Realising the Intended In-Use Performance of Ventilation Systems in Low Energy Homes

Project Proposal / Summary

1.0 Introduction

There is a pressing need to ensure that the ventilation strategies in new low energy, air tight homes work *"as intended"* based on the design at the completion of the building prior to occupation. Without properly functioning systems, indoor air quality (IAQ) is compromised, potentially leading to health issues for the occupants and damage to the building fabric.

A growing body of research suggests that problems introduced at each stage of the construction process, including the handover process to occupants and future maintenance, are creating a 'gap' in the actual performance of ventilation systems compared to the design intent. If the systems do not perform as intended, there are three key risks:

(i) A failure to provide intended air change rates, as deemed necessary for decent IAQ under building regulations and other guidance;
(ii) Mechanical systems operate sub-optimally, impacting MVHR efficiencies and specific fan power, resulting in higher than designed energy use; and
(iii) Damage to the building fabric and health impacts.

These *delivery-related issues* need to be tackled through industry collaboration, with the full support of government and the regulatory framework.

2.0 Project Aims

The Ventilation Group aims to work with housebuilders to study up to 15 new build sites in England and Wales. This will provide evidence for a summary report that will draw on findings from across all sites. Based on this, early recommendations will be made to industry and government to help ensure that ventilation systems deliver the designed flow rate and energy performance, to safeguard occupants' IAQ and protect the home's fabric and ensure energy efficiency. For industry, these recommendations will focus on process and areas of further research. For government, recommendations will address any amendments that may be needed to guidance or regulation.

3.0 Summary of Method

An adapted version of the Housebuilder Process Review (HBPR; developed by ZCH for the 'Design vs As Built Performance' project) will be used to identify what went well and what needs improving in the design, installation, commissioning, and hand over of the ventilation systems. The project will cover up to 15 sites, investigating 2-3 units at each site. It is proposed that the sites will have the following characteristics:

- Distributed across England and Wales;
- Can be analysed at different stages of construction, including completion for testing of flow rates;
- Some sites may have occupied units, at which occupant interviews could be carried out;

- New build residential units built to 2010 standards
- Across a range of dwelling types and build methodologies
- Where possible, to include a range of all four ventilation types from Part F (1. Background ventilators with intermittent extract fans; 2. Passive stack; 3. Continuous MEV; 4. MVHR).

This approach enables practical recommendations to be made to industry and government based on site realities and properly gathered evidence from completed sites. It also allows preliminary observations and recommendations to be made in advance of 2016 updates to Building Regulations.

Section 6 below provides more detail on the method.

4.0 Scope

The project focus is specific. This is to gather real site evidence on the existence and extent of the risks identified:

- Failure to deliver designed ventilation rates;
- Impact on energy use; and
- Understand occupant views and behaviour.

From this, recommendations will be made on whether changes are needed to regulation, guidance and operational practices.

The project will not 'review' the official requirements in ADF that relate to the standards of IAQ to be achieved; such advice should instead come from health experts and scientists. It will also be limited to measuring delivered ventilation rates and may potentially include measuring the resulting IAQ in a sub-set of occupied homes. However, the project does aim to link with a proposed DCLG / BRAC parallel project under development, which intends to examine the impact of the provisions in ADF 2010 by measuring the IAQ of a larger sample of homes.

5.0 Method Detail

5.1 Aim to understand:

- Why the ventilation strategy in question was chosen;
- What the detailed design intention was (by examining original plans and specifications);
- What ventilation rates are achieved;
- What MVHR efficiency and specific fan power is achieved;
- Who has responsibility for each part of the delivery process (which can then be 'mapped out'); and
- What problems - if any - have been encountered that may lead to performance issues.

5.2 Review process to include:

- Desk based review of the design;
- Interviews with key team members, including (where relevant): architect, M&E designer, services installers, construction manager and the sales/handover team;
- Visits to a number of units at each site to test completed flow rates and energy use against the design intention;

- Interviews of residents (plus additional testing) at any partially occupied sites; and
- Analysis of findings.

6.0 Outputs

There would be three types of output from the project:

i. A feedback report for the housebuilder, detailing the findings for the site in question (confidential).
ii. A summary report of findings from across the sites, drawing on site visits to 'map' the processes, share concerns and showcase common issues. This would include:
    - Process and research recommendations for industry; and
    - Legislation recommendations and guidance for government.
iii. Regular, scheduled updates with DCLG, providing information to inform consultations throughout 2015.

7.0 Industry and Government Engagement:

The project aims to achieve demonstrable outcomes, and has sought a number of commitments from the housebuilding industry and relevant government departments.

7.1 Industry: Funding has been agreed from a number of industry organisations. There will also be in kind investment from housebuilders through the contribution of sites for analysis, as well as a willingness to act on recommendations made.

7.2 Government: DECC and DCLG have committed to give serious consideration to any recommendations and respond to them when changes to the regulations and supporting framework allow. This could involve recognising best practice and improvement in the parts of the framework that guide delivery. Areas of investigation will include: competent persons schemes, SAP, Domestic Ventilation Compliance Guide, Part L, In-Use Factors, potentially Part C and any future review of Part F. Both government departments have committed time and resources to the project, including senior attendance at regular meetings and a site review pilot; they will also assist in developing advice for consumers.

8.0 Provisional Timetable

Date	**Action**
November 2014	Steering Group formed
December 2014	Agree scope and start to raise funding
Jan-Mar 2015	Ongoing fund raising, initial 'pilot' sites and approaching housebuilders
Feb onwards 2015	Carrying out site visits / reviews
Jun-Aug 2015	Analysis of results
Aug-Oct 2015	Preparing Reports
Oct-Nov 2015	Publication and release
Note that bi-monthly updates would be given to DCLG	