Quality of ventilation systems in residential buildings: Status and perspectives in the UK

Presented by
Alan Gilbert

ABOUT BSRIA – BUILDING SERVICES RESEARCH AND INFORMATION ASSOCIATION

What?
Who?
Where?

Member based Association
Consultancy, test, instrumentation and research
Building services and construction industry

The built environment experts
The built environment experts

**AIRTIGHTNESS – PART L1**
- **KEY STATISTICS**

- 2011 – BSRIA tested approximately 8,500 domestic properties
- 2012 – BSRIA tested approximately 10,000 domestic properties
- 2013 – BSRIA will test approximately 13,500 domestic properties (= 25% total tested)
UK HOUSING SECTOR
- KEY STATISTICS (2011) - LAST FULL YEAR OF REPORTED DATA

- 135,000 dwellings completed
- 27.4 million total number of dwellings in UK = 17.4 million privately owned, 4.7 million privately rented, 2.7 million rented from housing authorities and remainder rented from local authorities

VENTILATION - UK REGULATIONS PART F
- KEY STATISTICS

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Background (trickle) Ventilation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>System 1</td>
<td>Background ventilators and intermittent extract fans including single room heat recovery ventilators</td>
<td>Yes</td>
<td>Size as per tables in Regulations based on floor area and number of bedrooms</td>
</tr>
<tr>
<td>System 2</td>
<td>Passive stack ventilation (PSV)</td>
<td>Yes</td>
<td>As above</td>
</tr>
<tr>
<td>System 3</td>
<td>Continuous mechanical extract (MEV): centralised and de-centralised</td>
<td>Yes and No</td>
<td>Size as per tables in Regulations or if air permeability &gt;5m³/(m²) none is required</td>
</tr>
<tr>
<td>System 4</td>
<td>Continuous mechanical supply and extract with heat recovery (MVHR): centralised and single room</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

System 1, 30%
System 2, 0.5%
System 3, 40%
System 4, 29.5%

Percentage mix of new build ventilation system types in 2011
VENTILATION – UK REGULATIONS PART F – KEY STATISTICS

- In 2011 BSRIA tested less than 100 dwellings for airflow performance (completed systems and are post commissioning i.e. completed)
- In 2012 quantity increased to 500 dwellings
- In 2013 approximately 1000 dwellings will be tested for airflow performance

In 2011 95% of all dwellings when initially tested FAILED to meet the requirements contained in the Building Regulations. In 2012 this high % improved but only a little!
### VENTILATION – KEY FAILURE MODES (X40 RANDOM SAMPLE)

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 (82.5%)</td>
<td>Ductwork incorrectly fitted (kinked / bent / poor joints / excessive length)</td>
</tr>
<tr>
<td>10 (25%)</td>
<td>Undersized fans to meet the minimum ventilation requirement</td>
</tr>
<tr>
<td>6 (15%)</td>
<td>Insufficient fans or terminal outlets for dwelling type</td>
</tr>
<tr>
<td>3</td>
<td>No boost function</td>
</tr>
<tr>
<td>3</td>
<td>Incorrect installation data</td>
</tr>
<tr>
<td>2</td>
<td>Missing ductwork</td>
</tr>
<tr>
<td>1</td>
<td>Blocked ductwork</td>
</tr>
</tbody>
</table>

NOTE: Some dwellings had multiple failure modes

**The built environment experts**

---

**VENTILATION – KEY FAILURE MODES**

Poorly installed ductwork is without question one of the largest causes of systems not performing properly.

**The built environment experts**
There shall be adequate means of ventilation provided for people in the building” and “Fixed systems for mechanical ventilation and any associated controls must be commissioned by testing and adjusted as necessary”.

The built environment experts
DOMESTIC VENTILATION COMPLIANCE GUIDE

Covers installation and commissioning and copies of completed forms should be left in dwelling + submitted to the Building Control Body as evidence that the work has been correctly undertaken.

WHAT NEXT?

The built environment experts
The Domestic Ventilation Compliance Guide Section 5.2 states “Measurement of air flows should be performed using equipment that has been calibrated at a UKAS accredited calibration centre”.

The aim of the guide is to improve the standard of domestic ventilation installations. In particular, it focuses on making sure that the methods used for measuring airflow rates are fit for purpose.

www.bsria.co.uk
STEP 1

Laboratory investigation into the market leading vane anemometer & hood assembly measurement accuracies

STEP 2

Laboratory investigation into various instruments and how they influenced the performance of typical fans in the marketplace
The built environment experts
The built environment experts

THE UNCONDITIONAL METHOD
- THE PREFERRED METHOD -

• Free from site-specific conditions such as fan type and model, airflow direction and instrumentation characteristics
• Uses a powered hood assembly to eliminate back pressure and turbulent flow effects
• Devices based on a zero-pressure method
The built environment experts

THE CONDITIONAL METHOD

Must take into account specific site conditions such as fan performance characteristics, the resistance to airflow created by the measuring device, correction and conversion factors depending on the instrument used. This information is currently not available !!!!!

THE CONDITIONAL METHOD

True air volume = corrections for the anemometer + hood + fan system = Lots of unknowns especially in centralised fan systems with multiple grilles

VIDEO AT www.bsria.co.uk
In 2014 95% of all dwellings when initially tested PASSED the requirements contained in the UK Building Regulations.