

# Eliminating Chimneys

Should it come with a government health warning?

*The Link Between Energy Performance, Air Quality and Asthma*

The Energy Performance of Buildings Directive (EPBD) is pushing energy conservation to the top of the consumer agenda. One of the methods of achieving energy efficiency is to reduce air filtration through the fabric of the building. Air filtration can also be reduced by using chimney dampers, or in some cases eliminating chimney flues altogether. By encouraging the elimination of chimney flues, the Energy Performance of Buildings Directive could open the door to increased air quality problems, including the increased prevalence of asthma in the population. This is potentially a serious problem, since the prevalence of asthma in Ireland has already reached pandemic proportions.

A detailed study carried out by 4 Scottish academics entitled 'domestic ventilation rates, indoor humidity and dust mite allergens', concluded that it is more likely that relatively tight, energy efficient, modern dwellings will be subject to progressive and cumulative moisture build-ups during the winter months, if windows remain closed. They are also likely to have water vapour burdens that allow Relative Humidity (RH) to regularly rise above the 60% threshold, allowing the establishment and proliferation of dust mite colonies. Furthermore, diurnal (day/night) temperature variations, particularly in lightweight construction that have little thermal mass, will be greater, increasing RH and condensation rates, which can be reabsorbed by carpets, bedding and soft furnishings.

According to the Asthma Association of Ireland 470,000 people in Ireland have asthma, the fourth highest prevalence in the world. The problem is serious and in some cases life threatening to the sufferers, but it also hurts the economy. Asthma sufferers loose on average 12 days from work per annum and there are between 6,000 and 7,000 asthma related hospital admissions per year. Just over half of the admissions are visits by children less than 14 years of age. In the U.K. the problem is even more severe and the prevalence of asthma symptoms in 13 to 14 year olds is the worst in the world. Generally speaking, asthma is more prevalent in moderate, maritime climates such as ours.

Asthma is caused by Dust Mite colonisation. The ideal conditions for mites

to proliferate are at a temperature of 25° C and a relative humidity of 80%. The faecal pellets from mites contain very high concentrations of allergens which remain stable for at least 4 years, producing a cumulative antigen burden. Studies show that hygroscopic fabrics such as carpet floor coverings, bedding and other home fabrics, absorb moisture from the air during the diurnal cooling cycle. The micro-climates produced by home fabrics can produce favourable conditions for colony establishment and proliferation. Recent studies (*Gunnarsen et al*) found significantly more mites on the floor than in beds, with on average 15 times more mites found on carpets than on lacquered wood floors.

Table 1 shows air change rates and air flow in  $m^3/h$  for five living room models based on five generic house types typical of the epoch in West Central Scotland.

**Table 1** Air change rates and air flow in  $m^3/h$  for five living room models based on five generic house types typical of the epoch in West Central Scotland.

	Max	Min.	Ave.	Vol. ( $m^3/h$ )	
	(ac/h)	(ac/h)	(ac/h)	( $m^3$ )	
1900 model	2.15	0.78	1.66	83	138
1930 model	2.00	1.10	1.63	42	69
1950 model	1.03	0.63	0.83	37	31
1970 model	0.95	0.05	0.74	41	31
2000 model	0.63	0.23	0.45	33	15



Cultural factors and changing demographics also play a part in increasing the air quality problem. Children now spend more time indoors playing computer games and watching television than heretofore. Increasing property prices has reduced the average size of homes and rooms and this has further exacerbated the problem.

Sustainable Energy Ireland (SEI), the government body tasked with conserving energy and reducing CO<sub>2</sub> emissions, is in the course of finalising its software based energy calculation method which will be known as DEAP. This software incorporates a range of energy saving methods, including savings to be made by eliminating chimneys from the house. The Irish concrete Federation has calculated the savings to be made to be in the order of 17Kwh/ $m^3$  or 11% of the overall savings required to take a standard size house, currently complying with part L of the building regulations, to achieving an 'A' rating under the Energy Performance of Buildings Directive, using the DEAP calculation method.

The substantial energy savings to be made, combined with the substantial cost savings to the builder, are likely to encourage the elimination of chimneys in many developments. Should chimneys be eliminated without the incorporation of mechanically controlled ventilation systems, then problems associated with indoor air quality, including asthma are likely to increase. If SEI are to proceed with the incorporation of this measure i.e. the promotion of elimination chimneys from buildings, then it must come with a health warning.

Theoretically, householders can alleviate ventilation problems by taking simple measures such as opening windows on a regular basis during winter time. However, such a measure would be self defeating in terms of energy conservation and people will be reluctant to expel costly heat from their homes. The likely outcome is that many people will leave windows closed during winter time, resulting in air quality problems, improved conditions for dust mite reproduction and the threat of the increased incidence of asthma in the general population.

This gives rise to the question as to whether the exclusion of chimneys, which are one of the main sources of permanent ventilation, should be linked to the mandatory inclusion of mechanically controlled air ventilation as an alternative ventilation source. At the very least the imminent launch of DEAP requires that Part F of the Building Regulations (Ventilation) be reviewed as a matter of urgency.