What is Heat Recovery Ventilation (HRV)?

Heat Recovery Ventilation (HRV) is a controlled, continuous mechanical ventilation system that extracts stale, moist air from 'wet' rooms (kitchens, bathrooms, utility rooms) and simultaneously supplies filtered, fresh air to 'dry' rooms (bedrooms, living rooms). Crucially, before the extracted air is expelled outside, its thermal energy (heat) is recovered via a heat exchanger within the HRV unit and transferred to the cooler, incoming fresh air stream. This process significantly improves a building's **energy efficiency** by reducing the need to heat the incoming air, thus maintaining comfortable indoor temperatures while substantially lowering heating demands and running costs.

Explanation and Application in the UK Residential Sector

HRV/MVHR systems are considered best practice for achieving **low-energy building standards** and are highly recommended for **new build homes** in the UK, especially those constructed to high levels of airtightness (as typically required by **Part L of the Building Regulations**). They are also a prime consideration in deep **residential retrofit** projects (e.g., Energiesprong, whole-house refurbishment) and in thermally upgraded **home extensions** where the risk of condensation and mould is increased due to reduced natural air permeability.

The system provides consistent, filtered fresh air, which is vital for maintaining **good indoor air quality (IAQ)**, controlling humidity, and removing pollutants. This satisfies the requirements for background ventilation as detailed in **Approved Document F (Ventilation)** of the Building Regulations, often meeting the requirements of **System 4 (Continuous mechanical supply and extract with heat recovery)**.

- **Practical Example:** A modern, airtight UK house, built to meet the U-value and airtightness targets of current Building Regulations Part L, relies on an HRV system to provide the mandatory fresh air changes. If the outside temperature is 0 degrees C and the extracted indoor air is 20 degrees C, a high-efficiency HRV unit (e.g., with an efficiency rate of 80% or greater) will deliver the fresh air into the living spaces at approximately 16 degrees C. This means only a small amount of additional heat is required from the central heating system to reach the target internal temperature of 20 degrees C, dramatically reducing the building's **space heating demand**.

Essential Related Terms & Concepts

1. Mechanical Ventilation with Heat Recovery (MVHR)

- **Definition:** Often used interchangeably with HRV, **MVHR** is the preferred term in the UK, emphasising the mechanical aspect of both supply and extract. It refers to the specific System 4 ventilation strategy in Approved Document F, which requires a balanced flow rate and heat recovery efficiency.

- **Relevance:** In the UK, MVHR is the common terminology for whole-house heat recovery systems, especially those designed to comply with *Building Regulations Approved Document F (2021)*.

2. Airtightness

- **Definition:** The resistance of the building envelope (walls, floor, roof, windows, doors) to the uncontrolled flow of air through gaps, cracks, and unwanted openings. It is measured in cubic metres per hour per square metre at 50 Pa pressure difference (the **Air Permeability**).

- **Relevance:** High airtightness is **essential** for an HRV/MVHR system to work effectively. If a building is leaky, the system's balanced air flows are disrupted by uncontrolled draughts, reducing heat recovery efficiency and potentially causing comfort issues. New dwellings must meet specific airtightness targets (**Approved Document L**).

3. Indoor Air Quality (IAQ)

- **Definition:** The air quality within and around buildings, especially as it relates to the health and comfort of building occupants. Key parameters include levels of pollutants such as carbon dioxide (CO2), volatile organic compounds (VOCs), particulates (PM2.5), and relative humidity.

- **Relevance:** MVHR systems are critical for maintaining good IAQ in airtight homes by continuously removing stale, pollutant-laden air and supplying filtered, fresh air, directly addressing the health and well-being aspects mandated by Building Regulations.

4. Specific Fan Power (SFP)

- **Definition:** The measure of the electrical energy consumed by the fans to move a specific volume of air, usually expressed in Watts per litre per second (W/(L/s)). A lower SFP indicates a more energy-efficient fan/system.

- **Relevance:** While MVHR recovers heat, its fans still consume electricity. **Approved Document F** specifies maximum allowable SFP for ventilation systems to ensure the energy saved through heat recovery isn't negated by excessive fan power consumption. A low SFP is crucial for the overall energy balance of the dwelling.

5. Passive Stack Ventilation (PSV)

- **Definition:** A non-mechanical ventilation system that relies on natural buoyancy (stack effect) and wind pressure to move air up and out of a building through ducts.

- **Relevance:** This is an alternative, *non-mechanical* strategy to System 4 (MVHR), classified as **System 2** in Approved Document F. PSV is a simpler, zero-energy approach but cannot recover heat and offers less precise control over air change rates than MVHR, making it less suitable for highly airtight, low-energy buildings.