What is Indoor Environmental Quality?

Worksheet

Indoor environmental quality (IEQ) is the overall condition of air quality, thermal comfort, lighting, and acoustics inside a building, measured and managed through ventilation rates, temperature/humidity control, daylighting, and low-emission materials.

Questions

1. Which of these is NOT typically part of IEQ?

A) Thermal comfort
B) Acoustics
C) Building's stock market value
D) Air quality

2. In Vbz = RpPz + RaAz, the RaAz term accounts for

A) Airflow needed per occupant
B) Airflow needed to dilute area-based emissions (materials, furnishings)
C) Total building height
D) Window size

3. Rp=2.5 L/sperson, Pz=20, Ra=0.3 L/sm, Az=50 m. Find Vbz.

A) 50 L/s
B) 65 L/s
C) 80 L/s
D) 100 L/s

4. Elevated indoor CO2 concentration typically indicates

A) Excess natural light
B) Insufficient outdoor air ventilation
C) Too much acoustic insulation
D) Low humidity

5. A classroom holds 25 students (Pz=25) in an 80 m room (Az=80). Using Rp=3.8 L/sperson and Ra=0.3 L/sm (ASHRAE-style values), find the required outdoor airflow.

6. The same classroom's HVAC only delivers 90 L/s. What's the shortfall and likely IEQ symptom?

7. If occupancy drops to 15 students (same room), recalculate the required airflow.

8. Define: What four factors define IEQ?

9. Define: What does the ASHRAE breathing zone formula calculate?

10. Define: What indoor pollutant is often used as a ventilation proxy?

Answer Key

1. C) Building's stock market value - IEQ covers occupant-experienced conditions: air, thermal comfort, lighting, and acoustics - not financial metrics.

2. B) Airflow needed to dilute area-based emissions (materials, furnishings) - RaAz adds outdoor air proportional to floor area to dilute emissions from materials and finishes, independent of occupancy.

3. B) 65 L/s - Vbz = RpPz + RaAz = 2.520 + 0.350 = 50+15 = 65 L/s.

4. B) Insufficient outdoor air ventilation - CO2 builds up when outdoor air exchange doesn't keep pace with occupant respiration - a common under-ventilation signal.

5. Vbz = RpPz + RaAz Vbz = 3.825 + 0.380 Vbz = 95 + 24 Vbz = 119 L/s

6. Shortfall = 119 90 = 29 L/s Under-ventilation raises indoor CO2 and reduces fresh air per person Likely symptoms: drowsiness, poor concentration, stuffy air

7. Vbz = 3.815 + 0.380 Vbz = 57 + 24 Vbz = 81 L/s (below the 90 L/s HVAC capacity - now adequate)

8. Air quality, thermal comfort, lighting (daylight/glare), and acoustics.

9. The minimum outdoor air ventilation rate needed for a zone, based on occupancy (RpPz) and floor area (RaAz).

10. CO2 - elevated levels indicate insufficient outdoor air exchange relative to occupancy.