What is a Blower Door Test?

A blower door test is a diagnostic procedure used to measure the airtightness of a building envelope. It is a critical tool in assessing energy efficiency, identifying air leakage paths, and ensuring compliance with UK Building Regulations (particularly Part L: Conservation of Fuel and Power). The test is commonly used in new builds, retrofits, and residential extensions to validate ventilation strategies and thermal performance.

A blower door test involves mounting a calibrated fan in an exterior doorway, which depressurises or pressurises the building to measure air leakage. The results are quantified as **air changes per hour (ACH)** at a reference pressure (typically 50 Pascals, written as **ACH_{50}**). Lower ACH_{50} values indicate better airtightness.

Explanation:

1. **Purpose**:
   - Identifies uncontrolled air leakage, which impacts energy efficiency, indoor air quality, and thermal comfort.
   - Validates compliance with **Part L1B (Existing Dwellings)** and **Part L1A (New Dwellings)** of the Building Regulations.
   - Supports **Passivhaus certification**, where airtightness thresholds are stricter (≤ 0.6 ACH_{50}).
2. **Procedure**:
   - A fan is sealed into an external door frame.
   - The building is depressurised to 50 Pa while airflow rates are measured.
   - Infrared thermography or smoke pencils may be used to locate leaks.
3. **Real-World Applications**:
   - **Retrofits**: Detects gaps around windows, loft hatches, or service penetrations.
   - **New Builds**: Ensures compliance with **Approved Document L (2021 edition)**.
   - **Ventilation Design**: Informs **Mechanical Ventilation with Heat Recovery (MVHR)** system sizing.

Synonyms:

- **Airtightness Test** (commonly used interchangeably in UK construction).
- **Air Permeability Test** (though technically distinct, often conflated in practice).

Related Terms:

1. **Air Permeability** – Measured in **$m^3/(h \cdot m^2)$ @ 50 Pa**, the air leakage per square metre of building envelope.
2. **ACH_{50}** – Air Changes per Hour at 50 Pascals, the standard metric for airtightness.
3. **Part L (Building Regulations)** – Governs energy efficiency requirements in England and Wales.
4. **MVHR (Mechanical Ventilation with Heat Recovery)** – A system often required in airtight homes to maintain air quality.
5. **Thermal Bypass** – Heat loss caused by air leakage, addressed via blower door testing.
6. **Infiltration Rate** – Uncontrolled air leakage into a building.
7. **Passivhaus Standard** – A rigorous energy efficiency standard requiring exceptional airtightness.