ITC Grand Chola, Chennai

Indoor Air Quality in the Indian Hospitality Sector

Donald M. Weekes CIH, CSP, FAIHA, Partner, InAIR Environmental Ltd., Ottawa; Canada, Immediate Past President, Indoor Air Quality Association Inc.

Introduction

The quality of outdoor air and its effect on indoor air quality (IAQ) in homes and businesses has been a growing concern in India over the past decade. In particular, the outdoor air pollution created by increased use of biomass fuels and the resulting elevated levels of particulates has been a major issue for Indians. Nation-wide approximately 78% of the Indian population relied upon biomass fuels and about 3% on coal. India has the largest burden of disease due to the use of unclean household fuels and 28% of all deaths in developing countries such as India occur due to indoor air pollution. IAQ is a major concern for visitors to India who stay in a hotel or other hospitality suites. In particular, visitors on popular travel websites have expressed concern about building-related issues such as mould growth, objectionable odours, failing or inadequate ventilation systems, elevated humidity and temperature levels, particulates from combustion sources, chemicals in cleaning products, pesticides and other concerns. Based on current observations, it is noted that many of these concerns are outdated, and they are no longer found in India's best hotels. These hotels have been vigorously addressing indoor air quality in their facilities over the last decade. However, there are continuing IAQ issues in many of India's older hotels that have caused difficulties for travelers and for the employees in these hotels. This article will address some of these issues, and what can be done to improve IAQ in these settings.

About the Author

Don Weekes is a Certified Industrial Hygienist and Safety Professional with over 33 years of experience in dealing with issues involving hazardous materials, including asbestos, lead paint, and mould. He graduated from Ramapo College, New Jersey, USA with a Bachelor in Environmental Science and from New York University with a Master in Arts (Occupational Safety & Health).

Hospitality Sector in India

The hospitality sector is a key driver among the services sector of the Indian economy. India's rich and diverse cultural and historical heritage, abundant natural resources and biodiversity provide numerous tourist attractions.

It is estimated that the travel and tourism industry contributed a total of approximately US$ 136.3 billion to India's GDP in 2015. The GDP contribution from the travel and tourism industry is forecast to rise 12% in the next decade. The sector supports 40 million jobs and is expected to increase at a steady 2.1% by 2023. Statistics have shown that tourist visits to India have been steadily increasing at a rate of 16% over the last five years.

However, this steady growth in the hospitality sector and its contribution to the growing Indian economy are threatened by the inadequate indoor air quality in hotel and hostel guest rooms.

continued on page 56

continued from page 54

Airborne Particulates

Airborne particulates, both indoors and outdoors are a major issue in India. A recent paper by Rohra and Taneja (March, 2016) published in *Atmospheric Environment* titled 'Indoor air quality scenario in India — An outline of household fuel combustion' reported the following:

Cooking in Indian homes

- 80% of rural households use biomass fuel for cooking,
- ¼ of all ambient $PM_{2.5}$ is from cooking,
- 80% women are exposed to its health perils and 27.5% of under-five mortality in India is a result of its deadly effects,
- Worldwide, 4 million deaths and 5% disability-adjusted life-years occur from exposure to cooking particulates and fumes.

Photo 1: A typical morning in Delhi with high outdoor air pollution

In a WHO report, it is noted that approximately 2.0 million deaths and 39 million disability-adjusted life years (DALYS) (mainly of women and children) per year are due to unvented burning of biomass for cooking and heating; and about half a million of total deaths in India (WHO, 2002).

In a recent presentation titled 'Indoor Air Quality in India: Need and Concerns', Professor Mukesh Khare, Ph.D., of IIT Delhi discusses that a 'Pollutant released indoors is one thousand times more likely to reach people's lungs than a pollutant released outdoors'.

This issue also becomes important for the indoor environments associated with hotels such as restaurants, cafes and bars, lobbies and meeting rooms. Airborne particulates from cooking, smoking and infiltration from outdoor sources can lead to acute and chronic health effects among workers and guests.

Smoking in hotels, especially in bars, cafes and restaurants, can be addressed with bans on cigarette, cigar and pipe smoking in these spaces. A 2005 ASHRAE study found that the implementation of full smoking bans in these spaces can result in a reduction in $PM_{2.5}$ concentrations between 70 and 97%. The ASHRAE study did not see ventilation systems as a useful instrument to protect occupants from passive smoking in these venues (ASHRAE, 2005).

Microbial Contamination

Photo 2 shows an interior wall in a hotel room with heavy mould growth. This type of growth can occur when the ventilation system for the hotel, particularly within the interior walls, draws in the moist exterior air. This moisture meets the cool conditioned air in the room along the partition wall, creating condensation on the walls. This condensation leads to microbial growth under the vinyl wall paper in the hotel rooms.

Photo 2: Heavy mould growth on a hotel wall

Mould growth in Indian hotels has been reported by guests in numerous social media posts on TripAdvisor and other websites. Here are a few examples:

- "We found a room badly made, in need of repair, smelling of (also visible) mould. Also in the spa there was mouldiness all over the place."
- "The rooms were so moist from the mould on the walls that everything in my luggage felt wet after staying in the room for a few hours. "
- "The hotel does not have a single window. Therefore, the moisture is running down the windows (*sic*) every morning. The whole place is mould-infested and most rooms smell terribly."

It must be noted that these social media posts are about some Indian hotels, hostels and residencies. Many other hotels in India, including many newer and well built hotels, have not been reported for microbial growth in their guest rooms. However, it is a concern that must be addressed strongly by all hotels due to the perception that the hot and humid climate in India will automatically lead to mould growth in the hotels' guest rooms.

For microbial contamination, the most common health effects are:

- Allergic and hypersensitivity reactions,
- Irritant reactions,
- Fungal infections tend to be opportunistic and related to the individual's condition of health,
- Health effects from mycotoxins need further research, under exposure to high concentration (e.g., Organic Dust Toxicity Syndrome (ODTS)) or ingestion of mould contaminated food.

Health effects from mould exposure depend on:

- The health status of the individual and genetic factors related to susceptibility,

continued on page 58

continued from page 56

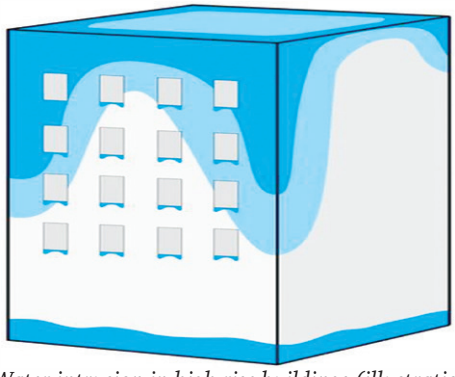

Figure 1: Water intrusion in high rise buildings (illustration courtesy Joseph Lstiburek).

- The organism,
- The dose,
- Other factors.

Microbial contamination will continue to be a problem in the hospitality sector due to the difficulties of controlling water activity, the prevalence of cellulose-based building materials in hotels that are susceptible to microbial growth, and the inefficiency of ventilation systems to screen out microbial spores.

Figure 1 illustrates the water intrusion problem for high rise buildings such as multi-storey hotels. Water from rain can penetrate the roof and windows, as well as air shafts. Water from ground water or flooding can penetrate the lower level of the building if it is not properly sealed and protected.

IAQ Investigation Protocol – CPCB Draft Document

For the hospitality sector, the recommended investigative procedure for indoor air quality issues is a thorough 'informed' inspection of the entire premises. This will require that the management of the hotel, hostel, restaurant, café, etc. work from a written protocol that can document what was found during each inspection. The inspection forms can then be retained as a record of any changes that have occurred in the premises. In addition, there should be a periodic update of the inspection form to take into account any new IAQ issues that arise. Finally, the management should periodically conduct a questionnaire on IAQ that is completed by the building's occupants and staff.

Photo 3: CPCB draft document

The Indian Central Pollution Control Board (CPCB) has published a draft document entitled 'Indoor Air Pollution Monitoring Guidelines'. This draft document outlines an integrated IAQ protocol for conducting indoor air quality investigations. The protocol includes the following components:

- Selection of type of building i.e. commercial, residential, sensitive;
- Conducting an IAQ building audit;
- Diagnosing IAQ related health problems;
- Selection of pollutants of concern corresponding to the type of building;
- Designing the monitoring programme of selected pollutants of concern;
- Setting up of IAQ guideline values for selected pollutants;
- Establishing an IAQ management and maintenance program to reduce IAQ risks;
- Protecting occupants from exposures to construction/ renovation contaminants; and
- Calculating the cost, revenue, and productivity impacts of planned IAQ activities.

According to the CPCB draft document, the integrated IAQ protocol should include three major areas of investigation:

- environmental measurements;
- building and ventilation characterization; and
- an occupant questionnaire.

A framework for understanding how indoor and outdoor sources of pollution together with the ventilation affect the IAQ in buildings is one of the essential requirements. The monitoring protocol also includes:

- schedule of measurements;
- specifications of the measurement equipment;
- how to select the representative space(s); and
- how to select the sampling sites in each space.

An efficient data collection program will allow the entry of majority of data and its findings in a readily accessible database so that it can be used by any interested party for a number of applications:

- developing the distribution of IAQ/building/ventilation characteristics;
- predicting IAQ (modeling);
- developing new hypothesis;
- establishing standard protocols;
- examining the relationship of symptoms to building and ventilation characteristics; exposure assessment/modeling;
- developing guidelines for building design and orientation; and
- construction, operation and maintenance.

Conclusion

Due to increasingly important IAQ issues such as airborne particulates and microbial contamination, all IAQ issues are beginning to be a priority for the Indian hospitality sector. As the sector continues to grow, it can be expected that the newer facilities will be built to minimize, if not eliminate the conditions and building materials that can result in IAQ problems for the occupants. The use of an integrated IAQ protocol by the hospitality sector and its management will help to define the IAQ issues in a building, and it will lead to improved IAQ in these buildings. The CPCB draft document is a useful starting point for building owners and managers to address the IAQ in their facilities.