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## **‘Ventilate Right’ – Methods of Effective Communication to New Residents**

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**Abstract:** Post occupancy evaluation in housing often places emphasis on energy efficiency and the residents habits that affect this. Whilst it is straightforward to measure energy consumption and obtain the residents thermal comfort perception, the measurement and perception of ventilation is less tangible. The importance of adequate ventilation is often not communicated to residents of new housing. With buildings being constructed to be more airtight to conserve space heating energy, indoor air quality and ultimately health and wellbeing can be compromised if the planned ventilation strategies are not understood and operated by the occupant. This paper assesses methods of communicating key information to occupants, making reference to two projects undertaken in conjunction with social housing providers. One case study assesses the impact of a short film describing effective ventilation methods intended for circulation to new residents by housing providers via the internet; the other introduces the production and use of a paper based occupant guide that is unique to the home. The success of each method is discussed, concluding with an outline of innovative alternative media formats that can enhance communication with occupants to improve indoor air quality and occupant’s health and wellbeing.

**Keywords:** Post occupancy evaluation, indoor air quality, short film, occupant guides, ventilation

### **Introduction**

Occupant understanding is a fundamental element in helping to ensure an occupied building meets its as designed energy consumption target, whilst maintaining good indoor air quality (IAQ). In a social housing context, advice to tenants regarding condensation and moisture control is not new, but there is an implied perception that ventilation advice is not so essential. In the drive to improve energy efficiency and lower dwelling carbon emissions in line with government targets, infiltration rates have been reduced. However without providing a planned, effective ventilation strategy the unintended result could be for a more hazardous indoor environment, with concurrent and significant negative long-term and undesirable impacts on public health and the building fabric. Since 2010, the Mackintosh Environmental Architecture Research Unit (MEARU) has undertaken research with residents of over 200 households in properties built to modern airtight standards in Scotland and London. This has revealed widespread evidence of poor ventilation, with bedrooms presenting a particular IAQ problem, and little awareness of potential consequences of this. Further research investigated mechanical ventilation systems and found that while these systems can deliver positive IAQ outcomes there is a risk of poor air exchange if the systems are not designed, installed and operated correctly; which was often the case. Findings from a study of housing in Scotland indicated that 83 % of mechanical extract systems were underperforming with 42 % operating below Building Regulations moisture control

requirements and 82 % of people had received no advice on ventilation (Howieson et al, 2013).

In the social housing sector where there is a relatively high turnover of tenants, simple and effective communication of good ventilation practices together with concise advice on improving energy efficient habits is of particular importance. The handover process for new residents varies significantly between social housing providers with several housing officers reporting that new tenants are handed a set of keys with little information or an introduction to their new home. Residents will often therefore apply established operational habits in new properties unaware that the new home may require a different ventilation strategy and methods of control.

The most common method of property handover in social housing involves issuing new residents with a tenant handbook. These normally consist of a series of individual manufacturers technical data sheets covering a wide range of operation and maintenance information relating to the building and its services; the residents often consider these as being too technical and are often not referred to.

Good IAQ is of particular importance and is being widely researched due to improved airtightness and the potential health impacts associated with inadequate air exchange within the home (The Royal College of Physicians, 2015). The measure of carbon dioxide (CO<sub>2</sub>) concentrations is frequently used as a proxy for assessment of the adequacy of ventilation air changes and the Scottish Building Standards Division (BSD) recently introduced a regulation requiring a CO<sub>2</sub> monitor with alarm to be installed in all principal bedrooms in new housing. With the aim of alerting residents when indoor air quality is reduced to prompt action to introduce fresh air (Scottish Government, 2015). This is a step towards highlighting the importance of good IAQ however it also stresses the need for landlords to supply clear advice to their residents when occupying a new build dwelling.

### **Context of Occupant Guides**

The Scottish Technical Handbook (Domestic) provides a clause for provision of a 'quick start guide' for new homes. This is the need to inform residents of how to operate their homes for optimum efficiency, as the design intent, via a clear occupant guide (Scottish Government, 2015a). This requirement stemmed from research undertaken by MEARU for the BSD which proposed a bespoke template for such a guide in booklet form. This was trialled on new tenants in both the private and social housing sector. This research identified that whilst many residents valued the document, as it was tailored to their home, many admitted they had put the booklet into a drawer until needed (Menon and Sharpe, 2013). Many tenants admitted a 'trial and error' approach to operating heating systems, timers and ventilation systems within their home and several noted that asking a neighbour for advice seemed to be the best option, potentially perpetuating poor ventilation or energy efficiency habits. With increasingly airtight homes the importance of good ventilation practices is paramount and the occupant guides are a simple way of conveying the ventilation design intent.

Further MEARU research undertaken as part of the EPSRC funded domestic laundering project identified that moisture loads in homes can be significant and are further exacerbated by residents drying clothes on radiators in key living spaces. The project surveyed resident habits (n=100) relative to ventilation regimes and identified that even in naturally ventilated homes, occupants often do not adjust trickle vents or open windows regularly. There was a general lack of appreciation of the importance of simple ventilation (Menon & Porteous, 2012). With increasingly sophisticated mechanical ventilation systems

including whole house mechanical ventilation with heat recovery (MVHR) becoming progressively mainstream, residents need clear and effective guidance to allow the confident operation of these for effective dwelling ventilation.

A recent survey undertaken by Ofcom, the independent regulator and competition authority for the UK communications industries, highlights that online video is becoming increasingly popular, with more than half of adults (54 %) watching television or video on a computer or mobile phone in 2015 (Ofcom, 2015). Almost a quarter (23 %) of respondents also said they had watched short video clips within the week of the survey, highlighting the popularity of video on social media. Smartphones have overtaken laptops as the most popular device for accessing web-based information, with record ownership and use transforming current communication methods. Within the social housing sector, the use of these technologies and associated applications could be developed further to allow greater access to occupant guidance and information. With this in mind, MEARU commissioned a filmmaker to produce a short information film titled 'Ventilate Right' to test the medium of film as a communication tool principally for social housing providers and their residents. The film was hosted as an online video on the website 'Vimeo' to increase accessibility and coverage.

Within that context, this paper examines alternative methods of communicating good practice for dwelling operation with a particular focus on ventilation and compares the effectiveness of a paper-based occupant guide with that of a short public advice film (hosted online) which gives helpful advice to maintain a healthy indoor environment in a simple, accessible and highly visual format.

## **Methodology**

The film, commissioned by MEARU in November 2015, was produced over a short period of time (three months from initial scriptwriting until final editing) with limited funding. The brief to the filmmaker was to produce five minutes of footage which clearly communicated the importance of maintaining good indoor IAQ levels and reducing indoor moisture loads with simple advice of how this could be achieved in both naturally and mechanically ventilated homes. The greatest challenge was to visualise the concept of 'air and moisture movement' within the house. Whilst poor ventilation can manifest itself visibly in the form of dampness and mould growth, stale and polluted air does not have such a tangible quality. In order to address this for the film, artist Rachel Duckhouse was commissioned to illustrate various moisture and potential pollutant flows for overlay animation on the film by the editorial team.

## **Film production structure**

The film was structured in such a way to address key findings of previous MEARU research with regards to moisture reduction, CO<sub>2</sub> and VOC's within the home environment. Each common resident habit and its consequences were documented and then the relevant occupant advice was integrated. Filming was undertaken at two houses in the Kingdom Housing Association development in Dunfermline, Fife, Scotland in houses which were constructed in 2013 to 2010 Building Regulations. The houses were semi-detached but each were constructed to varying thermal standards with different modes of ventilation. House 1 was Passive House certified and an MVHR system was installed. House 2 was naturally ventilated with mechanical extract fans in the kitchen and bathrooms. Residents in each house were willing for their houses to be filmed internally and assisted in demonstrating the

use of their ventilation controls as part of the filmmaking process. The film was aimed at both housing providers and residents and it was also free to access via the internet. The key challenge was to ensure that the film was not too simplistic but sufficiently technical and informative to communicate useful ventilation advice. The film content was intentionally pitched so as not to cause occupant alarm by not over stressing the health risks associated with under ventilating, instead it promoted the positive impact of a healthy indoor environment.

There is increasing evidence of a general lack of awareness of trickle vents with many occupants being unsure of where they are and when they should be used, leading to them remaining in the closed position for most of the year. Often these are inaccessible at the window head or are occluded by blinds and curtains (Sharpe et al., 2014a). The film encourages residents to locate these within their home and become familiar with opening and closing them on a regular basis. During the filmmaking the researchers noted that the living room trickle vents in House 2 had previously been taped closed by the occupant.

Potential sources of moisture within the home including showering, cooking and laundry were identified and good practice suggestions were made to minimise the impact of moisture loads with the home. The importance of opening windows was highlighted particularly for when drying clothes indoors to prevent a build-up of moisture in the home. An EPSRC funded project undertaken by MEARU in 2008 recorded the prevalence of the practice of indoor clothes drying within living spaces and bedrooms which in turn increases the moisture loads these key spaces (Menon et al., 2008).

The cleaning and maintenance of ventilation grilles and filters is critical to ensuring that the systems are working efficiently and are removing air at the rate in which they were designed. Housing Associations have varying advice and practices on the resident's level of involvement in this process but the film highlights good practice and identifies that filters should be cleaned (whether this is done by the resident themselves or for a call out to the maintenance team), the frequency of this is provided in the manufacturer information (Menon, 2015). Whilst the responsibility is on the occupant to maintain good ventilation regimes, if the means of doing this is compromised by ineffective mechanisms then their IAQ could equally be compromised. This is of particular importance in homes with MVHR systems where the resident is more reliant on this system to introduce outside air into their homes.

The film makes particular reference to houses with MVHR systems which are becoming increasingly mainstream in response to improved thermal energy requirements. MVHR systems have controls which are relatively straightforward but residents need to know when to operate 'boost' settings to increase the rate of air exchange when rapid moisture removal is required during activities such as cooking or showering. At a very basic level, residents also need reassurance that the system consumes minimal electricity and concerns regarding energy consumption should not lead to the disabling of the system.

There is increasing concern regarding high levels of volatile organic compounds (VOCs) within our indoor environments - these are off-gassed from building materials, fire retardants in soft furnishings (Figure 1) and everyday cleaning products (Liddell et al., 2008). The film aims to raise awareness of this in the context of the importance of maintaining good access to fresh air to remove any potential pollutants.

Upon completion of the film a launch event was held at the Glasgow Film Theatre (GFT) to promote the film within the social housing sector and among key policy makers and stakeholders. An invitation was sent to each Housing Association in Scotland and the event

was well attended with an engaged audience willing to provide detailed critical feedback during a question and answer session following the film screening. Subsequently the film was uploaded to 'Vimeo', a film based media website which allowed a platform for monitoring views but also allowed organisations to link to it on their own websites.



Figure 1 Potential VOC release from fire retardants in soft furnishings

In order to gain further feedback, one year later (February 2017), a follow up postal survey was sent to housing officers within Housing Associations across Scotland to ascertain whether they were aware of the film; whether they would consider using it as part of their handover process and to gain further feedback regarding the content of the film itself. In addition to this, the survey asked social landlords probing questions regarding their current handover procedures and whether these could be improved by the use of enhanced digital media communication tools.

### **Data-Feedback from housing providers**

For the purposes of this paper feedback from the film is centred on a short survey questionnaire which was distributed by postal service to Housing Associations (n=60) across West Central Scotland. Whilst the return rate was only 25 %, the information returned was significantly detailed and many respondents expressed a willingness to host the film on their website and engage in the development of further occupant guidance via web-based communication tools.

When asked whether it is standard procedure within their organisation for a housing officer to accompany a new resident when they first move in 60 % agreed this to be the case indicating that 40 % of residents are given keys and require to understand the workings of the home themselves. 67 % of respondents confirmed that their Housing Association issue new tenants with a handbook relative to their property however of this figure only 20 % could confirm that this included technical guidance on the use and maintenance of the mechanical ventilation systems (including both extract fans and MVHR systems).

It is evident from feedback that a lot of practical advice is delivered verbally by housing officers and maintenance departments with 73 % of Housing Associations confirming that advice regarding moisture control in the home is provided to residents. Whilst this is likely to be beneficial to the occupants, a more formal documented process which could allow residents to re-visit it once they have settled into their new dwelling or allow those family members not present at the handover meeting to benefit from the information.

Housing Associations certainly have the resource in place to deal with any residents having difficulty operating mechanical ventilation systems, 73 % identified that a maintenance officer, technical inspector or estates team member would deal with such problems however there seemed to be less clarity ascertaining who was responsible for changing filters on mechanical ventilation systems with only 53 % of respondents noting that they undertake this scope of works. Of those 53 %, only 25 % would only change a filter if a problem was identified by a maintenance officer thereby implying that filters were not changed on a regular basis. 67 % of respondents noted that their tenants were expected to clean ventilation grilles themselves yet little or no advice was contained in the tenant handbook of how to go about this or how to determine whether the fan itself was indeed performing as it was designed to.

Of the Housing Associations surveyed, only 33 % noted that they currently host occupant guidance on their website with most commenting that their primary method of communication with residents is through a resident newsletter or e-bulletin. However, in response to a question enquiring whether they would consider hosting information regarding ventilation and IAQ on their own website, 100 % answered positively.

The questionnaire progressed with a request for the respondent to view the film online at <https://vimeo.com/163384704> and provide feedback on the content, duration, style and target audience. 67 % of respondents viewed the film and feedback was varied and sometimes contradictory - some reported the film was too long and detailed whilst others noted it could have benefited from more discussions of the impact of poor IAQ and more examples of the potential causes. 60 % however reported that the film provided simple and effective advice and was pitched correctly for its target audience. When asked if they thought that a film is a better way of telling residents about the importance of ventilation than a technical manual, 100 % of respondents agreed with several noting that paper-based documents often get misplaced in the home therefore a digital format was deemed more beneficial.

The feedback concluded with an open question asking their opinion of the best method of advising tenants how to ventilate homes. The majority of respondents noted that the 'face to face' approach was favoured as it is not only the most effective method of locating and demonstrating controls but it also established a relationship between the housing officer and the resident which is key to any Housing Association. Several respondents appreciated that coordination of this handover was a fairly labour intensive process. It was also noted anecdotally that given the high percentage of non-English speaking residents within the social housing sector, highly visual formats of communication are much more beneficial. One respondent suggested a digital format which could be distributed via mobile technology may be relevant in the coming years given the prevalence and accessibility of social media across all social sectors.

In addition to the survey data, the feedback on the effectiveness of the film was garnered at a film launch hosted at the GFT which included a screening of the film and then discussion panel, feedback from industry. Some feedback suggested that the film was not technical enough whilst others disagreed and highlighted that it hit its target audience. Several Housing Associations present at the event requested DVD formats of the film so they could be used as a training video to their housing officers. On the day of the film launch the BBC covered the story and following this the subject of IAQ became a feature on BBC Breakfast on prime-time UK television. The web-based BBC news article provided a link to the film and the number of views was tracked which since the film was launched it has been

viewed nearly 2,000 times. This has also prompted several Housing Associations and other organisations to host the film on their respective websites.

## **Discussion**

The data clearly demonstrates that there is currently no standard handover procedure for new tenants in social housing and whilst a tenant handbook is available, the content and method of issue varies significantly. It is evident that whilst many housing providers have housing officers who show a tenant around the house demonstrating the key features of the home others simply give a set of keys to new tenants and they are left to a process of 'trial and error' or forced to consult overly complicated technical manuals. Respondents anecdotally indicated that new residents are too overloaded with information on the day they move in and often the maintenance officer is required to deal with any problems which arise at a later date. This highlights that a more accessible medium which could be re-visited by members of the same dwelling may be beneficial, as such, the online film can be hosted on landlords website or on social media and accessed when required. Given the statistics regarding the increasingly widespread use of smartphones using this as a tool to provide advice to residents seems to be advantageous.

In comparison to the effectiveness of the paper based logbook, a film advising residents how to use their home is clearly an effective tool. Issues relating to residents ability to read plans to locate systems and controls are removed and whilst the film based advice guide may not be particular to their home, residents can instantly make visual connections to similar features in their homes and where they are located. Home log book providers have been developing digital platforms to provide digital storage for manuals and technical brochures which is certainly a step towards addressing previous resident feedback which suggested that keeping a manual in the drawer is the norm.

## **Conclusion**

This paper highlights the potential demand for further public advice films for occupants with regard to the changes that require active ventilation to balance energy efficiency and indoor air quality. The 'Ventilate Right' film has succeeded in its aim to raise awareness of the importance of ventilation for general living environments. It has been an excellent pilot study to enhance and further develop occupant guidance using a variety of media which can be potentially integrated with the ever increasing popularity of mobile technologies. It is also important to note in the context of the building performance gap between designed performance and actual recorded data that whilst occupant behaviour is an important factor there is an understanding that the ventilation systems in the house should be installed correctly, are well maintained, are simple to operate in the first instance and the planned ventilation strategy must be effectively communicated. A resident can only expect to regulate their indoor environment if these systems are in place and are performing as designed. The consumer market for indoor air monitors and alerts synchronised with an application on mobile technology is in its infancy but as the awareness of healthy indoor environments increases the popularity of such devices will no doubt develop and has the potential to be combined with occupant guidance for dwelling operation.

Housing Associations are currently addressing occupant guidance with varying degrees of success. Ultimately good ventilation advice is critical to social landlords as they have a duty of care to their residents to provide indoor environments which are not only thermally efficient but also healthy.

Housing providers which have developed new build housing stock since the October 2016 revision to the Scottish Building Regulations will require to develop a body of practical advice and tips for residents regarding to help with maintaining good IAQ particularly in light of the requirement for CO<sub>2</sub> monitors in principal bedrooms, which will no doubt trigger a new realm of queries from residents.

To conclude, more research is needed in this area with enhanced engagement with housing providers to develop tools to help them deliver occupant advice effectively and consistently. Further research to test the effectiveness of the occupant guidance whether in paper based format or using media such as short film could be undertaken through a programme of environmental monitoring before and after the guidance has been issued – this would allow an assessment of the impact of occupants habits. This research together with the potential use of mobile smartphone technologies as a platform for resident engagement are exciting propositions.

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