BUILDING RESILIENCY FOR SCHOOLS IN TIMES OF CLIMATE CHANGE

From recent wildfires and air pollution to ongoing extreme heat, the effects of climate change are being felt all over the world. While we typically think of these issues in terms of outdoor environments, the majority of human exposure to outdoor pollution, including wildfire smoke, actually occurs indoors. So as the climate crisis increases in urgency, it's time to change the way we think about how our buildings can respond to protect us from a range of environmental threats.

Through the right strategies and solutions, resilient buildings can be powerful tools for protecting people from pollution, heat and other environmental threats, while playing a role in supporting overall health, performance and productivity.

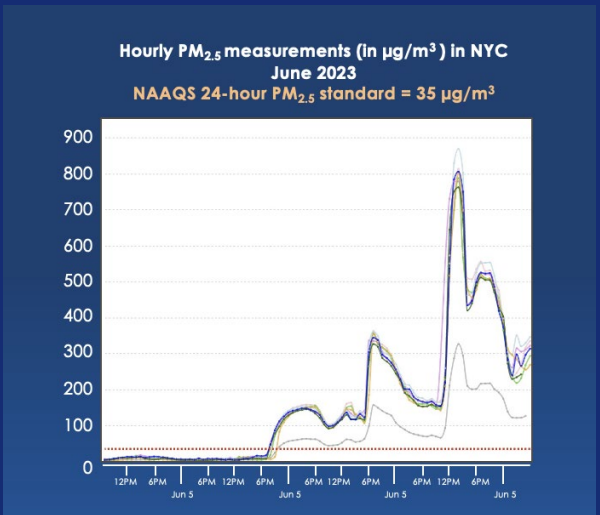
PROMOTE HEALTH AND COMFORT

ENHANCE OCCUPANT EXPERIENCE

INCREASE ENERGY AND OPERATIONAL EFFICIENCY

HIGHEST LEVELS OF PARTICLES EVER SEEN ON EASTERN SEABOARD:

On June 7, 2023, 46.4 million people were exposed to >75 µg/m^3 of smoke. In New York City, hourly $PM_{2.5}$ levels reached 800 µg/m^3.



Source: Annual 2023 Wildfires Report | National Centers for Environmental Information (NCEI). Accessed April 25, 2023. https://www.ncei.noaa.gov/access/monitoring/monthly-report/fire/202213

THE HEALTH IMPACT OF WILDFIRES

Wildfires are an ever-growing concern, especially in California and the western United States, where they occur more commonly and cause more damage than in the Eastern U.S. One of the main threats to human health from wildfires is exposure to particles ($PM_{2.5}$) in smoke, which can travel hundreds to thousands of miles from the source.

The short-term health effects of smoke exposure vary, but include irritation of the eyes and respiratory tract that may cause coughing, wheezing, difficulty breathing, bronchitis, asthma exacerbation, reduced lung function, heart failure, stroke and worsened symptoms of preexisting respiratory or cardiovascular disease. Wildfires have been associated with increased frequency of emergency room visits and hospital admissions.

THE EFFECT OF HEAT ON HEALTH

Extreme heat events, or heat waves, are gradually increasing in frequency, intensity and duration across the United States. Temperatures that are much hotter or more humid than average for a given area are considered extreme heat; temperatures considered "extreme" depend on the climate of a given area. Extreme heat events cause more deaths than any other weather-related disaster.[1]

On average, over

65,000

Americans visit an emergency room for heat illness each summer.[2]

One study among high-schoolers in New York found the likelihood of a student failing a test was

12% HIGHER

on a 90˚F or hotter day than on a 72˚F day.[3]

Another study among college students found that those in dorms without air conditioning scored about

10% LOWER

than those with air-conditioned dorms both in terms of reaction time and in speed when answering simple math questions.[4]

BREATHING HEALTH INTO SCHOOL BUILDINGS

Buildings can play a critical role in protecting people from potential health issues, by keeping them cool and comfortable in extreme heat to managing exposure to harmful elements – including smoke particles in the event of a wildfire.

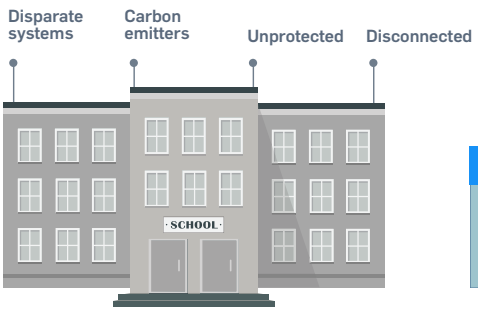
In fact, studies from the Harvard T.H. Chan School of Public Health and Carrier highlighted how mechanical ventilation with efficient filtration can help create healthier indoor environments by removing pollutants like $PM_{2.5}$ from the air.

VENTILATION + FILTRATION = PROTECTION

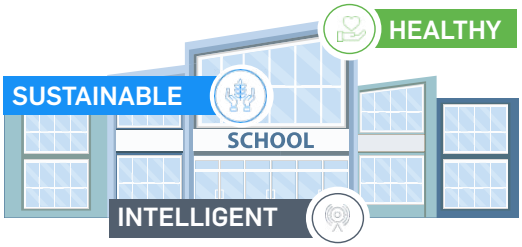
CARRIER HEALTHY BUILDINGS

As the inventors of modern air conditioning and a world leader in HVAC and refrigeration, Carrier has a legacy of creating healthier and more comfortable buildings. Our experts have in-depth knowledge and experience in creating resilient buildings utilizing our holistic suite of healthy building technologies and services to address current and future climate concerns.

BUILDINGS OF YESTERDAY



BUILDINGS OF TOMORROW



HEALTHY BUILDINGS ASSESSMENTS

At Carrier, we understand that many of our commercial building customers are facing uncertainty with how to move forward in developing a healthy building strategy. Our experts are here to help – starting with assessments across various aspects of a building.

VENTILATION

Outdoor air, airflow, commission equipment and monitor in real time

AIR QUALITY

Limit volatile organic compounds (VOCs), maintain humidity levels and indoor air quality (IAQ) testing

THERMAL HEALTH

Meet standards, provide individual control and monitor in real time

MOISTURE

Humidity, regular inspections and remedial actions

NOISE

Control indoor and outdoor sources of noise

FILTRATION

High-efficiency filtration targeting VOC, particulate matter

LAYERED SOLUTIONS

Carrier offers a full suite of products and services designed to help create healthy environments for building occupants. The following are just a few highlights of our offering.

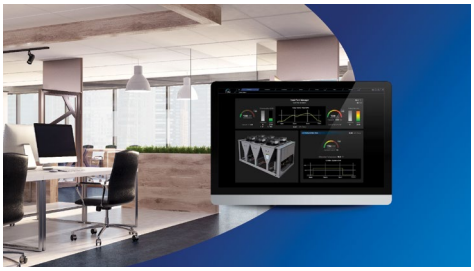
AIRSIDE TECHNOLOGIES

AIR PURIFIERS & FILTERS

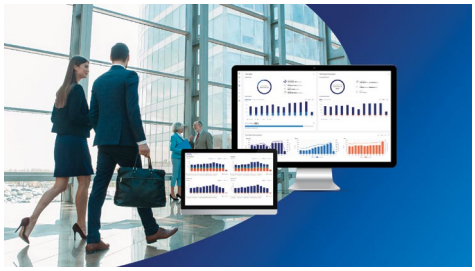
BLUEDGE

AGION® -COATED AIR HANDLING UNIT

ENABLING TECHNOLOGIES



I-VU® BUILDING AUTOMATION SYSTEM



ABOUND™ REAL-TIME MONITORING

CARRIER COMMERCIAL SERVICE - IEQ AUDIT

HEALTHY BUILDING SERVICES

Optimizing indoor environments for occupant health and safety and building efficiency requires ongoing management to adapt to changes over time, including building occupancy and usage and environmental fluctuations. Here are a few examples of Carrier remote services that can help customers manage assets to support full lifecycle asset resiliency.

REMOTE AIRSIDE MANAGEMENT

- Manage IAQ and ventilation in line with best practices
- Make changes and fix issues remotely
- Optimize maintenance and operational costs
- 24x7 command center

REMOTE ENERGY MANAGEMENT

- Provide advanced cloud-based analytics
- Optimize energy efficiency, equipment uptime, occupant comfort and operational productivity
- Actionable insights by CORTIX™ building IoT platform
- Optimize autonomously or through a mobile application

REMOTE HVAC SERVICES

- Maximize performance and efficiency
- Increase uptime
- Improve budgeting and scheduling
- Fault detection and diagnostics

GET STARTED WITH AN EXPERT

A healthier future starts indoors. Let's work together to create healthier, more resilient buildings that can rise to the evolving challenges of climate change. Visit us at carrier.com/K-12 to learn more about our Healthy Schools Program and connect with one of our experts.

VISIT OUR RESOURCE LIBRARY

Visit our resource library of Carrier white papers and materials here.

[1] www.scientificamerican.com/article/extreme-heat-is-deadlier-than-hurricanes-floods-and-tornadoes-combined/#:~:text=Studies%20show%20that%20outdoor%20workers,hurricanes%2C%20floods%20and%20tornadoes%20combined

[2] ephtracking.cdc.gov/Applications/heatTracker/

[3] Park, J. (2017). Heat stress and human capital production. Unpublished, Harvard University, Cambridge, MA

[4] Persily and Gorfain (2008)

SCAN HERE TO LEARN ABOUT HVAC SOLUTIONS FOR MORE RESILIENT SCHOOLS

Carrier HEALTHYSCHOOLS