Addressing the standards deviation

Indoor air quality is a hot topic at the moment, yet there is no indoor air quality standard for offices and other workplaces in the UK. *John Barker*, managing director of Humidity Solutions feels this is a serious omission.

There is no doubt that indoor air quality (IAQ) is now being given considerably more attention than was the case a few years ago. However, there are still many workplaces where the IAQ is far from satisfactory, but there is no legislation to enforce improvement.

I would argue that this is a topic that needs to be addressed with some urgency. Research shows that most of us spend up to 90% of our time indoors, a significant proportion of which is in the workplace. In the home, we can take measures ourselves to maintain good IAQ but in the workplace we are dependent on the systems in place and how they are operated.

The situation is different in schools, where the Building Schools for the Future programme laid down standards for new educational establishments, which included IAQ. The latest version of *Building Bulletin 101: ventilation for school buildings* also places great emphasis on IAQ.

Clearly, these moves to maintain good IAQ for our children are to be welcomed but what about the 32 million adults currently in employment – many of them working in buildings?

In discussing this topic it is worth taking a look at what actually happens in the UK at the moment. It is well documented that our cities are becoming increasingly polluted with car fumes, airborne industrial waste and even particulates from the fashionable log burners.

We tend to assume that once these pollutants have drifted away from their source, they leave nice clean air behind them. So, at this point we pull that air into our buildings, referring to it as fresh air ventilation – whereas it is actually a slug of polluted, harmful air. Yes, that air is filtered, but there is no standard requirement for the level of filtration that should be applied.

Many developments have a board outside proudly proclaiming 'fully air conditioned offices'. What they actually mean is that the offices are temperature-controlled for thermal comfort; they are not necessarily providing adequate filtration of incoming air or controlling the relative humidity (RH). Thus, they are not meeting the Oxford English dictionary definition of air conditioning, which is "A system for controlling the humidity, ventilation, and temperature in a building or vehicle, typically to maintain a cool atmosphere in warm conditions".

In fact, this highlights the parallel issue of the importance of humidity control in achieving and maintaining both thermal comfort and good IAQ. As we pointed out in the September 2017 issue of *ACR News*, there are important interactions between RH and airborne pathogens such as bacteria and viruses.

To recap briefly, low RH (<40%) enables these pathogens to remain suspended in the air for long periods, so they can travel further and spread infection across a wider area. Viruses such as influenza and norovirus (the 'vomiting bug') survive longer at an RH of 20-30%, whilst a mid-range RH between 40% and 70% will minimise their survival rate. Tests also indicate that the infectivity of the influenza virus is increased by both low and very high RH, with minimum infectivity at 50% RH.

RH has been shown to have a similar effect on airborne bacteria, with a high mortality rate of airborne pneumococci, streptococci and staphylococci at intermediate RH levels.

As with IAQ, there is no specific legislation relating to RH in general workplaces, though many organisations recommend maintaining an RH of 40-60% in commercial workplaces. These include the Humidity Group of the Hevac Association, the World Health Organisation and the National Association of Optometrists. This is also the range recommended by BS EN 29241 as the optimum for visual display terminals.

Above 60%, people will feel uncomfortable out of all proportion to the actual indoor temperature, with reduced capacity to focus on their work. If comfort cooling is installed, occupants will typically reduce the set point to alleviate that discomfort, resulting in increased energy costs.

High humidity also encourages mould growth and consequent damage to a building's fabric and fittings. It may also result in condensation on cold surfaces, potentially causing damage or creating a slip hazard.

At the other end of the spectrum, RH below 40% makes people feel colder than the actual temperature would suggest so they turn up the heating and, again, increase energy consumption. Raising the set point temperature also lowers the RH even further so the problem is exacerbated. Low RH may also cause a wide range of health problems and could increase the rate of absenteeism.

Problems relating to RH in the UK tend to be because of low humidity. During the winter months, buildings are usually heated to around 20°C and as the temperature rises the RH falls dramatically. For example, outdoor air at -5°C and 100% RH has a moisture content of 0.0025kg moisture per kg of dry air. When raised to 21°C dry bulb, with no humidification control, the resultant RH is a mere 18%.

This brings the focus back to what we do with outside air as we pull it into buildings. Firstly, we need to ensure that pollutants are removed by applying effective filtration that is dictated by appropriate IAQ regulations.

Second, in addition to tempering incoming air to either raise or lower the temperature, we need to control the RH to ensure that it contributes positively to both thermal comfort and IAQ.

I believe the main barrier to properly addressing these IAQ issues is commercial. We seem to be shying away from setting coordinated regulated standards to ensure excellent IAQ, as this would result in extra investment in plant and slightly higher running costs due to higher maintenance requirements. What we should be considering as an industry, employers, employees and society as a whole is whether improving IAQ to underpin improved health and wellbeing is worth that investment. I believe it is.