Improving Indoor Air Quality for Health and Energy Efficiency: Challenges and Opportunities

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Impact of COVID-19

- COVID-19 pandemic highlighted indoor disease transmission through the air

- Improved indoor air quality (IAQ) was a core recommendation from public health authorities

Image Credits: CBS, ACHR News

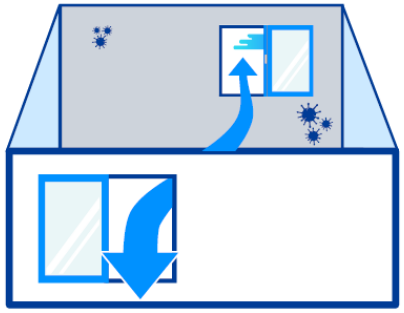
Why Poor IAQ Leads to Disease Spread

Image Credit: Wikimedia Commons

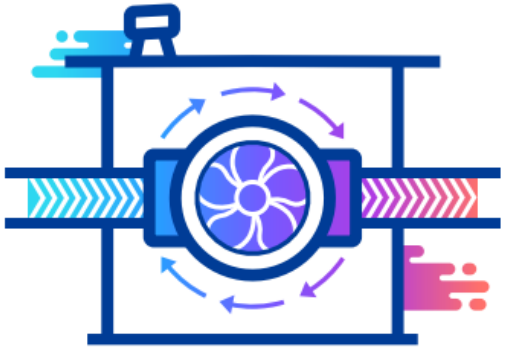
How Do We Improve Indoor Air Quality?

Ventilation

Natural

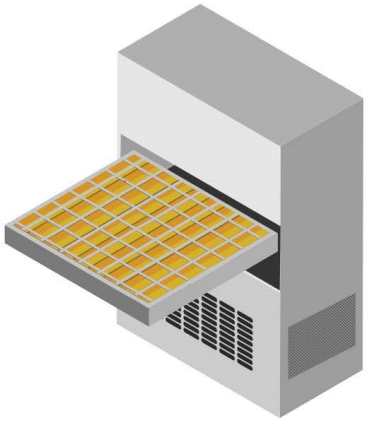


Mechanical



Filtration

HVAC



Portable

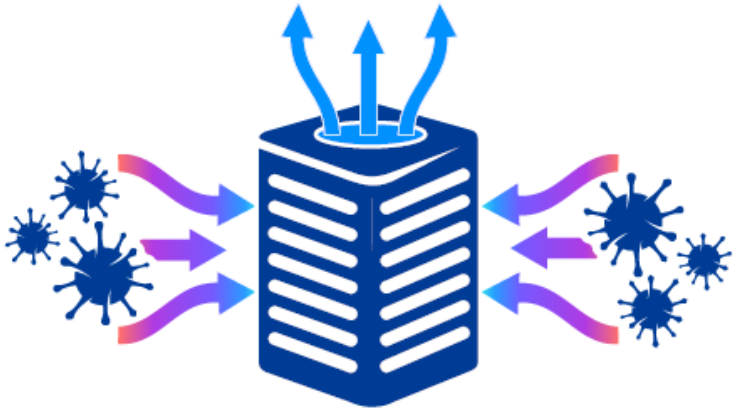
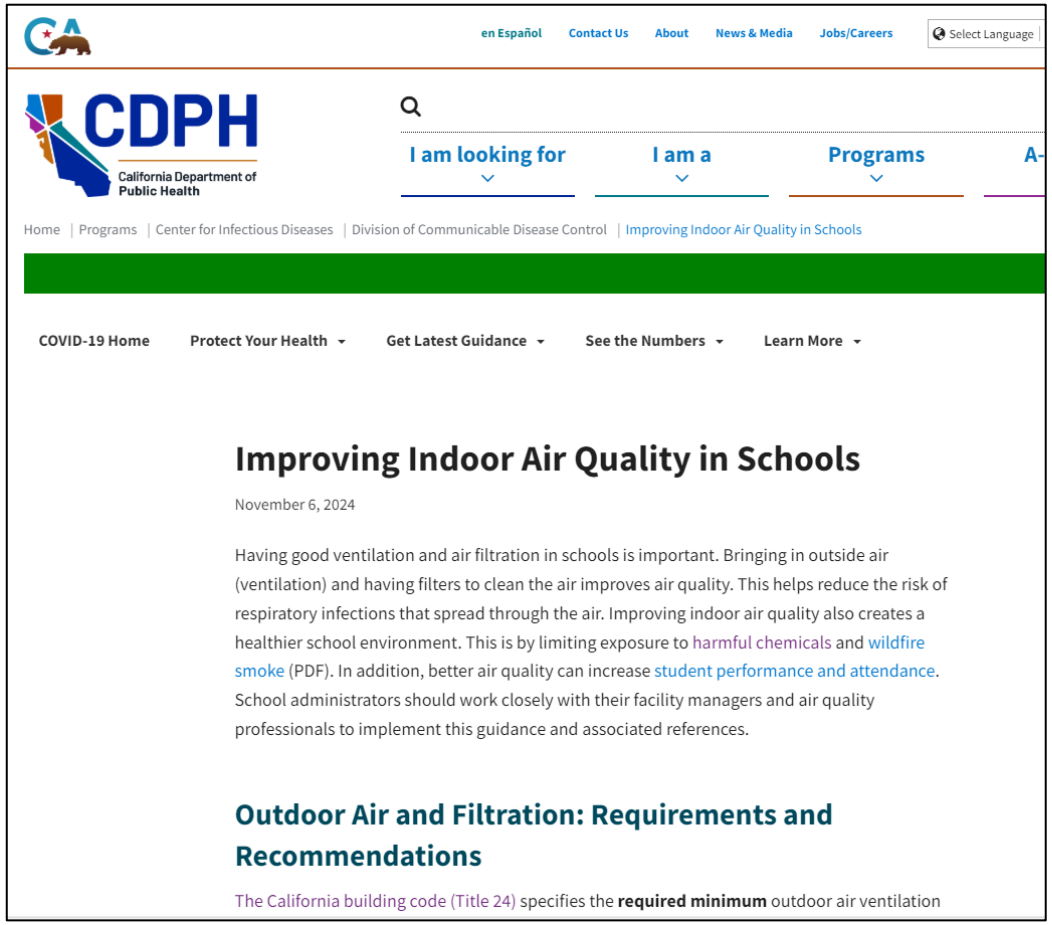


Image Credit: California Department of Public Health and UC Davis

Typical Guidance for COVID-19

- Increase outdoor air ventilation
- Run HVAC system continuously
- Increase filtration to MERV-13 or higher
- Install portable air cleaners



Our Experience

- Encountered resistance to guidance due to cost and strains on HVAC systems in older buildings
- Newer (wealthier) facilities easily able to implement recommendations
- Median age of school buildings in U.S.A is 49 years[1]
- Median age of skilled nursing facilities in CA is 56 years[2]

1. National Center for Education Statistiics, 2004
2. HCAI Public Data, accessed 2025

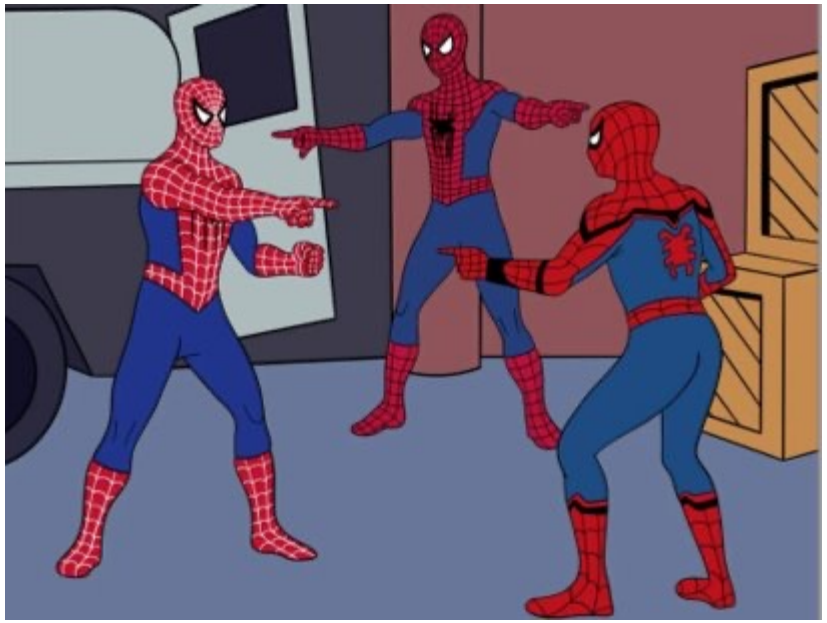
Image Credit: San Diego Dept of Public Health

Disconnect With the “Real World”

- We live in a society with large inequities in buildings in terms of age and maintenance
- Health-related recommendations for ventilation/IAQ can increase energy consumption if systems are not designed to implement them
- **Fundamental Structural Problem:** Building ventilation systems designed for thermal comfort, not health of occupants

Structural Issues with Regulation and Enforcement in Building Life Cycle

- **Design:** Minimum code-required ventilation rates don't address things like infection risk
- **Applicable Code:** Big gap in Title 24 requirements between new and existing buildings
- **Enforcement:** Little to no verification of HVAC performance requirements after construction or renovation
- Interdisciplinary problems need interdisciplinary solutions



Who "owns" IAQ?

An Important Opportunity & Challenge for Public Health and Decarbonization Efforts

- We spend 90% of our time indoors, we need similar effort and attention on indoor air as outdoor air
- Productivity and health benefits of good IAQ are known!
- Healthy IAQ and energy efficiency are in conflict in many (generally older) buildings, health shouldn't be sacrificed to save $$ or fight the climate crisis
- Buildings can be designed with the health of occupants and the environment in mind, but it will require creative efforts and $$ to modernize building stock and ventilation

Important Developments and the Future

- ASHRAE 241 Model Standard – first model standard with proposed ventilation/filtration requirements aimed at controlling infectious disease transmission
- ARPA-H “Breathe” Program funding IAQ R&D at the federal level, approx. $150 million in seed funding
- New requirements in CA schools: MERV-13 filters, CO2 monitoring required in new school construction (AB 2232)
- Main work/effort needs to be focused on older, existing buildings

Thank you!

Please contact me at:

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