

## Why Indoor Air Quality matters

Air pollution is the fourth greatest cause of death worldwide, with 92% of the world's population breathing air deemed unsafe by the World Health Organization. But while outside air pollution grabs most of the headlines, the air we breathe inside can be even more harmful. And as we spend around 90% of our time indoors, those places we feel safe may not be as healthy as they seem.

Additionally, other costly incidents in your building like mold growth, water leakage (increased humidity) and dust mites are strongly related to air quality and can be prevented by regular air quality monitoring.



## MANN+HUMMEL Air Quality reference table according EPA standard

	AQI	PM 2.5 (ug/m³)	PM 10 (ug/m³)	VOC (ppm)	CO <sub>2</sub> (ppm)	Formaldehyde (ppm)
<b>Good</b>	0-50	0 - 12	0 - 54	0 - 15	400 - 1000	0 - 0.2
<b>Moderate</b>	51 - 100	12.1 - 35.4	55 - 154	16 - 25	1001 - 1500	0.21 - 0.4
<b>Unhealthy for sensitive groups</b>	101 - 150	35.5 - 55.4	155 - 254	26 - 50	1501 - 2000	0.41 - 0.6
<b>Unhealthy</b>	151 - 200	55.5 - 150.4	255 - 354	51 - 75	2001 - 2500	0.61 - 0.8
<b>Very Unhealthy</b>	201 - 300	150.5 - 250.4	355 - 424	76 - 100	25001 - 5000	0.81 - 1
<b>Hazardous</b>	301 - 400 401 - 500	250.5 - 350.4 350.5 - 500.4	425 - 504 505 - 604	101 - 125 125 - 150	5001 - 10000 10001 - 15000	1.01 - 1.1 1.11 - 1.2

Each category corresponds to a different level of health concern. The six levels of health concern and what they mean are:

### Good

AQI is 0 to 50. Air quality is considered satisfactory, and air pollution poses little or no risk.

### Moderate

AQI is 51 to 100. Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people. For example, people who are unusually sensitive to ozone may experience respiratory symptoms.

### Unhealthy for Sensitive Groups

AQI is 101 to 150. Although general public is not likely to be affected at this AQI range persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air.

### Unhealthy

AQI is 151 to 200. Everyone may begin to experience some adverse health effects, and members of the sensitive groups may experience more serious effects.

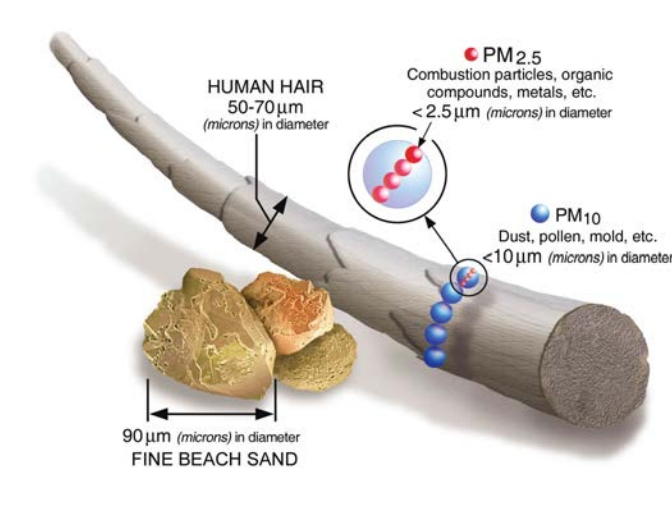
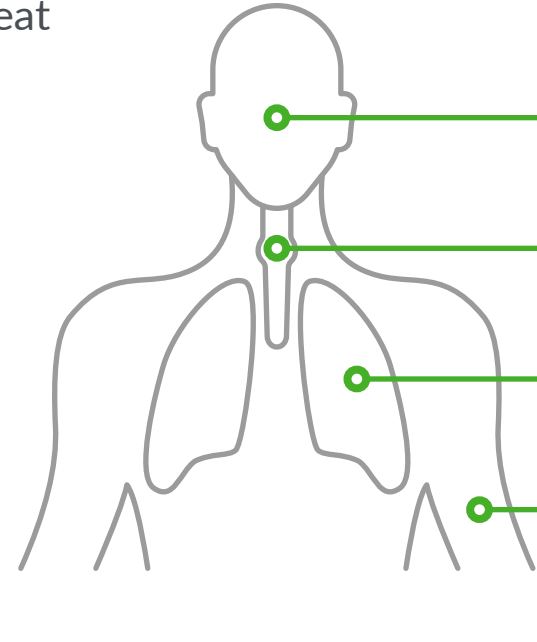
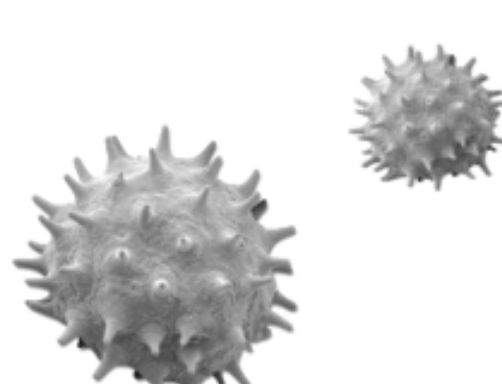
### Very Unhealthy

AQI is 201 to 300. This would trigger a health alert signifying that everyone may experience more serious health effects.

### Hazardous

AQI greater than 300. This would trigger a health warnings of emergency conditions. The entire population is more likely to be affected.

## List of most common pollutants

Definition	Sources	Risks for humans
<p><b>Particulate Matter (PM)</b> refers to the size of particles in units of µm. PM is also known as fine dust.</p> 	<ul style="list-style-type: none"> <li>Transportation</li> <li>Power and heat generation</li> <li>Industrial processes</li> <li>Cooking</li> <li>Pollen</li> </ul>	 <p>PM has been linked to:</p> <ul style="list-style-type: none"> <li>Eye, nose and throat irritation</li> <li>Breathing difficulties</li> <li>Lung irritation and coughing</li> <li>Aggravation of asthma attacks</li> <li>Weakend immune system</li> <li>Increased risk of stroke and heart disease</li> </ul>
<p><b>Volatile organic compounds (VOCs)</b> are organic chemicals with high volatility (i.e. can evaporate even at low temperatures). VOCs include hydrocarbons, alcohols, aldehydes and organic acids.</p>	<p>Solvents, liquid fuels, synthetic manufactured fabrics, furniture (particle boards), carpets.</p>	<p>Certain VOCs, especially at high concentrations indoors, have been linked to negative impacts on health such as: irritation of the eyes and mucous membranes, damage to the liver and kidneys, and allergic skin reactions.</p>
<p><b>Formaldehyde</b> is a VOC that is significant in the field of air quality monitoring.</p>	<p>Construction and insulation materials, furniture, household products (cleaning agents), cosmetics.</p>	<p>Formaldehyde is classified as a probable human carcinogen (cancer-causing agent) in both EU and US. Formaldehyde exposure has also been associated with respiratory issues and skin irritation.</p>
<p><b>An allergen</b> is a substance that can cause hypersensitivity (allergic reaction) in the body.</p> 	<ul style="list-style-type: none"> <li>Dust mites</li> <li>Volatile organic compounds (VOCs)</li> <li>Pollen</li> <li>Formaldehyde</li> <li>Mix of fragrances</li> <li>Mold spores</li> <li>Animal hair</li> <li>Bacteria (in the indoor air)</li> </ul>	<ul style="list-style-type: none"> <li>Allergies</li> <li>Asthma, diseases of the alveolus, respiratory symptoms</li> <li>Chronic sinusitis</li> <li>Headache</li> <li>Lack of concentration</li> <li>Irritation of the eyes and skin</li> </ul>

## The impact of Green Buildings on Cognitive Function

Cognitive function scores were better in green building conditions compared to the Conventional building conditions across nine functional domains, including crisis response, strategy, and focused activity level. On average, cognitive scores were:

- 61% higher in green building conditions
- 101% higher in enhanced green building conditions

CO<sub>2</sub>, VOCs and ventilation rate all had significant, independent impacts on cognitive function.

