



Alex Baines

## **PAS 2035**

Specification for the energy retrofit of  
domestic buildings

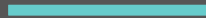
Ventilation Overview

# AGENDA.

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- WHAT?
- 3. UPGRADING VENTILATION**  
- THE OPTIONS
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KNOWLEDGE
- 5. NEXT STEPS**  
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**bsi.**

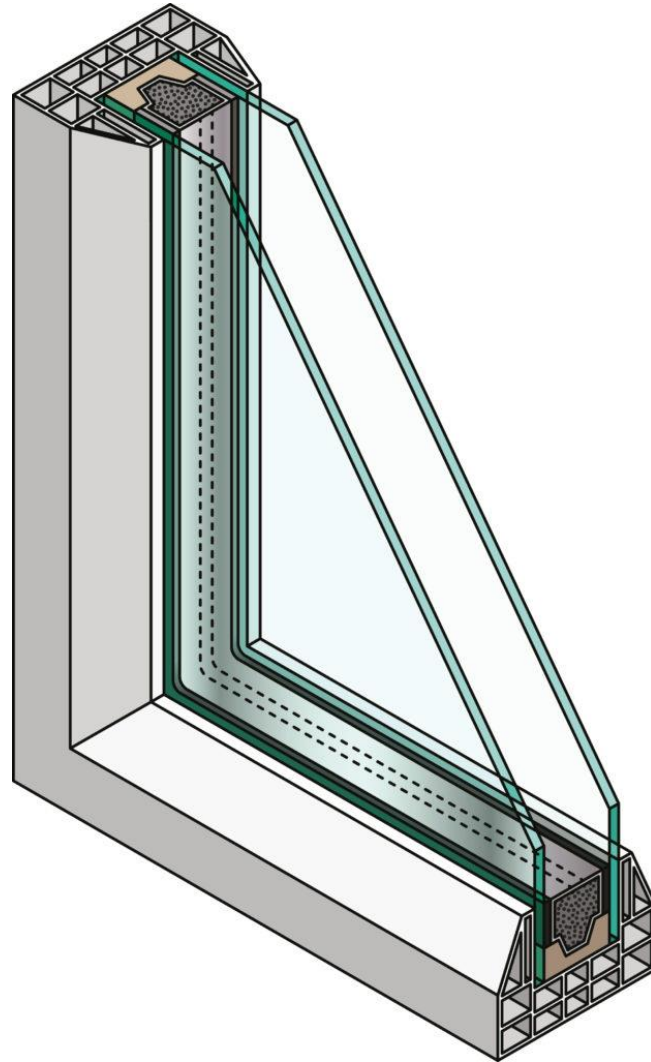
# INTRODUCTION.



# WHY?

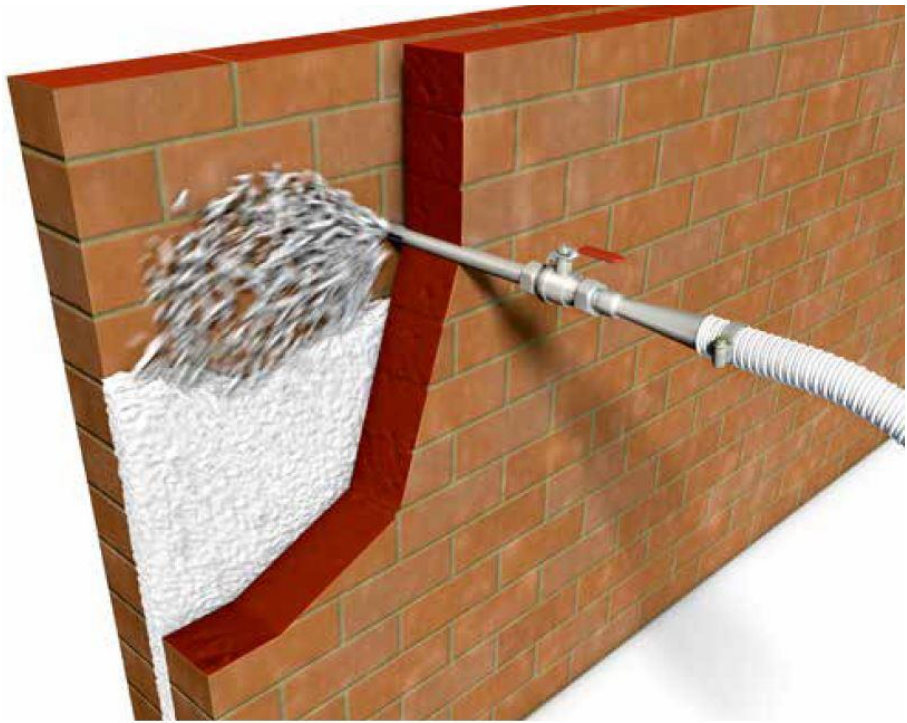
## THE EXISTING STATE

- Traditionally relied upon wind-driven air infiltration & air leakage to provide adequate ventilation
- The average air permeability dwellings (fans and background ventilators sealed) as measured by BRE is approx.  $10\text{m}^3/\text{m}^2.\text{hr}$  @ 50 Pa
- Infiltration and air leakage provide most (~3/4) of the required ventilation
- Since the 1970s we have been making improvements











# WHY?

## THE OUTCOME

- Focused on improving energy
- But has also reduced the air permeability of many homes
- Reducing the infiltration and air leakage







# WHY?

## THE REALITY

- Without adequate ventilation any airtightness measure
- Reduces the infiltration and leakage rate
- Increases the risk of insufficient ventilation to maintain IAQ
  - High humidity
  - High concentrations of pollutants (CO<sub>2</sub>, VOCs, dustmites)
- All associated
  - Serious health risks for occupants
  - Potential damage to building finishes, fabric and structure



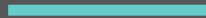








# ASSESSMENT OF EXISTING.



# ASSESSMENT OF EXISTING.

When installing any insulation or airtightness measures, or replacing windows, in existing buildings, the adequacy of the existing ventilation shall be assessed and if necessary improve it

# ASSESSMENT OF EXISTING.

Existing ventilation shall be assessed as inadequate if on or more of the following are apparent:

- Evidence of condensation and/or mould growth in the dwelling
- There is no ventilation system, or the ventilation system is incomplete or not functional
- There are no undercuts of at least 7600mm<sup>2</sup> beneath all internal doors, above the floor finish, to allow air to move through the dwelling
- There is no provision for purge ventilation of each habitable room as required by Part F

# ASSESSMENT OF EXISTING.

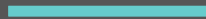
An acceptable, complete ventilation system shall be:

- An intermittent extract ventilation (IEV) system consisting of correctly sized extract fans in all 'wet' rooms and correctly sized background ventilators in all living spaces and bedrooms
- A passive stack ventilation (PSV) system consisting of PSV serving all 'wet' rooms and correctly sized background ventilators in all living spaces and bedrooms
- A continuous PIV system that supplies 'fresh' air combined with correctly sized background ventilators in all rooms, including wet rooms
- A continuous mechanical extract ventilation (MEV) system that extracts from all 'wet' rooms combined with correctly sized background ventilators in all living spaces and bedrooms
- A whole-house supply and extract MVHR system that extracts from all 'wet' rooms and supplies to all living spaces and bedrooms, and has been properly commissioned and balanced

# ASSESSMENT OF EXISTING.

However, if the proposed energy efficiency improvement measures are either intended to reduce the air permeability of the building envelope below 5 m<sup>3</sup>/m<sup>2</sup>.hr @ 50 Pa, or might do so, then existing IEV or PSV shall be assessed as inadequate

# UPGRADING VENTILATION.



# UPGRADING VENTILATION.

An acceptable, complete ventilation system shall be:

- Where ventilation is inadequate but no insulation or airtightness measures the Retrofit Coordinator brings results to client and Retrofit Designer with recommendation to upgrade. Risk grades B or C upgrading ventilation shall be included in any medium-term improvement plan
- IEV or PSV accepted if ventilation to be upgraded but AP is not less than  $5\text{m}^3/\text{m}^2.\text{hr}$  and proven by an air test but must be sized in accordance with Part F but assuming occupancy equal to bed spaces. PSV apertures to air extract shall be automatically controlled to internal RH
- Due consideration to be given to building location, local topography, orientation and internal layouts and dimensions to confirm that IEV or PSV is effective, if not then not acceptable.



# UPGRADING VENTILATION.

In all other cases where ventilation is to be upgraded the minimum acceptable shall be:

- Continuous MEV, tested to BS EN 12141-6 combined with background ventilators tested to BS EN1314-1
- Continuous whole-dwelling MVHR tested to BS EN13141-7
- Continuous PIV tested to BS EN 13141-11 combined with background ventilators tested to BS EN1314-1 with Note
- Provision shall be made for purge ventilation in any habitable room
- Any fan shall be compliant with Eco Design Commission Regulation (EU) 1253/2014. Ventilation systems shall conform to Domestic ventilation systems [N10]
- If MEV can be cMEV or dMEV. If dMEV they shall either meet reqs for SAP Product Characteristics Database (PCDB) or tested to BS EN 13141-6. The effect of wind on performance shall not reduce air flow by more than 10%

# UPGRADING VENTILATION.

Sizing and Controls. Whichever of the options is adopted:

- The ventilation system shall meet at least the 'minimum low rate' of whole-dwelling ventilation in Part F assuming occupancy equal to the number of bedspaces. The system shall also provide sufficient additional capacity to ensure that adequate ventilation is maintained throughout the year. Additional capacity shall also be available intermittently to achieve at least the 'minimum high rate' specified in Part F. See additional note.
- The whole-house ventilation rate shall be controlled automatically so that it can maintain good internal air quality and avoid waste of energy. Controls shall be provided that sense and monitor a control parameter in order to automatically regulate vent rate. Ventilation shall not be controlled solely via light switches or manual switches.

# UPGRADING VENTILATION.

## Further considerations

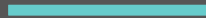
- Single-room heat recovery ventilators (SRHRVs) or alternate flow heat recovery (AFHR) fans tested to BS EN 1314-8 can be specified to complement an existing or new system but multiple fans shall not be used as a whole-dwelling system.
- Any metal or plastic ductwork shall conform to Domestic ventilation compliance guide [N14]. Flexible ductwork shall only be used for final connections in fan boxes, extract grilles or terminals and shall conform to Flexible ductwork [N14].
- With any new system proposal, the ventilation system design shall include calculations provided by technical consultant, specialist designer or supplier to demonstrate the vent rates are provided by the system proposed.

# UPGRADING VENTILATION.

## Further considerations

- The ventilation system design shall include provision to ensure that the location, configuration and fixing of systems allow them to operate as quietly as possible, without unnecessary noise or vibration, inside or outside the home. The maximum acceptable noise shall be 30dB measured as BS 8233. Designers shall take account of acoustic data provided by fan manufacturers to ensure that system noise levels are acceptable.
- The design shall specify that it is to be installed by operatives holding suitable qualifications identified in the Register of Regulated Qualifications maintained by OfQual for England (and equivalents in devolved nations) . See Note

LEARNING FROM FAILURE.



# FAILURES.

## NOT WHAT YOU THINK



- Cannot remove filter due to position of controls
- Some supply valves poorly installed
- Commissioning clearly invalid
- Leakage found through MVHR ductwork, despite being sealed on the filters

# FAILURES.

NOT WHAT YOU THINK



NEXT STEPS.





# NEXT STEPS

## OPTIMISATION

Scope for ventilation, airtightness, comfort, iaq & overheating



THANKS FOR LISTENING  
**QUESTIONS?**

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