

Step-by-Step Guide to Complying with UK Ventilation Regulations (Approved Document F 2021)

How to Design Ventilation Systems for Dwellings

1. Start Here: Determine Your Dwelling's Airtightness

Every ventilation system design begins with one critical question: **Is your dwelling designed to be highly airtight?**

- **Highly airtight** = Design air permeability $<5 \text{ m}^3/(\text{h}\cdot\text{m}^2)$ at 50Pa *or* as-built air permeability $<3 \text{ m}^3/(\text{h}\cdot\text{m}^2)$.
- **Less airtight** = All other cases.

This decision determines whether you'll use **natural ventilation** or **mechanical systems**. Let's explore both paths.

2. Path A: Natural Ventilation (For Less Airtight Dwellings)

Step 2.1 - Install Intermittent Extract Fans in Wet Rooms

- **Kitchens:**
 - *With cooker hood extracting externally:* Minimum 30 l/s extract rate.
 - *Without external cooker hood:* 60 l/s extract rate (Diagram 1.2).
- **Bathrooms/Utility Rooms:** 15 l/s (bathrooms) / 30 l/s (utility rooms).
- **Installation Rules:**
 - Position fans $\leq 400\text{mm}$ below ceilings (Diagram 1.1).
 - Avoid placing fans and background ventilators $< 500\text{mm}$ apart.

Step 2.2 - Background Ventilators

- **Habitable Rooms/Kitchens:**
 - Multi-storey: $8,000\text{mm}^2$ equivalent area per room.
 - Single-storey: $10,000\text{mm}^2$ per room.
- **Bathrooms:** $4,000\text{mm}^2$ minimum.
- **Total Units:** ≥ 4 ventilators for 1-bed; ≥ 5 for >1 -bed.

Example: In a 3-bed house, install 5+ ventilators distributed across ≥ 2 façades for cross-ventilation.

Step 3 - Purge Ventilation (Rapid Air Exchange)

- **Window Requirements:**
 - Hinged windows ($15\text{--}30^\circ$ opening): Total area $\geq 1/10$ of floor area.

- Hinged windows ($\geq 30^\circ$): $\geq 1/20$ floor area.
- **No External Windows?** Use adjacent rooms:
 - Permanent opening $\geq 1/20$ combined floor area.
 - Ensure background ventilators ($\geq 10,000\text{mm}^2$) in the adjacent room.

Step 4 - Final Checks

- **Doors:** 10mm undercut (or 20mm if no floor finish).
 - **Noise Areas:** Install noise-attenuating ventilators near roads.
 - **Access:** Ensure all components are reachable for cleaning/filter changes.
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3. Path B: Mechanical Ventilation (For Highly Airtight Dwellings)

Option 1: Continuous Mechanical Extract Ventilation (CMEV)

- **Extract Rates** (Table 1.2):
 - Kitchen: 13 l/s (high rate), 8 l/s (continuous).
 - Bathroom: 8 l/s (high), 8 l/s (continuous).
- **Ductwork:**
 - Use rigid ducts; limit flexible ducts to $\leq 1.5\text{m}$ (BSRIA BG 43).
 - Seal joints to prevent leaks.
- **Background Ventilators:**
 - $4,000\text{mm}^2$ in habitable rooms (no ventilators in wet rooms).

Option 2: Mechanical Ventilation with Heat Recovery (MVHR)

- **Balanced System:**
 - Match supply/extract airflow ($\pm 10\%$ tolerance).
 - Heat recovery efficiency $\geq 70\%$ (BS EN 13141-7).
- **Frost Protection:** Required for outdoor intakes in temperatures $< 0^\circ\text{C}$.
- **Condensate Drainage:** Connect to soil stacks or external soakaways.

Controls & Noise

- **Noise Limits:** $\leq 30\text{ dB(A)}$ in bedrooms; $\leq 45\text{ dB(A)}$ in kitchens.
 - **Automatic Controls:** Humidity sensors in wet rooms; CO_2 sensors in living areas.
 - **Manual Overrides:** Local switches for boost mode.
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4. Commissioning & Compliance

Airflow Testing

- Use UKAS-calibrated equipment to verify rates (Appendix C).
- Example: A 4-bed home needs whole-dwelling ventilation $\geq 37\text{ l/s}$ (Table 1.3).

Homeowner Documentation

- Provide:
 - Filter replacement schedules (MVHR: every 6-12 months).

- Fan cleaning instructions (CMEV: quarterly).
 - Signed commissioning sheet (Appendix C).
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5. Special Cases

Existing Dwellings & Retrofits

- **Window Replacements:** Match original ventilator sizes or install 8,000mm² in habitable rooms.
- **Energy Efficiency Upgrades:** Follow Table 3.1 to assess ventilation impact (e.g., loft insulation = “minor” measure).

Basements & Internal Rooms

- Treat basements as separate single-storey dwellings.
 - Use permanent openings ($\geq 1/20$ floor area) for rooms without external windows.
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Final Note

Proper ventilation isn't just about compliance – it prevents mould, controls humidity, and ensures healthy indoor air. Always cross-reference with **Approved Document F (2021)** and consult specialists for non-standard designs.

For full details: [Download Approved Document F Volume 1](#).