

# **Sick Building Syndrome**

## **Assessment and Rectification**

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### **Introduction**

It is important that buildings provide a healthy, safe and comfortable environment for occupants. Considerable attention has recently been given to the high incidence of sickness amongst people who work in modern office buildings. SBS is not only of obvious concern to the sufferer, but has commercial implications, in terms of increased absenteeism, reduced productivity, increased staff turnover, low morale, etc. This chapter will help owners, developers, facilities managers, architects, surveyors and other professional advisers in assessing existing and potential office buildings. It will also be of assistance to students in understanding this relatively new but important phenomenon.

The first section of this paragraph explains SBS and its possible causes. It highlights and evaluates factors, which should be taken into account in determining if it's likely to exist or how it can best be eliminated.

## **SBS Explained**

SBS by its nature is difficult to define. It is generally considered to be a group of symptoms which people experience specifically at work, the typical symptoms being:

- Lethargy.
- Loss of concentration.
- Nausea and dizziness.
- Head ache.
- Hoarseness, wheezing and itching.
- Skin rash.
- Eye and nose irritation.

While the population as a whole generally exhibit these symptoms, with SBS, certain patterns evolve:

- The symptoms disappear or decline away from work.
- They are more prevalent in clerical staff.
- They occur more in public buildings.
- They are most common in office buildings with air conditioning.
- People with most symptoms have very little individual control over their environment.

SBS should not be confused with legionnaires' disease.

## **Causes**

SBS is generally considered to result from one or more of the following factors:

- Uncomfortable working environment due to poor lighting, high temperatures and inadequate air movements/stuffiness.

- Low relative humidity.
- Odours.
- Air-borne dust and fibres.
- Chemical pollutants.

## **Ventilation**

The ventilation is often regarded as the most significant factor in affecting buildings, which are sealed and have mechanical ventilation or air conditioning. The assumption is that lack of fresh air is the major cause of SBS.

Fresh air is required for various reasons, the main ones being to supply air for respiration and to dilute CO<sub>2</sub>, odours, cigarette smoke and other contaminants. Ventilation, although not necessarily fresh air, may also be required to maintain personal comfort, i.e. for the control of air temperature.

Various standards exist for ventilation and fresh air supply rates to offices. They range from 5 litres per second per person in general offices up to 25 litres per second per person for personal offices or boardrooms where smoking is heavy.

The impetus to seal buildings and increase the control over the environment is usually motivated either by necessity for open plan deep offices, which are difficult to ventilate naturally or by desire to save energy (and money). The practice of tight control over indoor environment poses problems if the ventilation or air conditioning system is in any way imperfect.

Mechanical ventilation of buildings is less satisfactory than natural ventilation because:

- Mechanical ventilation and air conditioning allow more precise overall environmental control but little personal or local control.
- The air supply into mechanical ventilation systems can often be varied during operation, in order to increase the proportion of air that is recirculated and to reduce the quantity of fresh air drawn in from outside.
- Mechanical ventilation and air conditioning systems have components that are susceptible to failure and to poor design or installation.
- Recirculating ventilation or air conditioning systems can harbour organic growth and may distribute pollution from one area though out the building. Inadequate fresh air is probably a contributory factor rather than a sole cause of SBS.

## **Humidity**

It is necessary to be able to control humidity in the work place for a variety of reasons. Very high humidity can cause discomfort, especially at elevated temperatures and may even result in excessive condensation. Low humidity causes drying of the mucous membranes resulting in eye, nose and respiratory discomfort. For most offices a relative humidity of 40-60% is appropriate and will prevent the build up of static electricity.

Humidification is important for comfort and health; but if the humidifier is allowed to become contaminated with micro-organisms and distribute contaminated water from humidifiers or from air washers, it can cause various illnesses such as 'Monday sickness' or 'humidifier fever'.

Several types of equipment exist for controlling humidity. In assessing the options, the primary object should be to prevent dispersion of heavily contaminated water droplets from humidifiers or air washers. The systems, which are least likely to contribute to SBS in ascending order, are:

- Steam Humidification.
- Hot water evaporators.
- Cold water evaporators.
- Spinning disc and spray humidifiers.
- Air washers.

The humidifier water supply should be clean and free from contamination. Water supplied directly from the mains greatly reduces the risk of contamination. The humidifier and storage tanks or reservoir should be regularly and thoroughly cleaned. This is particularly important if the system is of a spray or atomising type.

## **Environmental comfort**

Various standards have been set for the comfort of building occupants, the most widely accepted being the international standards (ISO 7730-1984). Recommended comfort requirements:

- Operative temperature 20-24°C (23°C is normally accepted for the UK).
- Vertical air temperature at head and ankle height should show less than 3°C variation.
- Floor surface temperature 19-26°C (29°C with floor heating systems).
- Mean air velocity less than 0.15 m/s.

Dissatisfaction with the thermal environment is a greater problem in large air-conditioned building than in small and naturally ventilated buildings. In a building with opening windows and radiators the occupants are able to vary the thermal environment to some extent. If the air conditioning or heating system in a large 'tight' building fails to control the thermal environment, there is often little that the occupants can do to improve conditions.

A sensation of 'stuffiness' may play a part in promoting SBS, indicating dissatisfaction with the working environment.

### **Visual environment**

Potential problems in the visual environment are inadequate illumination, uniform or dull lighting, discomfort glare, and flicker from luminaries and tinted windows, which reduces the amount of daylight. These cause eyestrain and headaches and are a major contributor to SBS.

It is generally accepted that there is a link between the level of workers' satisfaction and their perceived ability to control the environment. Perhaps one of the most effective and economic solutions, especially in deep open plan offices, is the provision of task lighting.

The use of up lighting in open plan offices has greatly added to comfort levels. Similarly, the use of high frequency lighting is considered to greatly add the office worker productivity. The reduction of ultraviolet light by the installation of appropriate fittings is considered to reduce the symptoms of SBS by reducing indoor chemical pollution.

## Contaminants

The potential range of contaminants in offices is enormous. The main sources of air-borne contaminants are:

- Building occupants: pollutants released by occupants of the building include CO<sub>2</sub>, water vapour and micro-organisms and matter. Smoking is a considerable source of air-borne pollution.
- Building fabric and furnishings: the main sources of pollution are from releases (or 'offgassing') from the fabric and furnishings of the building; dust and fibres from carpets, floor tiles, etc. Formaldehyde, especially from urea formaldehyde installations and certain types of board, is an irritant, and may therefore cause some symptoms similar to those of SBS.
- Office machinery: photocopiers have been suggested as a cause of building sickness, and pollutants such as ozone can collect in very poorly ventilated photocopying rooms.
- Ventilation and air conditioning systems: ventilation and air conditioning systems can transmit air-borne disease including 'humidifier fever', and various infections. Even where air conditioning systems do not contain humidifiers, items of plant can act as breeding sites for organic growth. This is true of items such as cooling coils where condensed water can collect, and these have been shown to release micro-organisms in the air stream.

## **Management and Maintenance**

- Efficient planning, particularly with the organisation of office space and storage means less clutter and over crowding. Untidy piles of papers and books not only create dust, but also collect dust as these areas are not easily cleaned.
- Management should be sensitive and people orientated, as this will promote good will and higher levels of satisfaction.
- Proper maintenance and regular cleaning of mechanical plant and ductwork are essential.
- The cleaning regime for soft furnishings, carpets and curtains should be carefully considered. Agents used should be chosen to eliminate potential sources SBS and not inadvertently add to it.
- Files should be vacuum cleaned in order to remove paper and other dust as thoroughly as possible.
- Vacuum cleaners generally should be fitted with high efficiency final filters.
- Cool shampooing of carpets, chairs and other fabrics should be undertaken periodically.
- If symptoms persist steam cleaning should be considered.

## **Noise**

Noise in itself has not generally been considered to be a main cause of SBS. It is clear, however, that both office workers' productivity and a poor acoustic environment can affect comfort levels. Most noise sources from both fixed plant and machinery and office equipment can normally be silenced by appropriate physical measures.

In open plan offices the maintenance of conversational privacy is important, and can often be achieved by the positioning of appropriate screens. The need for privacy suggests that cellular offices or several groupings of up to five workers in open plan offices help reduce the symptoms of SBS.

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