

What is a Whole House Retrofit (WHR)?

A Whole House Retrofit (WHR) is a systematic approach to upgrading all major energy-consuming elements of a residential property simultaneously. Unlike piecemeal improvements, WHR integrates:

- Building fabric enhancements** (insulation, airtightness, thermal bridge mitigation)
- Mechanical services upgrades** (heating, ventilation, renewables)
- Monitoring & controls** (smart systems, user interfaces)

This methodology aligns with the UK's **SHDF Wave 2.2** objectives (2024-2027) and **Future Homes Standard 2025** requirements, typically achieving **60-80% energy demand reduction** in pre-1980s housing stock.

Synonym(s): Whole-building retrofit, holistic retrofit, deep energy retrofit.

Key Components

1. Fabric-First Principle

- Example: A 1920s terrace receives external wall insulation (EWI), triple-glazed windows, and insulated suspended floors - reducing heat loss by 65%.
- Regulation: **Approved Document L1B (2023)** mandates $U\text{-values} \leq 0.18 \text{ W/m}^2\text{K}$ for retrofit walls.

2. Ventilation Strategy

- Best Practice:** Hybrid ventilation systems (MEV + humidity-controlled trickle vents) in airtight retrofits ($< 3.0 \text{ m}^3/\text{h.m}^2 @ 50\text{Pa}$).
- Case Study:** Nottingham City Homes installed dMEV in 500 retrofitted properties, eliminating condensation issues while maintaining < 1.5 air changes/hour.

3. Heating Transition

- SHDF Requirement:** Heat pumps must achieve $\text{SCOP} \geq 2.8$ in WHR projects.
- Example:** Bristol City Council's WHR programme saw ASHP installations achieve 320% efficiency when combined with fabric upgrades.

Regulatory Framework

Document	Relevance to WHR
Approved Document L (2023)	Sets retrofit insulation standards and DER/TER calculations
Part F (2021)	Mandates ventilation rates post-retrofit (6-8 l/s per bedroom)
PAS 2035:2023	Requires retrofit coordinators for WHR projects $> \pounds 15,000$

Practical Challenges

1. Moisture Management

- Issue:** 38% of poorly executed WHR projects develop interstitial condensation (BRE Report 2024).
- Solution:** Hygrothermal modelling + vapour control layers in $> 0.5 \text{ W/m}^2\text{K}$ upgrades.

2. Ventilation Compliance

- **Conflict:** Achieving <3 ACH airtightness often requires mechanical ventilation, yet 42% of UK retrofit installers lack MEV commissioning skills (NIBE 2025 survey).
-

Related Essential Terms

1. **Fabric Efficiency Ratio** - Measures insulation performance relative to building geometry
2. **Ventilation Heat Recovery Efficiency** - Critical metric for MVHR in retrofits ($\geq 85\%$ for SHDF funding)
3. **Thermal Bypass Risk** - Hidden gaps allowing heat escape, requiring infrared thermography
4. **Retrofit Moisture Risk Index** - PAS 2038:2024 assessment criterion
5. **Energy Followback Effect** - Post-retrofit energy use rebound phenomenon