

AIR QUALITY



Risks to Buildings, Occupant Safety & Environment

- ◆ Decreased outdoor and indoor air quality due to allergens (e.g. pollen)
- ◆ Risk of building-related and non-specific building-related illness
- ◆ Electrical system overload due to increased energy usage associated with ventilation and air conditioning systems
- ◆ Potential utility service interruption due to increased energy usage

Design Strategies

Strategy	Cost	Impact	Alignment
Select a minimum of double-paned tempered window and frames with an air barrier seal to provide greater air quality protection	\$\$	**	
Include mesh debris screens for gutters, eaves and vents to reduce accumulation of allergens	\$	*	
Include mesh screens into operable windows to prevent and insects pests from entering occupied areas	\$	***	
Ensure the building air intake is away from local sources of outdoor air pollution	\$	***	
Exceed industry standards for ventilation to keep indoor air pollutants and carbon dioxide levels low. Consider including a carbon dioxide monitor to monitor ventilation needs	\$\$	***	
Use demand-controlled ventilation based on carbon dioxide levels to reduce the introduction of outdoor air beyond required air flow rates	\$	**	
Ensure HVAC systems are HEPA ready and/or procure portable HEPA filters with carbon filters to be used during wildfire smoke events	\$	**	
Use the highest rated filter possible in HVAC systems (minimum MERV 13, and ideally HEPA) in areas with poor local air quality, such as areas with high traffic, rail, port, or industrial activity	\$\$	***	
Activated carbon filters can be incorporated into HVAC systems in areas with poor local air quality to reduce exposure to outdoor gaseous contaminants (e.g. VOCs)	\$\$	**	
Consider ventilation systems that reduce humidity and prevent allergens, such as dust mites, mould, and pollen	\$	**	
Include cooling in HVAC design to allow windows to be closed under conditions of poor air quality"	\$\$	***	
Connect cooling and ventilation systems in refuge areas to a source of back-up power	\$\$	**	
Ensure backup power to critical systems and areas to prevent system overload during high use of mechanical ventilation/cooling (i.e. when air quality is poor)	\$\$	*	
Eliminate infiltration of air from the parking garage into the building using air barriers and ventilation	\$\$	***	
Ensure sufficient ventilation in cooking areas to reduce particulate matter exposure	\$	**	
Further reduce indoor particulate matter levels in small rooms for extreme air quality events, such as a building amenity space, through use of air cleaners equipped with high-efficiency particle air (HEPA) filters or electrostatic precipitators (EP)	\$\$	***	
Place equipment and furniture with air circulation, temperature control, and pollutant removal functions of the HVAC systems in mind	\$	**	
Use building materials and furnishings that are low in volatile organic compounds	\$	***	

Sources of airborne contaminants from both inside and outside a building can have a serious impact on indoor air quality. Outdoor sources of contaminants include major roads, rail yards, industry, fireplaces and wildfire smoke events, while indoor sources of contaminants include off-gassing from building materials and furnishings, cooking, moisture, mould and pests. As the climate changes, climate scientists expect to see an increase in the number of wildfire smoke events and in the levels of summer ozone overall. Exposure to these contaminants have been linked to a number of short-term health effects such as fatigue, headaches, eye, nose and throat irritation, and impacts on cognitive function. Long-term health effects include respiratory diseases, cardiovascular disease and cancer. Emerging research shows association of poor air quality with birth outcomes, diabetes, obesity, mental health outcomes, cognitive development and cognitive decline. However, several measures can be taken to reduce exposure to poor air quality and improve occupant health and well-being.

Operations Strategies

Strategy	Cost	Impact	Alignment
Create a schedule to inspect, maintain and regularly replace high-efficiency air filtration media for all outdoor air building ventilation systems	\$	*	
Improve access to local outdoor air quality data by installing displays in common areas of the building	\$\$	*	
Close building openings to temporarily reduce the intake of outdoor air during extreme events, including forest fires	\$	***	
Keep relative humidity below 60% to control dust mites	\$	**	
Develop a whole-building strategy to manage moisture and mould by reducing wet or damp areas, standing water, and condensation (minimizing attraction for mosquitos and other insects)	\$	***	
Integrate indoor air quality concerns into purchasing decisions (e.g. building materials and furniture)	\$	*	

Power Outages
 Heat Waves
 Fire at the Urban Interface
 Severe Storms
 Seismic Events

Relative Cost/ Cost Premium		
Low	Medium	High
\$	\$\$	\$\$\$

Relative Impact		
Low	Medium	High
*	**	***

Community Benefits

Consider the following strategies to help improve the resilience of the community overall:

- ◆ Educate building managers and occupants on measures to prevent exposure to and reduce impact of allergens, extreme air quality events, and traffic-related air pollution
- ◆ Provide refuge areas with excellent air filtration to create safe and healthy spaces for vulnerable community members during periods of extreme air quality advisories

Potential Design Conflicts

Take care and ensure resilient strategies do not exacerbate vulnerability and other risks

- ◆ Passive ventilation strategies that rely on natural air flow to cool and ventilate a building may exacerbate indoor air quality issues during times of poor air quality (e.g. forest fire smoke). Ensure buildings have back-up cooling and ventilation systems that allow for mechanical ventilation when necessary.

Additional Resources

- ◆ US Environmental Protection Agency: *Fundamentals of Indoor Air Quality in Buildings*.
- ◆ US Environmental Protection Agency: *Indoor airPLUS Program for Builders*.
- ◆ US Environmental Protection Agency: (2013) *Moisture Control Guidance for Building Design, Construction and Maintenance*.
- ◆ US Environmental Protection Agency: *Best Practices for Reducing Near-Road Pollution Exposure at Schools*.
- ◆ US Environmental Protection Agency: (2016) *Recommendations for Constructing Roadside Vegetation Barriers to Improve Near-Road Air Quality*.
- ◆ US Environmental Protection Agency: (2001) *Building Radon Out: A Step-by-Step Guide On How to Build Radon-Resistant Homes*.