$ Equation 6.1.

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Range of comfort conditions (Design conditions)

Comfort range varies by season

- **Summer**: 74°F - 80°F, 50% RH
- **Winter**: 68°F - 75°F, 30% RH

ASHRAE guidelines

- Older: Fig 6.1 (2001 Handbook, left)
- New: Fig 6.1 (right), ASHRAE Standard 55-2014

Recommendation: follow "older" comfort windows but limit RH < 65%

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Ventilation Requirements

ASHRAE Standard 62.2-2016

Equation 6.2 $\rightarrow$ Volume flow that needs to be delivered to the "breathing zone"

$$ V_{bz} = R_p P_2 + R_{a} A_2 $$
3. \( A_2 = S t^2 \) of space

\( P_2 = \) "population" (how many people?)

Table 6.2 lists \( R_p \) and \( R_a \) for a few applications

Equation 6.4 gives total outdoor air flow based on \( E_2 \)

\[ V_{0z} = \frac{V_{0z}}{E_2} \]

\( E_2 = \) ? = page 71.

\( 0.5 < E_2 < 1.2 \)

depends on configuration of supply and return

DOAS - see Fig 6.2 upper right

OA conditioned and delivered to space separate from recirculating air.