What is Carbon Dioxide (CO_2)?

Carbon Dioxide (CO_2) is a colourless, odourless gas naturally present in Earth's atmosphere. It is produced by human respiration, combustion of fossil fuels, and organic decomposition. In building ventilation, CO_2 levels are a key indicator of indoor air quality (IAQ). Elevated concentrations can lead to drowsiness, reduced cognitive function, and poor health outcomes.

Context in UK Building & Ventilation

- **Building Regulations (Approved Document F 2021)** mandates adequate ventilation to maintain CO_2 levels below **1,500 ppm** (parts per million) in occupied spaces.
- **Retrofits & Renovations**: Poorly sealed homes (e.g., after insulation upgrades) may trap CO_2, necessitating mechanical ventilation (MVHR) or background trickle vents.
- **Monitoring**: CO_2 sensors are increasingly used in Passivhaus and low-energy builds to ensure compliance with health standards.

Practical Example

A **UK residential retrofit** adding airtightness measures (e.g., triple glazing, insulation) may inadvertently reduce natural air exchange. Installing a **demand-controlled ventilation (DCV) system** with CO_2 sensors ensures airflow adjusts based on occupancy, maintaining safe levels.

Related Essential Terms

1. **Indoor Air Quality (IAQ):** The overall healthiness of air inside buildings, influenced by CO_2, VOCs, humidity, and particulates.
2. **Mechanical Ventilation with Heat Recovery (MVHR):** A system that extracts stale air (high in CO_2) while recovering heat, improving energy efficiency and IAQ.
3. **Approved Document F (Ventilation, 2021):** UK regulation specifying minimum ventilation rates for dwellings, including CO_2 limits.
4. **Airtightness (Air Permeability):** Measured in **$m^3/(h \cdot m^2)$@50Pa**, critical for preventing CO_2 buildup in modern builds.
5. **Passivhaus Standard:** Ultra-low-energy buildings requiring CO_2 monitoring to balance airtightness with ventilation.
6. **Volatile Organic Compounds (VOCs):** Often co-monitored with CO_2, as both degrade IAQ.
7. **Demand-Controlled Ventilation (DCV):** Smart systems using CO_2 sensors to adjust airflow dynamically.