Impact of Outdoor Seasonal Changes on Indoor Air Quality

Variables such as occupancy rate, ventilation rate, rate of contaminant accumulation, housekeeping, processes, integrity of building systems, temperature control, and moisture intrusion are known to impact the air quality within buildings. Most of these variables can be controlled, thereby, limiting the impact these variables may have on the expression of symptoms by an occupant. Certain variables such as seasonal changes and occupant variables (i.e. age and health) are less likely to be controlled or managed. For example, occupant variables in relation to symptom expression are very difficult, if at all possible, to assess on a qualitative or quantitative basis. On the other hand, seasonal variables are closely linked to occupant symptom expression and follow predictable trends. Let's look at some seasonally related stressors typical of Pennsylvania and their associated health effects.

Spring

Pollen, dust, mold, temperature and humidity begin to increase during the spring months (March, April, and May). As pollen, mold and dust concentrations increase, so do the associated symptoms. Interestingly, these symptoms, which also occur outside of the workplace, carry over into an employee's work shift and are often incorrectly associated with exposure within the workplace. Conversely, as temperature and relative humidity increase, many individuals experience fewer colds and respiratory irritations as the drying effects of low relative humidity experienced in the winter months no longer exist.

Summer

During the summer months (June, July and August) pollen decreases while mold, dust, temperature and relative humidity typically continue to increase. If rainfall is greater than normal, molds increase and dust levels decrease, and vice versa. Increases in mold and dust can impact individuals with various respiratory health issues. Another compound of concern particularly in urban areas is ozone which increases under certain atmospheric and air pollution conditions.

Although not an outdoor stressor, air-conditioning is used seasonally and can clearly impact occupants of buildings due to mold growth in the ventilation systems or on surfaces, and the reduced relative humidity indoors versus the higher outdoor levels can impact individuals with sinus problems. The other concern related to high outdoor levels of relative humidity and temperature is that the intake of fresh outdoor make-up air is set to a minimum to reduce air-conditioning costs. However, reducing the amount of fresh outdoor air introduction into a building allows airborne contaminants to accumulate within the indoor environment which is a potential concern.

Fall

In the fall (September, October, and November) mold levels tend to reach the highest concentrations of the year. This is primarily due to increased decay of grasses, leaves and other vegetation. These elevated concentrations can persist through November and into December. Early in the fall, pollen from select plants can cause reactions in some sensitive individuals. Interestingly, the intensity of these reactions can vary daily based on pollen release which is controlled by moisture, temperature and wind.

Winter

Outdoor airborne contaminants during the winter months (December, January, and February) are typically at their lowest levels of the year. As the ground freezes or is covered with snow, few if any mold spores are found in air samples. One of the more significant issues in the winter months is lower relative humidity. In addition, outdoor relative humidity is typically at its lowest point of the year, and indoor relative humidity is even lower due to heating of the air within the buildings. Temperature within a building should be kept as low as "comfortable" to minimize the effects of low relative humidity. Low relative humidity causes drying of the mucous membranes of the eyes and respiratory tract resulting in irritations and an increasing potential for respiratory infections.

The other cold weather concern is that the intake of outdoor make-up air is set to a minimum to reduce heating costs and freeze-out potential of coils in the ventilation systems. The reduced amount of fresh outdoor air introduction allows airborne contaminants to accumulate within the indoor environment which is a potential concern.

In summary, outdoor contaminants that impact air quality vary throughout each season of the year. The impact of these contaminants on individuals can be significant depending on their age, health (physical and psychological), job function, and management actions. It is important to point out that since individuals interact with the outdoor environment that the symptoms caused by these outdoor contaminants must be kept separate from indoor air quality issues.

For more details and to learn how we can assist in addressing indoor air quality concerns, please contact Harry M. Neill, CIH at hneill@1ssh.com or 888-873-9983, ext. 15.