LCA'S LawSmarts Webinars

LAWYERS FOR THE CREATIVE ARTS®

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LEAGUE OF CHICAGO THEATRES

Curtains Up!

Legal Issues for Re-Opening Venues

Safety Measures and Costs

April 15 @ 3PM

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CHICAGO DEPARTMENT OF DCASE CULTURAL AFFAIRS & SPECIAL EVENTS

This workshop will be presented as a Zoom Webinar.
Watch law-arts.org for more details

Curtains Up! Legal Issues for Re-Opening Venues
Safety Measures and Costs

Speaker Biographies

Dr. William Bahnfleth is a professor of architectural engineering at the Pennsylvania State University. He held previous positions as Senior Consultant for ZBA, Inc. in Cincinnati, OH and Principal Investigator at the U.S. Army Construction Engineering Research Laboratory in Champaign, IL. He holds BS, MS, and PhD degrees in Mechanical Engineering from the University of Illinois and is a registered professional engineer. At Penn State, Dr. Bahnfleth teaches undergraduate courses in HVAC fundamentals and system design, and graduate courses in district cooling systems and indoor air quality. His research interests cover a wide variety of indoor environmental control topics including chilled water pumping systems, stratified thermal energy storage, protection of building occupants from indoor bioaerosol releases, and ultraviolet germicidal irradiation systems. He is the author or co-author of more than 170 technical papers and articles and 14 books and book chapters. Dr. Bahnfleth is a fellow of ASHRAE, the American Society of Mechanical Engineers (ASME) and the International Society for Indoor Air Quality and Climate (ISIAQ). He served as President of ASHRAE in 2013-2014 and currently chairs its Epidemic Task Force. His ASHRAE honors include the Louise and Bill Holladay Distinguished Fellow Award, E.K. Campbell Award, and F. Paul Anderson Award. He is also a recipient of the Penn State Engineering Alumni Society's World-Class Engineering Faculty Award and a Penn State Exemplary Designation for Faculty Outreach.

Dr. Marwa Zaatari is Chief Science Officer at DZINE Partners and co-Chair of enVerid Systems Advisory Board. She leads the research and development of "Air as a Service" around heat exchanger coils, ventilation, filtration, and IAQ measurements. She has extensive experience in identifying and quantifying the sources, fate, and transport of indoor air pollutants, and developing and applying models for energy efficiency, exposure assessment, and economic impacts of indoor air pollution. Her work continues to advance building science methods in assessing performance-based procedures to design and operate buildings to optimize energy and people efficiency.

Previously, Dr. Zaatari was Vice President of Building Solutions at enVerid Systems since 2015. She leads the design of ventilation and filtration/sorption systems in buildings, integration into HVAC systems, and was responsible for managing customer-site installation and ongoing operations and field service. Dr. Zaatari is an ASHRAE Distinguished Lecturer, a member of

several ASHRAE Committees and a member of the ASHRAE Epidemic task force. She also serves on the USGBC board.

Dr. Zaatari earned a PhD in Architectural and Environmental Engineering from the University of Texas at Austin with a focus on the built environment and a master's degree in engineering management from The American University of Beirut, Lebanon with a focus on energy management.

Kate Ansorge, Managing Director of Chicago Real Estate Services, oversees IFF's Real Estate Solutions team serving non-profits in the Chicago and Milwaukee metro areas. IFF offers real estate consulting include project feasibility analysis, lease versus buy analysis, site search, building assessments, predevelopment services including architect, design oversight, zoning and permitting assistance, vendor oversight, and cost estimating as well as owner's representative services including contractor procurement and construction oversight.
Recently, Kate has worked with Greater Milwaukee Foundation and Chicago Public Schools to lead early childhood initiatives to increase access and quality of education for children ages 0 to 6 years old. Kate also leads work under IFF programs including Stronger Nonprofits Initiative and Chicago Cultural Treasures, programs that aims to reduce structural barriers that nonprofit leaders of color face in accessing valuable tools and resources related to financial management and real estate planning, as well as Elevated Chicago, an initiative to promote equitable transit-oriented development by identifying community-led solutions to address neighborhood displacement and inequities.

Brett Mueller, Senior Lender – Northern Illinois and Northwest Indiana. Brett has been with IFF for 9+ years working in its Capital Solutions department. IFF Capital Solutions see the same financial risks as traditional banks, but we make different choices. That's because our goal is not to maximize profits for shareholders, but to bring capital to communities where it's most needed.

We've partnered with nonprofits for over 30 years, working alongside nonprofit leaders to plan, finance, and build facilities that are critical to their mission. Our role is to design capital solutions that help nonprofits grow, build net assets, and strengthen financial health.

Recently, Brett has worked with a Black led Dance company in Woodlawn to provide financing for renovations of leased space, a Black led Federally Qualified Heath Center in Harvey, IL seeking to refinance high-cost debt and reposition its balance sheet, and financed a new facility for an organization providing services and placement to recently arrived refugees and immigrants in West Ridge.

Wendell Harris has over 20 years of commercial real estate, property management, and banking experience. He was promoted to Vice President of Lending Operations in March 2019, after serving as Director of Lending Operations following a brief tenure as Senior Loan/Program Officer for CCLF.

In the past five years, he has underwritten investments at CCLF that leveraged over $443.3 million in real estate transactions that strengthen lower-wealth communities. He has held various positions in Treasury Management, Retail Management, Business Banking, and Commercial Real Estate at leading financial institutions such as Northern Trust, LaSalle Bank N.A., Charter One, GE Capital, and Urban Partnership Bank. He also worked for Midway Broadcasting (WVON radio) in Marketing and Sales.

Wendell holds a Master of Business Administration degree with a certificate in Financial Analysis from the Keller Graduate School of Management. He also holds a Bachelor of Science degree in Business Management with an emphasis in Accounting from Northern Illinois University. Wendell enjoys spending time with family, has a passion for classic cars, has volunteered as an Assistant Boys Basketball Coach for Morgan Park High School and Fenger High School in Chicago, and looks forward to coaching again in the future.

Curtains Up! Legal Issues for Re-Opening Venues
Safety Measures and Costs

Resource Links

I. Government Guidance
   a. Occupational Safety and Health Administration (OSHA)
      i. Protecting Workers: Guidance on Mitigating and Preventing the Spread of COVID-19 in the Workplace
   b. National Endowment for the Arts
      i. The Art of Reopening: A Guide to Current Practices Among Arts Organizations During COVID-19
   c. Illinois Department of Commerce & Economic Opportunity
      i. Phase 4 Guidance: Theaters and Performing Arts
   d. City of Chicago Reopening Businesses Portal
      i. Industry Guidelines
      ii. Be Safe Chicago: Performance Venues

II. Union and Professional Association Guidance
   a. ASHRAE Epidemic Task Force
      i. Core Recommendations for Reducing Airborne Infectious Aerosol Exposure
   b. Actors' Equity Association
      i. COVID-19 Safety Guidance
      ii. Safety Guidance for Fully Vaccinated Workplaces

III. Financing Resources
   a. IFF
   b. Chicago Community Loan Fund
   c. Chicago Pace

Asked and Answered: Q&A with our ASHRAE Experts

1. Can you address the possible interference of ozone when measuring aldehydes?

It depends on the sampling method. This resource might be useful as it addresses interference of ozone when sampling aldehydes using DNPH cartridges.

This study showed that ozone does not significantly interfere with the sampling.

2. Are there commercial HVAC HEPA filters available which contain antiviral components in the filtration medium?

Not for HEPA, but for some lower efficiency filters. Whether these are actually worth the additional cost is an unresolved question. Filters can be bagged and disposed of as ordinary waste. Eye and respiratory protection and gloves should be worn when servicing HVAC filters during the pandemic, and persons performing maintenance should wash well afterwards, but no other special precautions are believed to be necessary even for ordinary filters.

3. There a lot of pollutants to consider regarding Indoor Air Quality, how can this related to MERV 13 to mitigate the risk of Indoor pollution according to ASHRAE?

Mechanical filters remove one component of indoor air pollution – particles that have direct health affects and/or that may serve as the delivery mechanism for chemicals and microbes. Ventilation and gas-phase air cleaning (for example with activated carbon or other sorbent media filters) address gaseous pollutants and odor.

4. Thanks for presenting this as we are concerned about risk and protecting artists, staff and patrons.

Are HVAC/ air quality standards or recommendations required of other public buildings that are already open to public (e.g, restaurants, bars, movie theatres, hospitals)? If not, very curious why?

Yes, many states and cities have established requirements for reopening various types of facilities. These include things like occupancy limitations and HVAC performance requirements (ventilation and filtration). In some cases, occupancy limits have been tied to ventilation.

See LCA's COVID-19 Resources for links to Illinois and Chicago guidelines on reopening.

5. In terms of risk of infection, is there any consensus on what is an acceptable level of risk that is deemed reasonably safe?

Views of what is acceptable have not been formally established. Many have considered reduction to less than 10% for a single exposure and in some cases lower. Another is a "public health" approach that is based on reducing the R_0, the basic reproductive number of a disease to less than 1, which means that an average infected person infects less than one other person, which will cause an epidemic to end. E.g assuming one infector, less than one predicted infection. The outcome of analyses using the Wells/Riley model for a number of different occupancy types is 4 -6 air changes per hour. The HSPH/CU recommendations Marwa showed were developed for schools, but more generally applicable.

6. I understand VOCs are a concern from air cleaners. Can you expand if possible what cleaners to avoid? I found this article from Berkeley Lab on VOCs in cleaning/sanitization

I think the link is actually to surface cleaning products, but it is an important issue. Any of the air cleaners that add reactive substances to the air have the potential to produce either particles or organic compounds. These agents themselves have health effects. Included are ions (positive, negative, bipolar), dry hydrogen peroxide, photocatalytic

oxidation, "cold plasma" and others. A recent paper reported both particle and organic contaminant generation by a bipolar ionization unit.

Zeng, Y., Manwatkar, P., Laguerre, A., Beke, M., Kang, I., Ali, A.S., Farmer, D.K., Gall, E.T., Heidarinejad, M. and Stephens, B., 2021. Evaluating a commercially available in-duct bipolar ionization device for pollutant removal and potential byproduct formation. Building and Environment, 195, p.107750.

Another recent paper reported increases in oxidative stress biomarkers resulting from exposure to negative ions.

Liu, W., Huang, J., Lin, Y., Cai, C., Zhao, Y., Teng, Y., Mo, J., Xue, L., Liu, L., Xu, W. and Guo, X., 2021.

7. When Marwa showed the filter of MERV 7 + 11 to achieve MERV 13, what particle size was that based on? And did this account for anticipated virus distribuion between the different ranges?

See ASHRAE Building Readiness guidance.

It addresses filter performance based on particle sizes for different MERV. It's based on the typical respiratory aerosol particle size distribution.

8. It is my understanding that COVID spreads directly between people. If we need the air to come back to the air handler, is that really doing anything at all?

Within 3 - 6 feet, larger aerosol particles that have a tendency to settle can strike eyes, nose, mouth of a susceptible person who is close to an infected person. However, a significant amount of the infectious material in the air can remain suspended for a long time and move far from the source. Perhaps 50% of close range exposure comes from these particles and they can also cause infections at a distance. Ventilation, filtration lower the ambient concentration. There have been multiple cases of superspreading incidents that confirm this mode of transmission, which is why WHO and CDC acknowledged it last October.

9. We have small kiosks and an air cleaner of suitable size could not keep it clean, probably

because it's too leaky. (air outside is "dirty" so it's easy to tell) for Covid should a person consider the leakiness of a space?

Within 3 - 6 feet, larger aerosol particles that have a tendency to settle can strike eyes, nose, mouth of a susceptible person who is close to an infected person. However, a significant amount of the infectious material Leakage would not subtract from the air cleaner clean air delivery rate of the air cleaner. Whether that leakage is a problem depends in part on where the air comes from. Would help if I could visualize the scenario more clearly.

10. We have been very conservative to achieve a calculated risk below 5% which is hard to achieve. Like you said there is no formally established acceptable baseline.

Given all the factors affecting infection risk - airborne, close contact, uncertainty in infectivity, etc., anything under 10% is probably within calculation uncertainty.

11. Will you be discussing resources to help us measure outside airflow, calculate time needed to flush out space etc.?

More appropriate for technicians/engineers, but there is information on flushing in the ASHRAE Building Readiness guidance.

A technician with the right instruments can do an outdoor air flow measurement or in some systems the flow measuring station may already be there. Alternatively, decay of carbon dioxide concentration over time can be used to estimate the outdoor air change rate. Harvard School of Public Health has described a number of techniques in its schools guidance.

12. This all seems to assume these are stand alone, large theatres. What about storefronts? 30-50 seaters in a residential building

The same general principles in the ASHRAE Core Recommendations apply. An important question is whether HVAC was upgraded for the theater occupancy. If

ventilation low and cannot be increased, that could be addressed temporarily by reduced occupancy and in-room air cleaners.

13. How much of your recommendations can be eased, if say, in an orchestra rehearsal room, mandatory vaccination is implemented?

I would be guided by what public health authorities say - CDC, etc. Vaccines are not 100%, so even if everyone is vaccinated, there is still risk. There are not many recommendations we made that are not good permanent upgrades. Portable air filters could be removed eventually, and some control changes like disabling demand controlled ventilation could be undone.

LAWYERS for the CREATIVE ARTS®

ASHRAE'S CORE RECOMMENDATIONS FOR REDUCING INFECTIOUS AEROSOL EXPOSURE

William P. Bahnfleth, PhD, PE, FASHRAE, FASME, FISIAQ
Professor, The Pennsylvania State University
Chair, ASHRAE Epidemic Task Force

PennState College of Engineering | ARCHITECTURAL ENGINEERING

ASHRAE®

WHO and CDC: Indoor airborne transmission happens, should be mitigated

(10/5/2020)

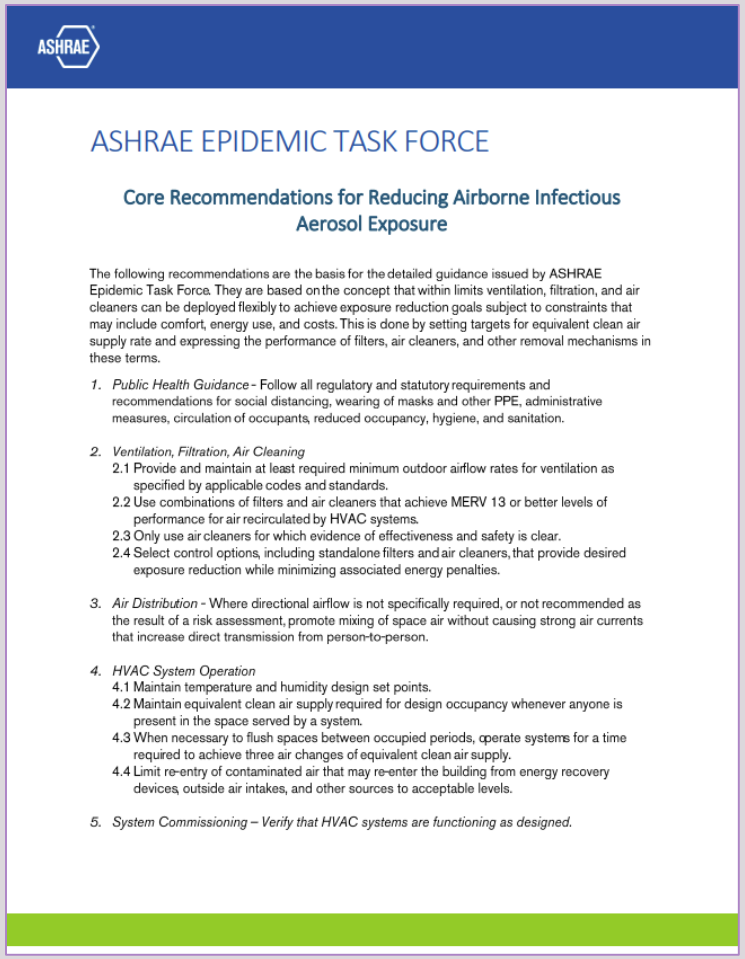
- COVID-19 most commonly spreads during close contact
- COVID-19 spreads less commonly through contact with contaminated surfaces
- **Airborne transmission of SARS-CoV-2 can occur under special circumstances**
  - *Enclosed spaces*
  - *Prolonged exposure to respiratory particles*
  - *Inadequate ventilation and air-handling*

"Ventilation represents a very important aspect, a very important factor to prevent the virus from spreading indoors."

WHO Science in 5
https://www.youtube.com/watch?v=XJC1f7F4qtc

Core Recommendations (1/6/2021)

- Concise framework for detailed ASHRAE guidance
- Inward-facing function:
  - *Promote consistency across all guidance documents*
- Outward-facing functions:
  - *Communicate basics of airborne risk reduction*
  - *Document current status of ASHRAE guidance*



ASHRAE

ASHRAE EPIDEMIC TASK FORCE

Core Recommendations for Reducing Airborne Infectious Aerosol Exposure

The following recommendations are the basis for the detailed guidance issued by ASHRAE Epidemic Task Force. They are based on the concept that within limits ventilation, filtration, and air cleaners can be deployed flexibly to achieve exposure reduction goals subject to constraints that may include comfort, energy use, and costs. This is done by setting targets for equivalent clean air supply rate and expressing the performance of filters, air cleaners, and other removal mechanisms in these terms.

1. *Public Health Guidance* - Follow all regulatory and statutory requirements and recommendations for social distancing, wearing of masks and other PPE, administrative measures, circulation of occupants, reduced occupancy, hygiene, and sanitation.

2. *Ventilation, Filtration, Air Cleaning*
   2.1 Provide and maintain at least required minimum outdoor airflow rates for ventilation as specified by applicable codes and standards.
   2.2 Use combinations of filters and air cleaners that achieve MERV 13 or better levels of performance for air recirculated by HVAC systems.
   2.3 Only use air cleaners for which evidence of effectiveness and safety is clear.
   2.4 Select control options, including standalone filters and air cleaners, that provide desired exposure reduction while minimizing associated energy penalties.

3. *Air Distribution* - Where directional airflow is not specifically required, or not recommended as the result of a risk assessment, promote mixing of space air without causing strong air currents that increase direct transmission from person-to-person.

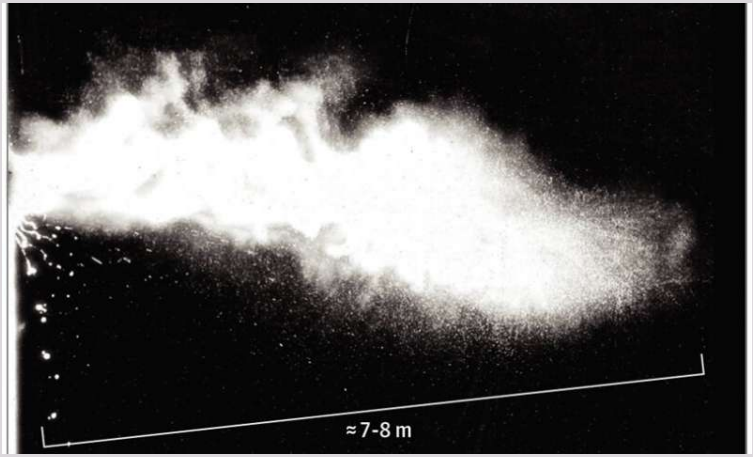
4. *HVAC System Operation*
   4.1 Maintain temperature and humidity design set points.
   4.2 Maintain equivalent clean air supply required for design occupancy whenever anyone is present in the space served by a system.
   4.3 When necessary to flush spaces between occupied periods, operate systems for a time required to achieve three air changes of equivalent clean air supply.
   4.4 Limit re-entry of contaminated air that may re-enter the building from energy recovery devices, outside air intakes, and other sources to acceptable levels.

5. *System Commissioning – Verify that HVAC systems are functioning as designed.*

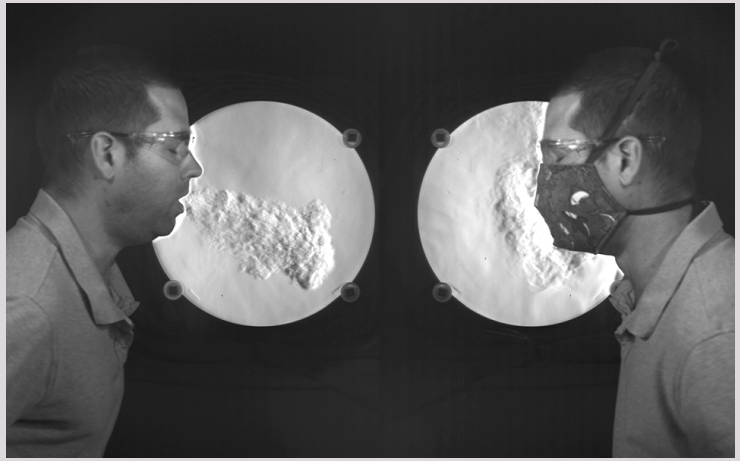
ashrae.org/covid19

1. Public Health Guidance

- ***Follow all regulatory and statutory requirements and recommendations for social distancing, wearing of masks and other PPE, administrative measures, circulation of occupants, reduced occupancy, hygiene, and sanitation.***
- Importance:
  - *COVID-19 is transmitted by multiple modes, layered risk management is needed*
  - *Mask use indoors helps control airborne transmission*



Bourouiba, L. JAMA. 2020;323(18):1837-1838. doi:10.1001/jama.2020.4756



https://www.nist.gov/blogs/taking-measure/my-stay-home-lab-shows-how-face-coverings-can-slow-spread-disease

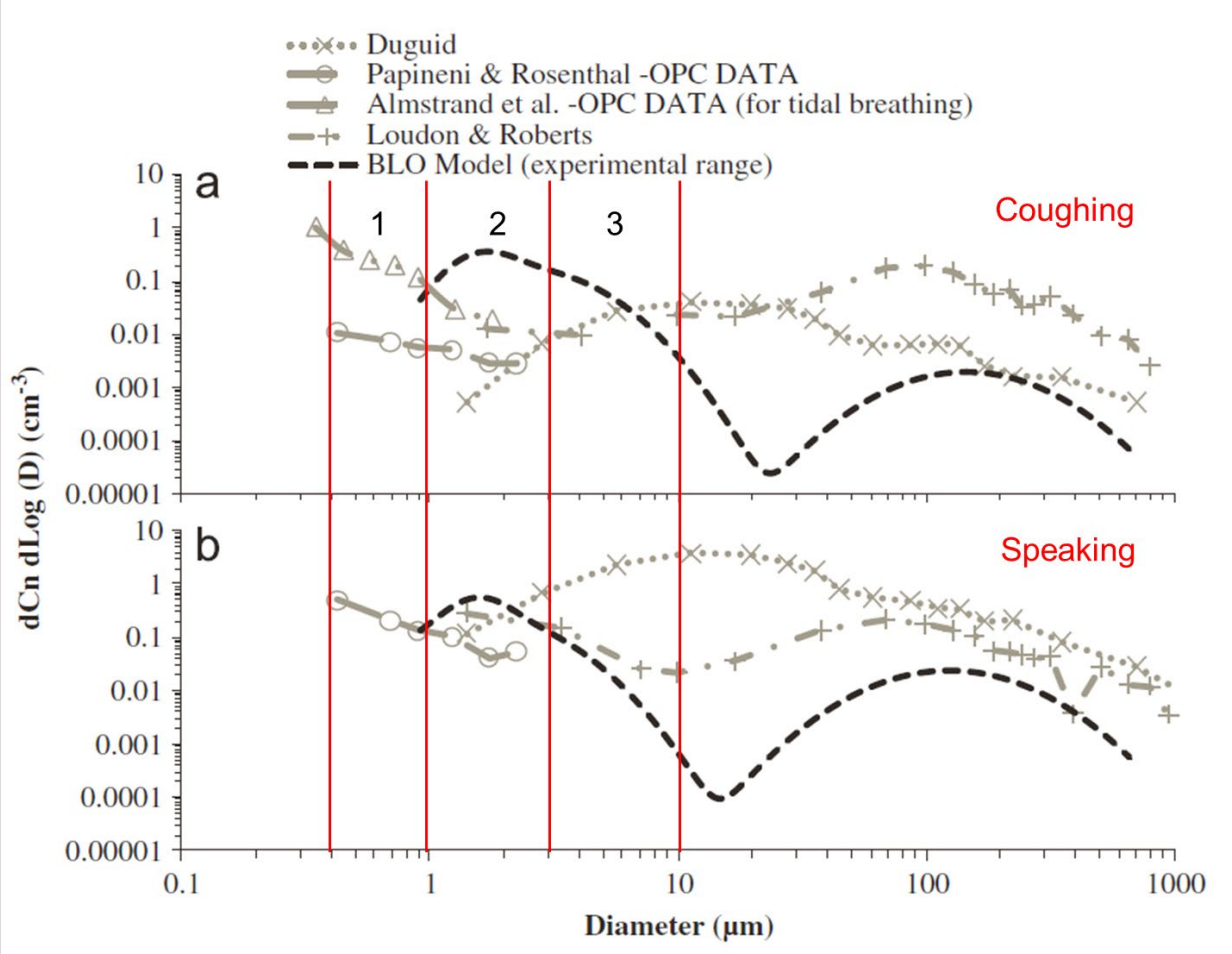
2. Ventilation, Filtration, Air Cleaning
Outdoor Air

- ***2.1 Provide and maintain at least required minimum outdoor airflow rates for ventilation as specified by applicable codes and standards.***
- Importance:
  - *Early guidance from ASHRAE/others recommended maximizing outdoor air flow*
  - *Energy intensive, expensive, possible impacts on indoor environmental control*
  - *ETF has concluded that other controls may be equally effective and more acceptable*
  - *Code minimum ventilation should be mandatory for general air quality control*
- *Note – code outdoor air is not necessarily sufficient to achieve acceptable risk for COVID-19*

2. Ventilation, Filtration, Air Cleaning
Filtration

- ***2.2 Use combinations of filters and air cleaners that achieve MERV 13 or better levels of performance for air recirculated by HVAC systems.***
- Importance:
  - *Minimum standard filters are not effective for infectious aerosols*
  - *HEPA filters not necessary in central systems/expensive and difficult to retrofit*
  - *MERV 13 has good efficiency for respiratory aerosols*
  - *Allows trade-offs when MERV 13 mechanical filter is not feasible*

Why MERV 13 filters are needed

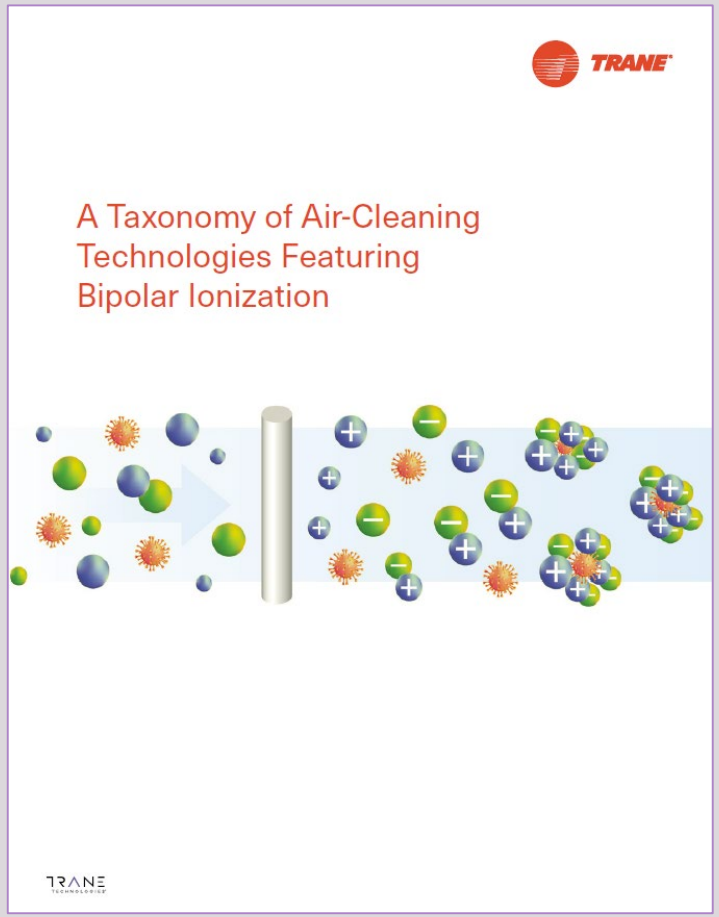


	MERV 6	MERV 8	MERV 13
1 (0.3-1µm)	N/A	N/A	≥ 50%
2 (1-3 µm)	N/A	≥ 20%	≥ 85%
3 (3-10 µm)	≥ 35%	≥ 70%	≥ 90%

Johnson, et al. 2011. Modality of human expired aerosol size distributions. Journal of Aerosol Science 42:839-851.

2. Ventilation, Filtration, Air Cleaning
Air Cleaners

- ***2.3 Only use air cleaners for which evidence of effectiveness and safety is clear.***
- Importance
  - *Air cleaners have value*
  - *Many products lack evidence of effectiveness and safety*
  - *Only germicidal UV has a clear evidence basis*
  - *For other technologies, users must judge whether they are <u>effective</u> and <u>safe</u>. Caveat emptor*
  - Ionizers, PCO, DHP, TEG…



https://www.jp.trane.com/content/dam/Trane/Commercial/global/about-us/wellsphere/Technology%20Whitepaper%20-%20Bipolar%20Ionization.pdf

2. Ventilation, Filtration, Air Cleaning *Combining Controls*

- ***2.4 Select control options, including standalone filters and air cleaners, that provide desired exposure reduction while minimizing associated energy penalties.***
- Importance:
  - *Consistent with approach based on clean air delivery targets*
  - *Not necessary to maximize ventilation*
  - *Flexible approach that accommodates differences in systems*

The Wells-Riley model predicts risk based on multiple factors

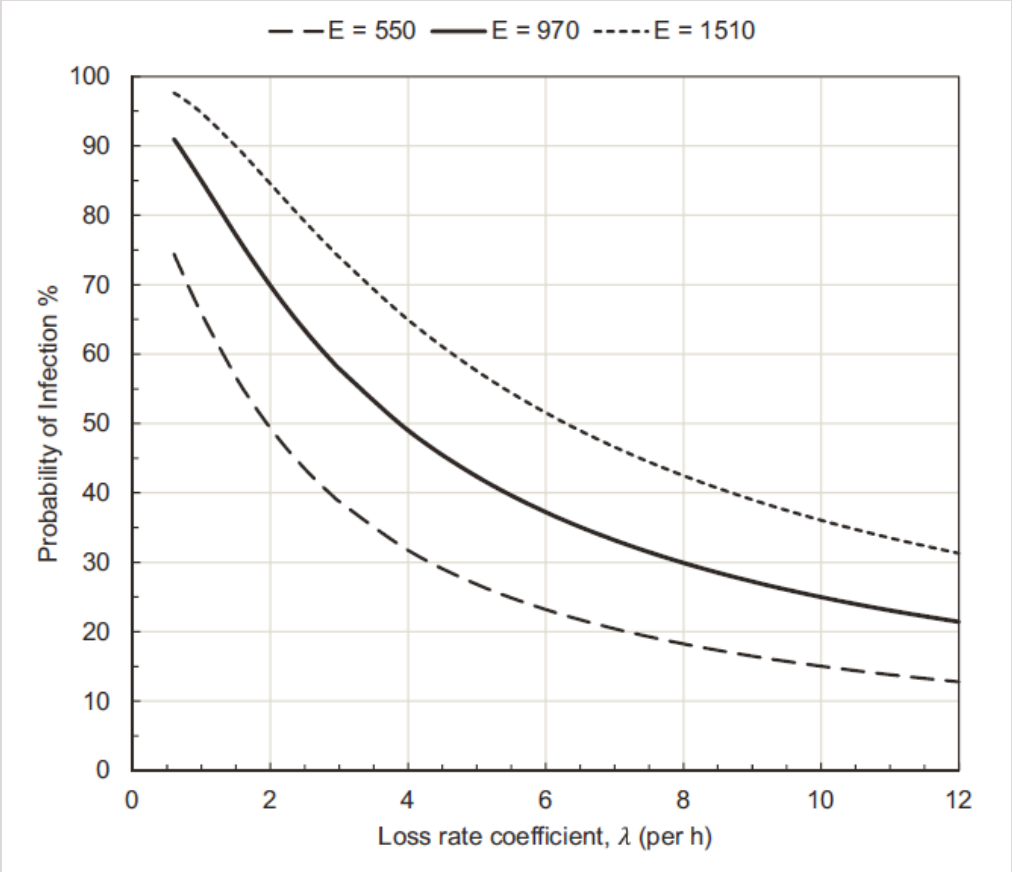
$$P = 1 - \exp\left(-\frac{Iqpt}{Q}\right)$$

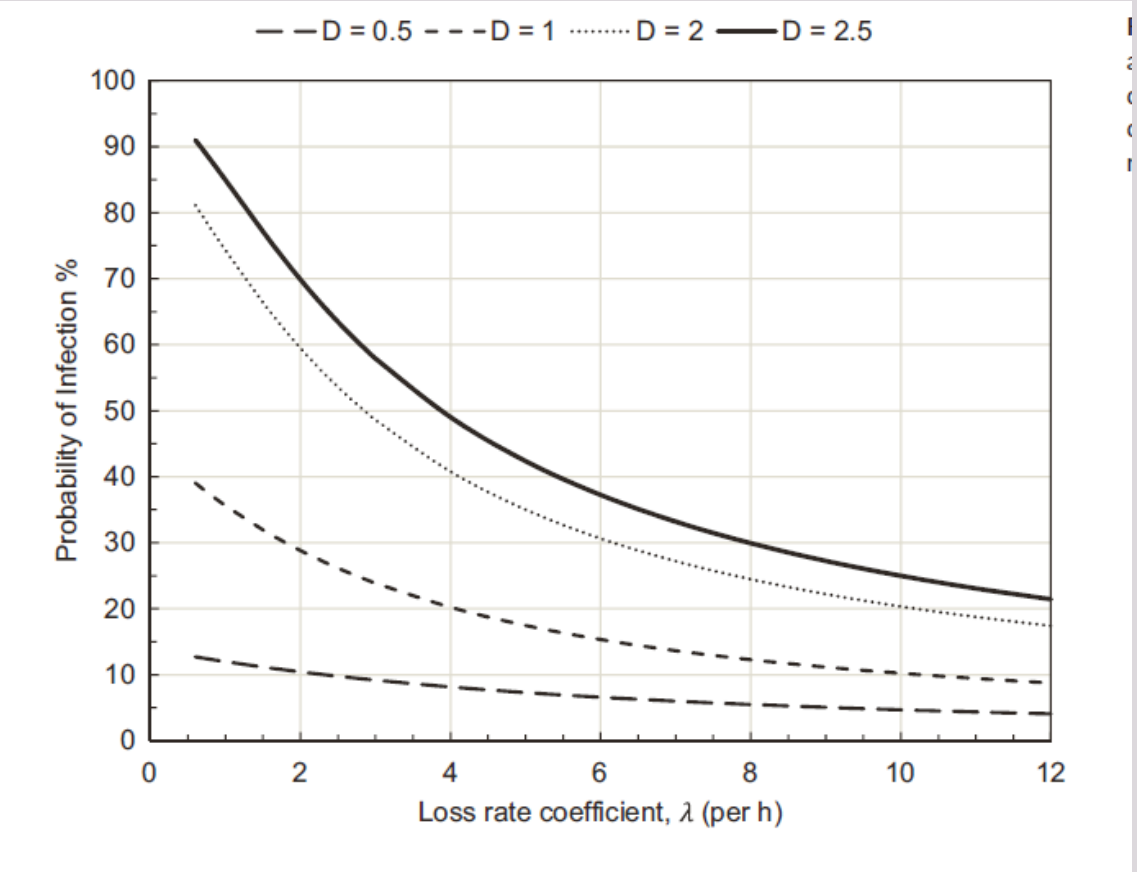
- Steady-state conditions
- Time-dependent risk
- Quanta determined from data

- P = probability of new infections
- I = number of infectors
- q = quanta (infectious dose) emission rate [1/hr]
- p = pulmonary ventilation rate per susceptible [m^3/h]
- t = exposure time [hr]
- Q = flow rate of uncontaminated air [m^3/h]

Given source and occupancy characteristics, can calculate required uncontaminated air flow rate

Wells-Riley shows impacts of risk factors (emission rate *E*, duration *D*) and controls (ventilation and others λ)



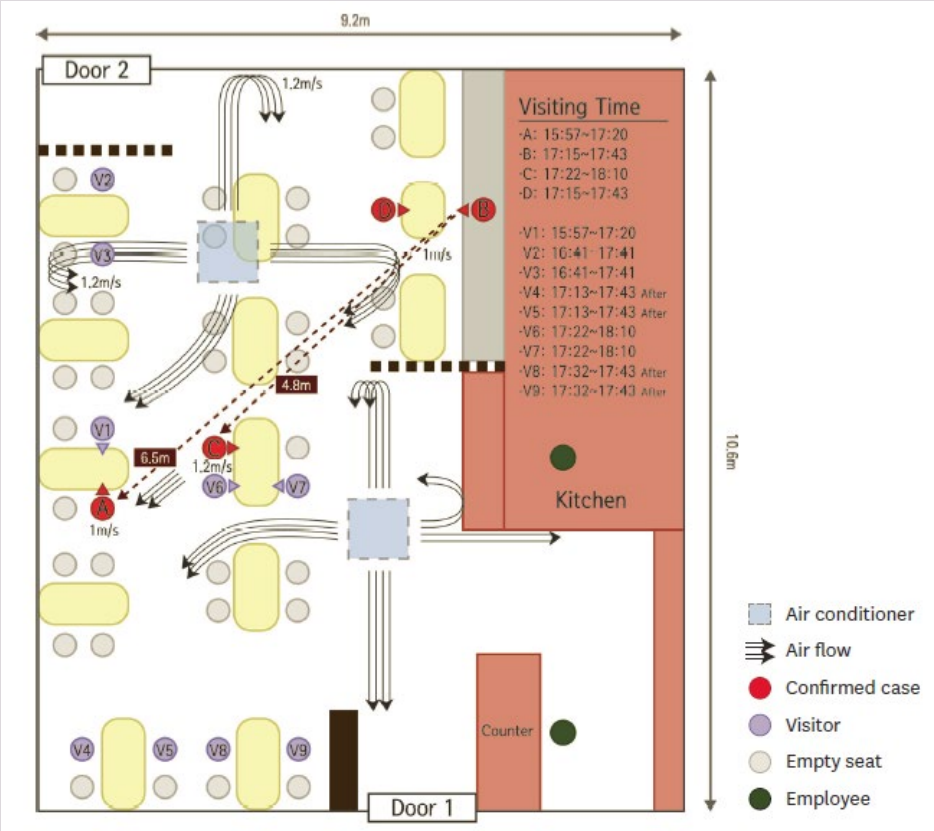


Miller, S.L., Nazaroff, W.W., Jimenez, J.L., Boerstra, A., Buonanno, G., Dancer, S.J., Kurnitski, J., Marr, L.C., Morawska, L. and Noakes, C., 2021. Transmission of SARS-CoV-2 by inhalation of respiratory aerosol in the Skagit Valley Chorale superspreading event. *Indoor air*, *31*(2), pp.314-323.

3. Air Distribution
Mixing, Drafts

- ***Where directional airflow is not specifically required, or not recommended as the result of a risk assessment, promote mixing of space air without causing strong air currents that increase direct transmission from person-to-person.***
- Importance:
  - *Stratified ventilation can trap infectious aerosols in inversion layers and increase risk*
  - *Strong drafts can move even large infectious aerosol droplets long distances*

Rationale for air distribution recommendations

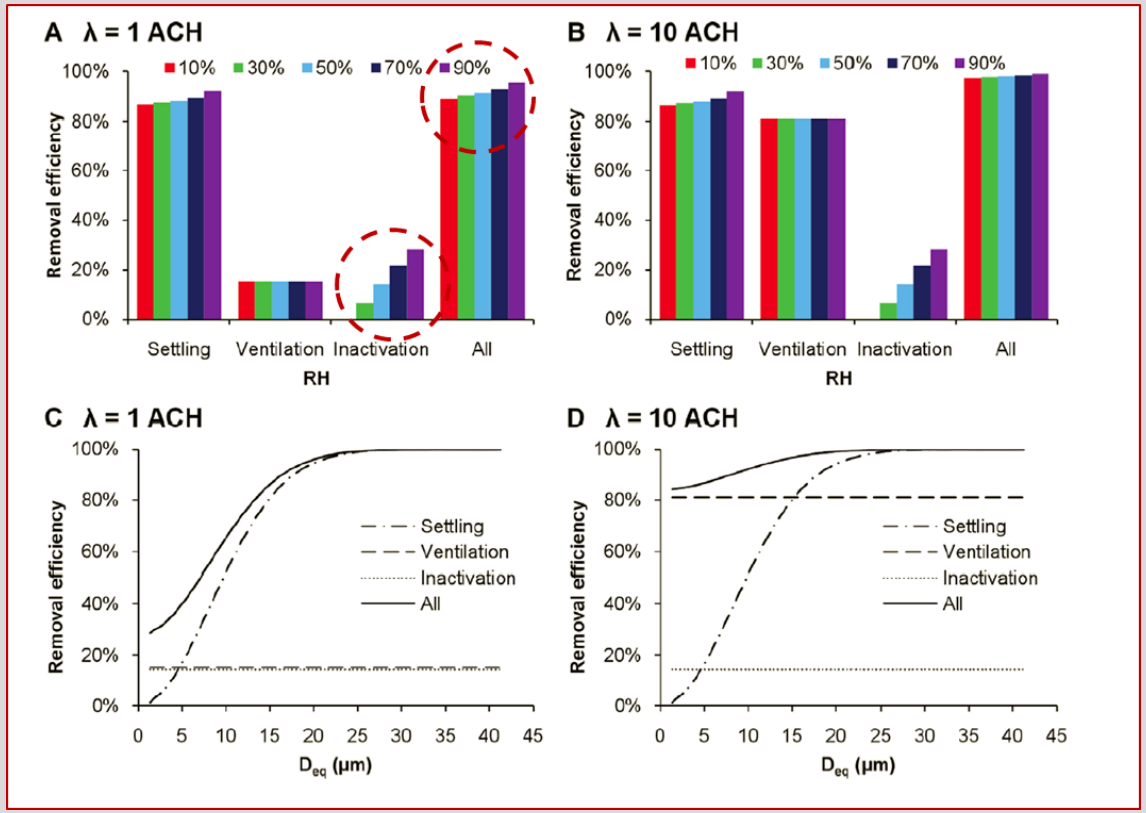


J Korean Med Sci. 2020 Nov 30;35(46):e415
https://doi.org/10.3346/jkms.2020.35.e415

Li, Y., P. Nielsen, M. Sandberg. 2011. ASHRAE J. 53(6): 86-88

4. HVAC System Operation
Humidity and Temperature

- ***4.1 Maintain temperature and humidity design set points.***
- Importance:
  - *Humidity impact less than other controls*
  - *Some buildings are poorly suited to addition of humidification*
  - *Central humidification relatively expensive*
  - *Limited ability to adjust occupied temperature set points*



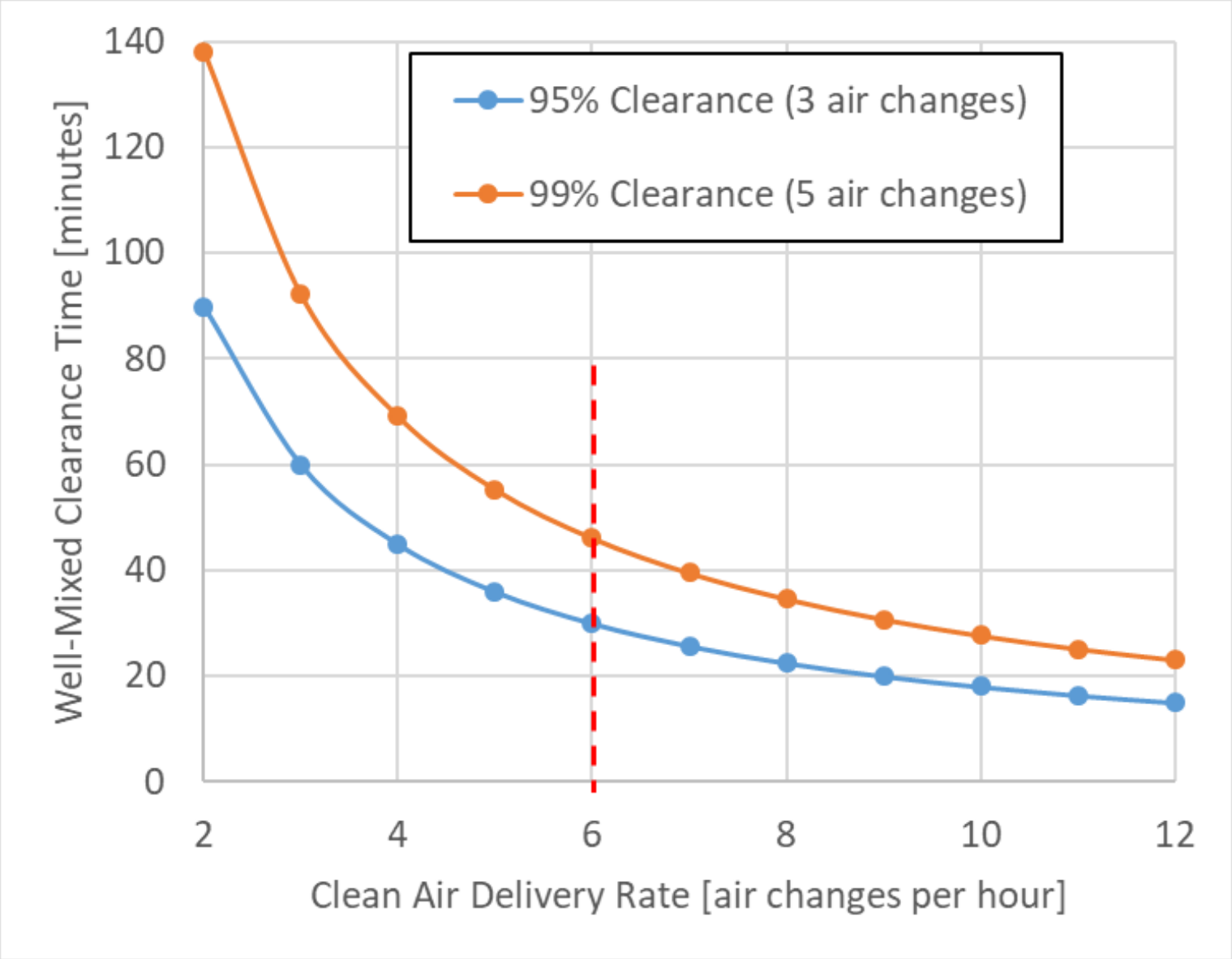
Yang W, Marr LC (2011) Dynamics of Airborne Influenza A Viruses Indoors and Dependence on Humidity. PLoS ONE 6(6): e21481.

4. HVAC System Operation
Maintain Ventilation During Occupancy

- ***4.2 Maintain equivalent clean air supply required for design occupancy whenever anyone is present in the space served by a system.***
- Importance:
  - *Prohibits demand controlled ventilation*
  - *Underscores need to ventilate outside normal hours for cleaning and maintenance crews and others*

4. HVAC System Operation
Flushing Between Occupancies

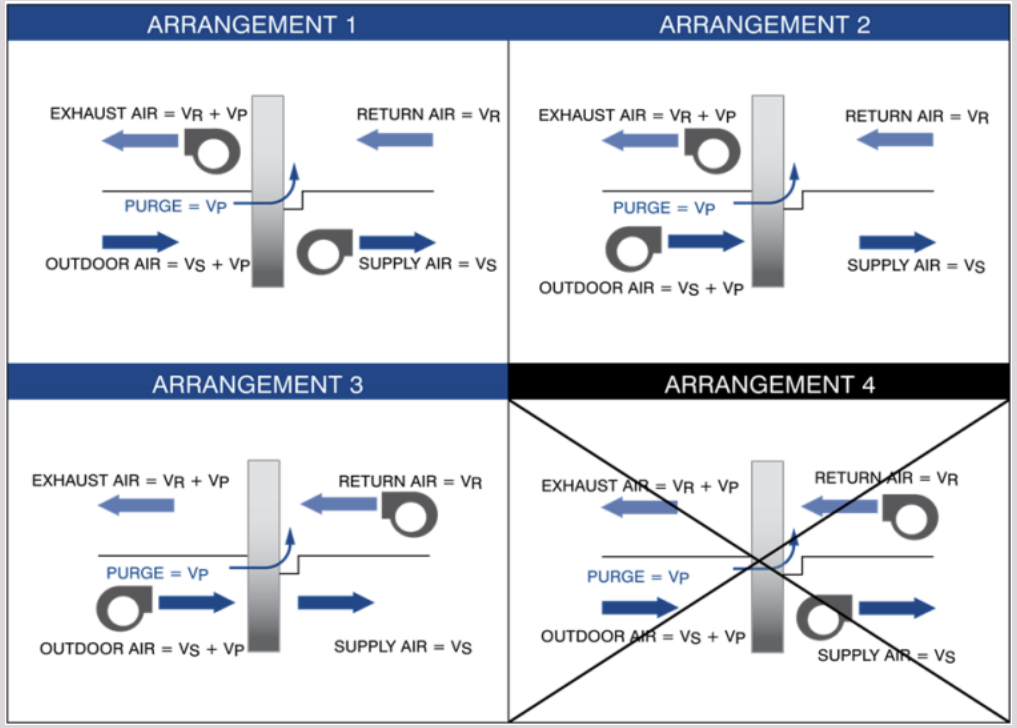
- ***4.3 When necessary to flush spaces between occupied periods, operate systems for a time required to achieve three air changes of equivalent clean air supply.***
- Importance:
  - *Rescinds initial 24/7 operation recommendation*
  - *Defines minimum requirement for clearance between occupancy periods (3 air changes → 95% reduction)*
  - *Clean air changes can be filtered/treated air*



Clean Air ACH	t (95%) minutes	t (99%) minutes
2	90	138
3	60	92
4	45	69
5	36	55
6	30	46
7	26	39
8	22	35
9	20	31
10	18	28
11	16	25
12	15	23

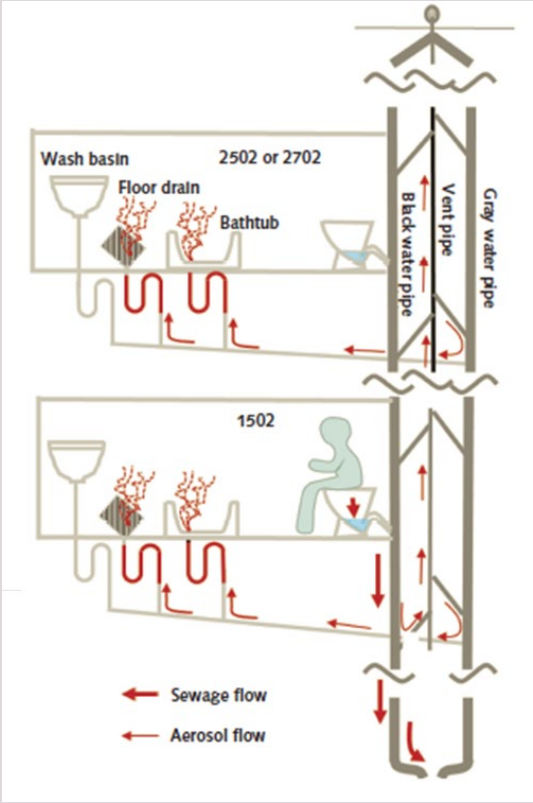
4. HVAC System Operation
Prevent Re-Entry

- ***4.4 Limit re-entry of contaminated air that may re-enter the building from energy recovery devices, outside air intakes, and other sources to acceptable levels.***
- Importance:
  - *Initial recommendation by ASHRAE and others was to disable energy recovery ventilators, energy wheels, etc. that had any potential for re-entry*
  - *Current guidance addresses how to evaluate re-entry risk and assess ability to operate*
  - *Addresses other possible sources of re-entrant contamination*

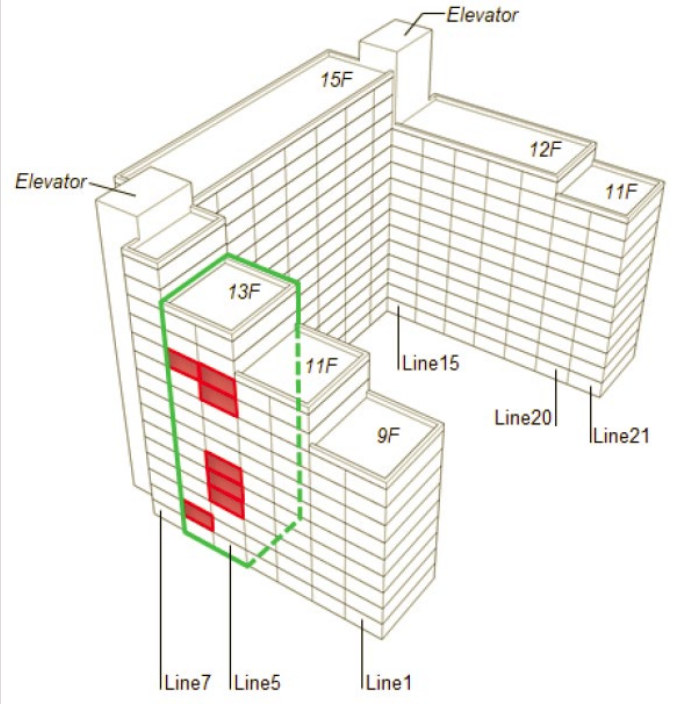


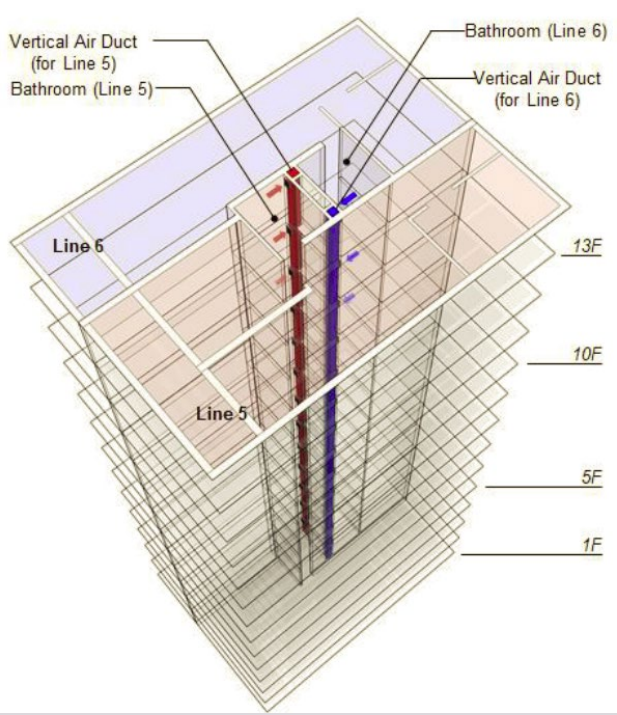
https://www.ashrae.org/file%20library/technical%20resources/covid-19/ashrae-building-readiness.pdf

Recent investigations document plumbing and air shaft transmission



Kang, M., et. al. 2020 Probable evidence of faecal aerosol transmission of SARS-CoV-2 in a High-Rise Building. Ann Intern Med. doi:10.7326/M20-0928

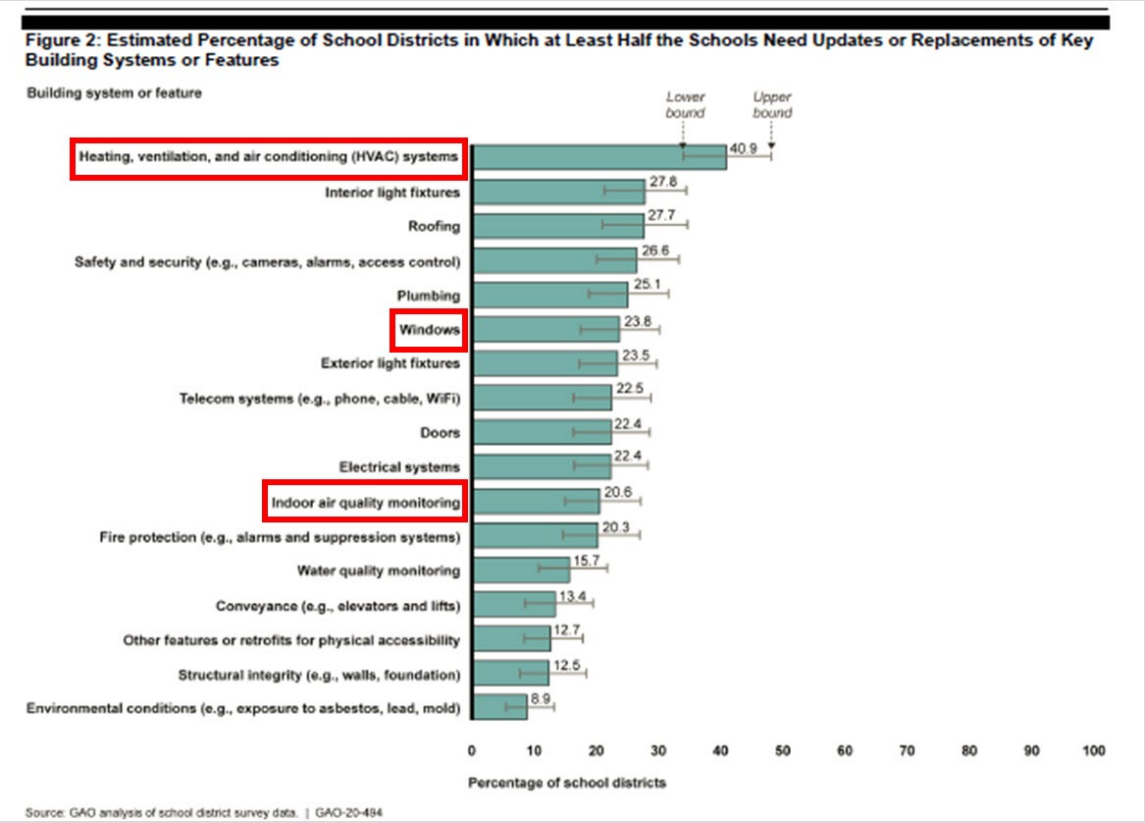




Hwang, S.E., Chang, J.H., Bumjo, O. and Heo, J., 2020. Possible Aerosol Transmission of COVID-19 Associated with an Outbreak in an Apartment in Seoul, South Korea, 2020. *International Journal of Infectious Diseases*.

5. System Commissioning

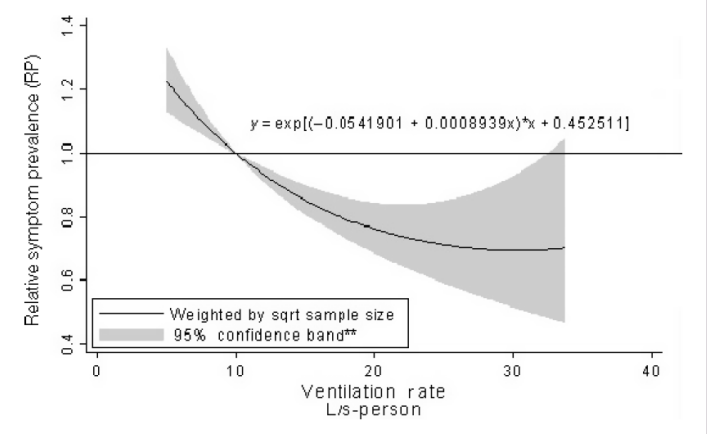
- ***Verify that HVAC systems are functioning as designed.***
- Importance:
  - *Many existing systems are poorly maintained*
  - *Performance of badly maintained systems is unpredictable*
  - *Retro-commissioning likely to make buildings safer and save energy*

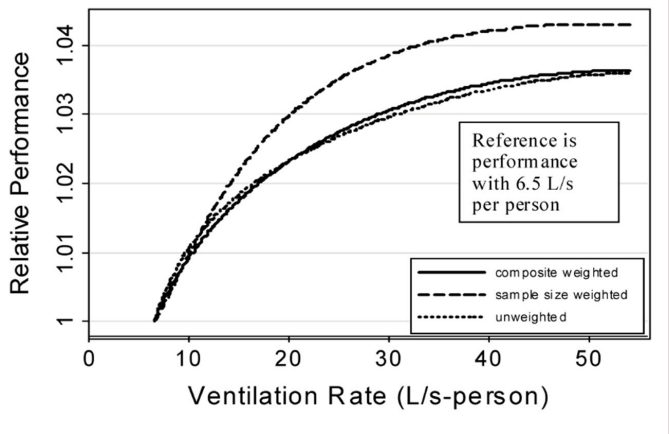


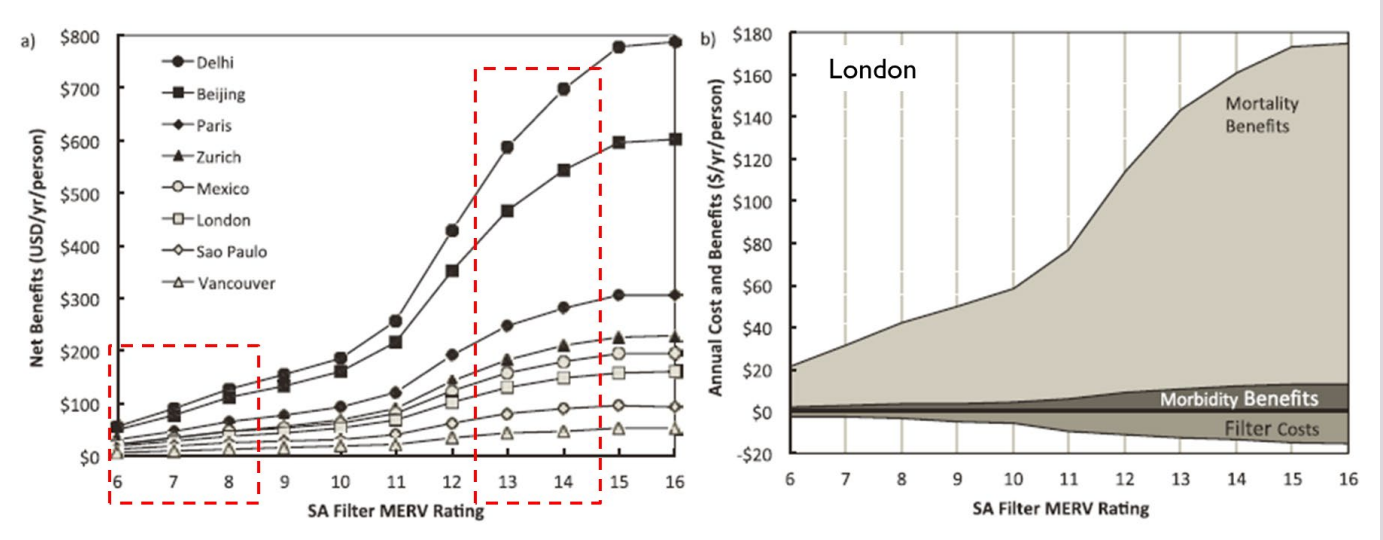
https://www.gao.gov/assets/710/707374.pdf

No-Regrets Benefits of HVAC Upgrades

- Increased ventilation
  - *Reduced sick building syndrome symptoms*
  - *Increased performance*
- Better filters
  - *Reduced respiratory illness*
  - *Lower risk of allergy and asthma attacks*
- Retro-commissioning
  - *Comfort, health, energy savings*







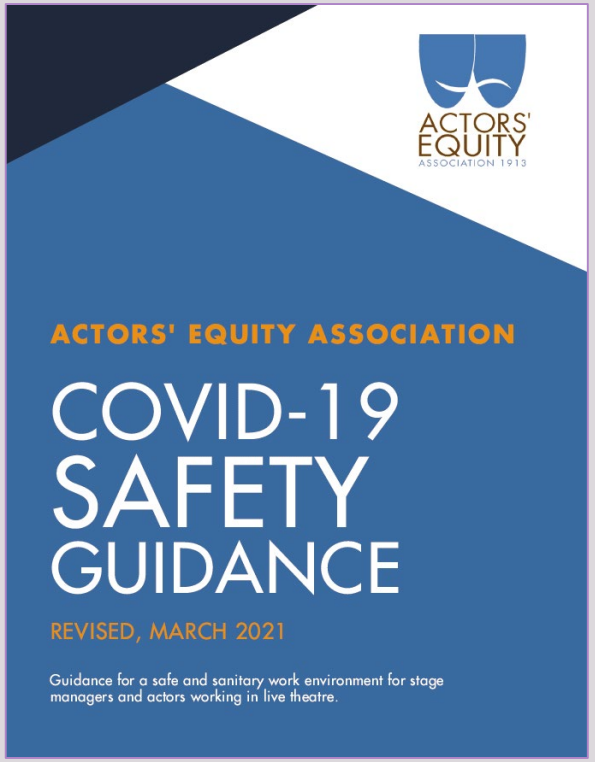
Other Non-HVAC measures
Maybe the wrong kind of theater

- Barriers/shields
  - *May reduce spray exposure in some situations*
  - *Not very effective for aerosol exposure*

- Cleaning
  - *Frequent deep cleaning is not justified by current understanding of fomite risk*

Actors Equity

- Minimum 6 ACH (supply, not outdoor air)
- Minimum MERV 13, ideally HEPA
- Trade off MERV and outdoor air
  - *MERV 17 (does not exist) – 20% OA*
  - *MERV 16 – 25% OA*
  - *MERV 15 – 30% OA*
  - *MERV 14 – 35% OA*
  - *MERV 13 – 40% OA*
  - *< MERV 13 – 100% OA*

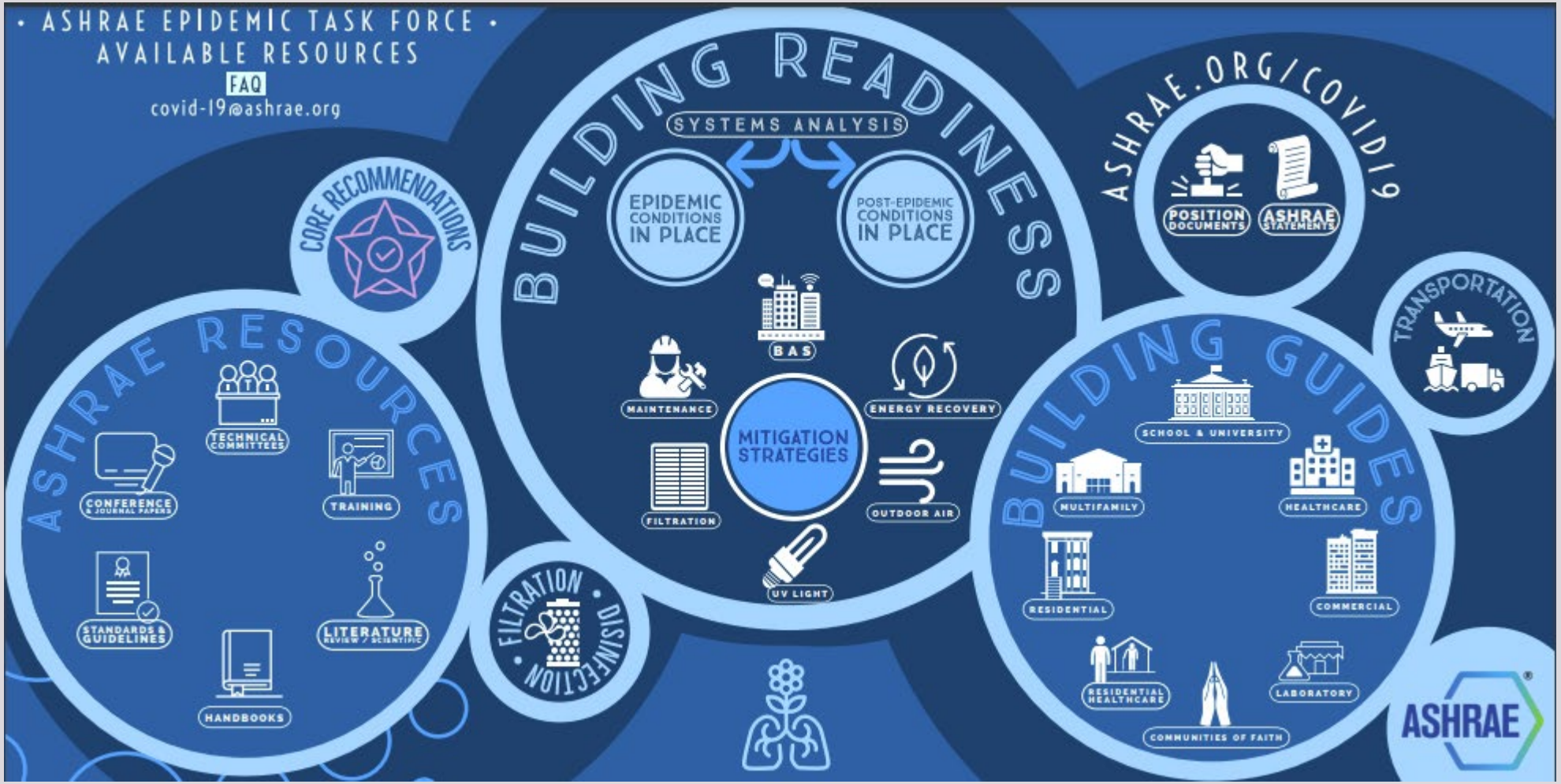


Actors Equity

- HEPA filter units in all off the deck spaces
- Restroom exhaust run 24/7
- Systems run 24/7
- Deep cleaning
- Windows, portable fans, window unit AC, air purifiers with UV, ionizers, ozone generators not permitted as ventilation
- No use of spaces without supply and exhaust

Thank You!

Bill Bahnfleth
wbahnfleth@psu.edu



ashrae.org/covid19

"Without the arts, there simply can't be a recovery" *Julian Knight*

Reopening Performing Arts

Marwa Zaatari, PhD
April 15, 2021

TABLE OF CONTENTS

The Approach

Airborne Transmission

This plan addresses primary strategies for source removal and dilution for mitigating the risk of the spread of the disease via the airborne route.

Multiple Layer Defense Strategies

This plan minimizes risk by pursuing a multi-layered defense strategy from ASHRAE/CDC with shared responsibilities across staff, artists, and audiences.

Specific Plan Per Space and Performance Type

This plan addresses the unique spaces found in the theater and the different performances duration and times.

Risk, Cost, Energy Assessment ($/risk reduction)

This plan outlines the probability of infection for different scenarios of risk reduction strategies.

The health and safety of staff, artists, and audiences are paramount at every step in the roadmap.

Checklist Reopen Safely (not exhaustive)

1

Outside Air

Minimum outside air per ASHRAE Standard 62.1

Action: Test and Balance

2

Filtration

MERV 13+ or equivalent

Action: Upgrade, replacement schedule for all filters/ Proper fit

3

Flush-out

Action: Time required to flush out to reduce 95% of concentration in a space

4

Controls

Action: pandemic plan

5

Commissioning + Maitenance

Action: Maintain Design Temperature and Relative Humidity

Action: Maintain your IAQ-related systems

Clean Air Target

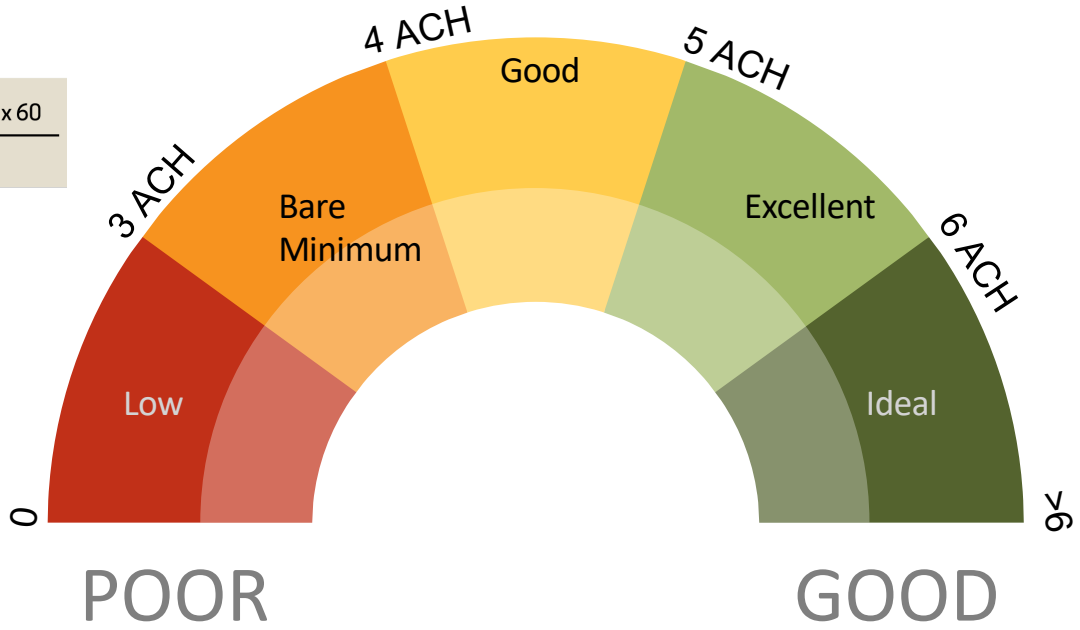
ACH: Air changes rate per hour

Formula

$$\text{Air Changes per Hour} = \frac{\text{Outside Air Intake (ft}^3\text{/minute)} \times 60}{\text{Volume of Space (ft}^3\text{)}}$$

Effective ACH =
ACH Outside Air +
ACH Filtration +
ACH In-room Air Cleaning

HARVARD/UC Boulder



Stage - Characteristics

Area	~2,000 ft^2
Height	64 ft
Max number of people	10
Volume	~128,000 ft^3
Distribution	Supply and return from ceiling
Design Supply Air	17,400 CFM

Central double stage filtration: MERV 7 filter + 10 bag filter

Design outside air = 2,500 CFM

Thermal comfort is maintained

Stage – Control Strategies

Existing Strategies

Name	Dilution		Filtration		All
	Outside Air (CFM)	Outside Air (ACH)	Airflow Through the Filters (cfm)	Filter (ACH)	Total ACH
Stage	2,500	1.2	14,900	5.2	6.4

Recommendation:
Upgrade Central Filtration from MERV 7+10 to MERV 7+11

Name	Filtration	
	Airflow Through the Filters (cfm)	Filter ACH including Efficiency (MERV 7+11)
Stage	14,900	5.9

Stage – Control Strategies

Summary (after recommendation is implemented)

Name	Outside Air Compliant to 62.1	Filter (equivalent to MERV 13)	Air Cleaner (equivalent to MERV 13)	ACH Total
Stage	✓	✓	N/A	7.1

Classification

Name	ACH Classification per Harvard/Boulder
Stage	Ideal

Per. HARVARD - CU BOULDER PORTABLE AIR CLEANER
- Ideal (6 ACH)
- Excellent (5-6 ACH)
- Good (4-5 ACH)
- Bare minimum (3-4 ACH)
- Low (<3 ACH)

Auditorium - Characteristics

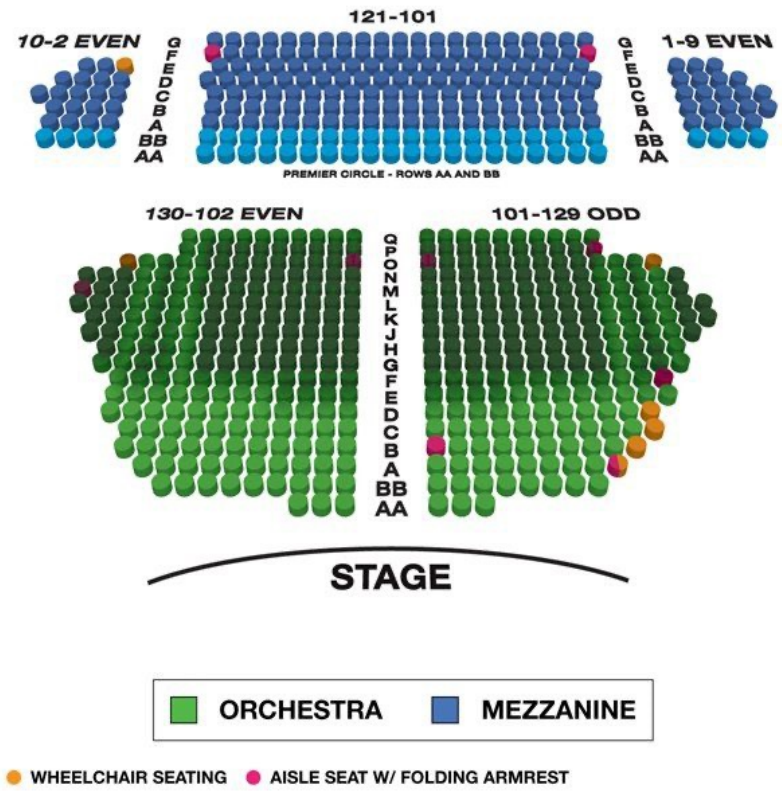
Area	~3,700 ft^2
Height	20 ft (see next page)
Max number of people	650
Volume	~74,000 ft^3
Distribution	Floor supply and wall/ceiling return
Design Supply Air	22,300 CFM

Central double stage filtration: MERV 7 filter + 10 bag filter

Design outside air = 9,000 CFM

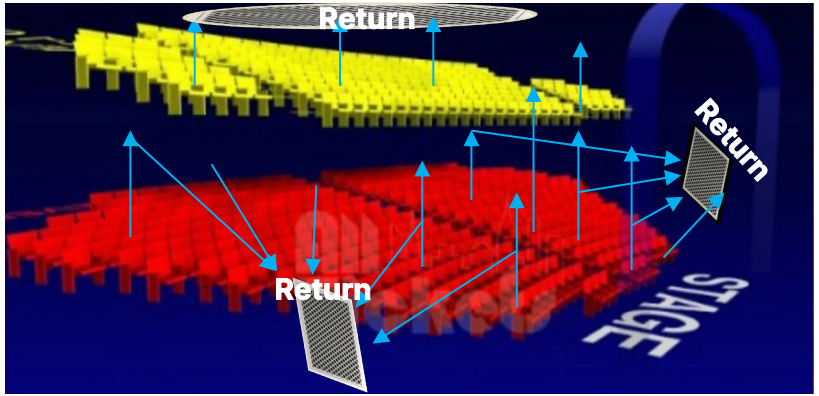
Thermal comfort is maintained

Orchestra - Height for ACH



Orchestra Height	First row to ceiling (ft)	Last row to ceiling (ft)	Orchestra to balcony last row (ft)
Orchestra level	47		8.75
Balcony level	32	20	

Height considered for ACH = 20 ft



Orchestra – Control Strategies

Summary (after recommendation is implemented)

Name	Outside Air Compliant to 62.1	Filter (equivalent to MERV 13)	Air Cleaner (equivalent to MERV 13)	ACH Total
Spectator	✓	✓	N/A	16.1

Classification

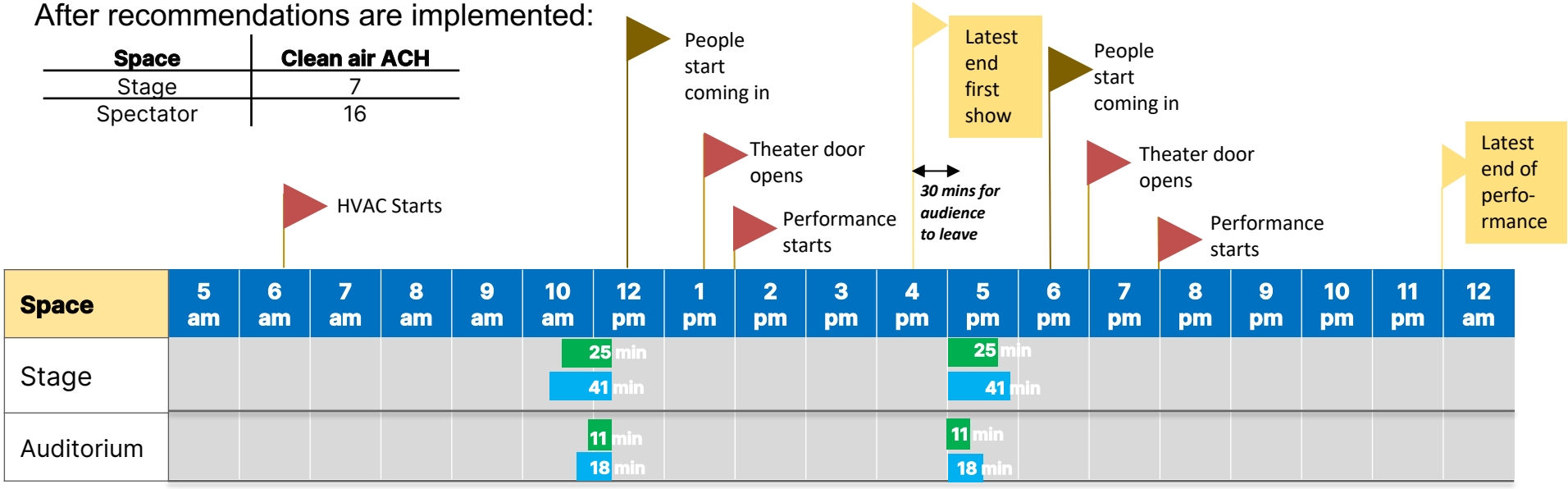
Name	ACH Classification per Harvard/Boulder
Spectator	Ideal

Per. HARVARD - CU BOULDER
PORTABLE AIR CLEANER
- Ideal (6 ACH)
- Excellent (5-6 ACH)
- Good (4-5 ACH)
- Bare minimum (3-4 ACH)
- Low (<3 ACH)

Flush-out: 2 PM & 8 PM Performance

After recommendations are implemented:

Space	Clean air ACH
Stage	7
Spectator	16

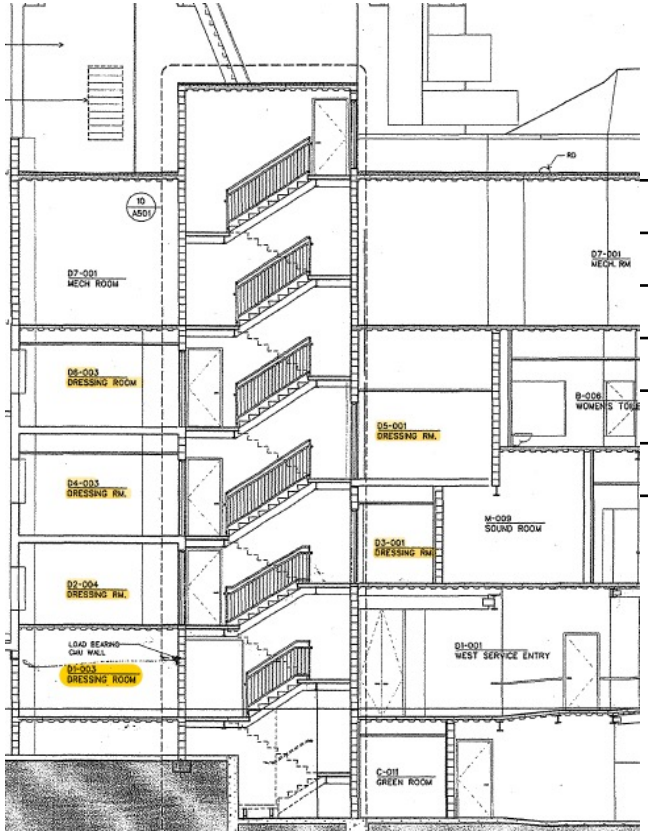


Legend:

95% Reduction of contaminants

99% Reduction of contaminants

Dressing Rooms



Name	Level
Room 1	Orchestra
Room 2	1st Floor
Room 3	1.5st Floor
Room 4	2nd Floor
Room 5	2.5nd Floor
Room 6	3rd Floor

Dressing Rooms – Characteristics

Design Supply Air	660 CFM (100% Outside Air unit)

FTR = Fin Tube Radiator or Fan Coil unit

Design total outside air = 660 CFM

Thermal comfort is maintained

Stand-alone air cleaner = FTR 145 CFM (large) – 200 CFM (small)

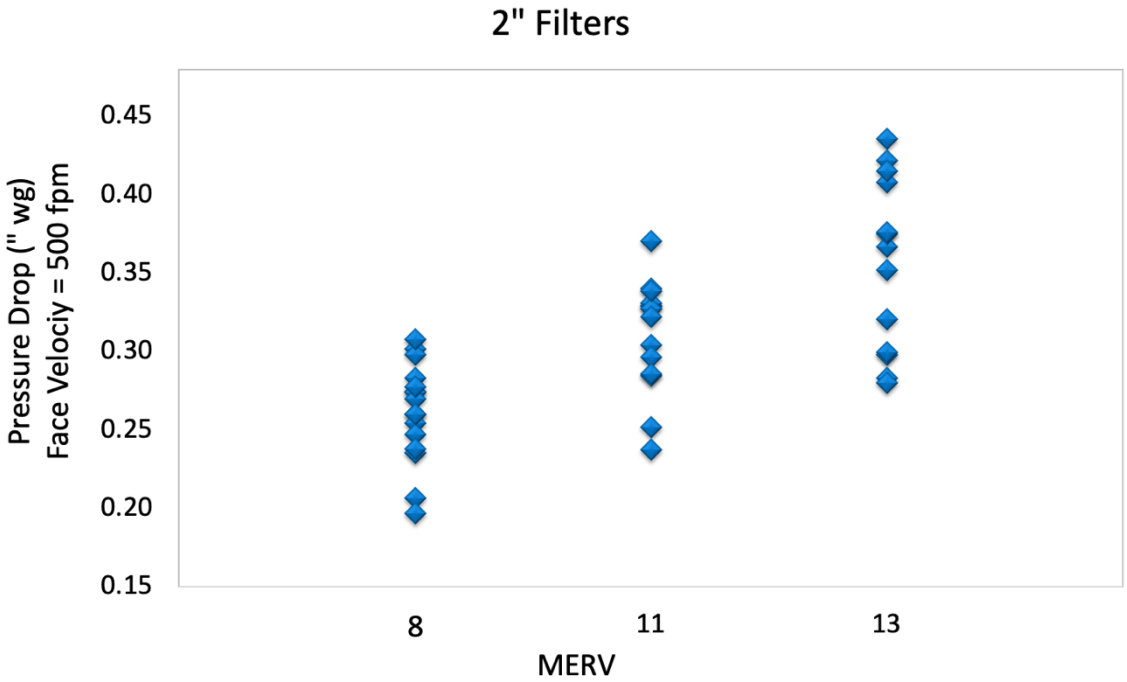
In-room filter = MERV 8, 1″

Dressing Rooms– Control Strategies

Recommendation 1: Upgrade filter efficiency, from MERV 8 to MERV 13

You can find a **MERV 13** filter that has *equal* or *lower pressure* drop than a **MERV 8** filter.

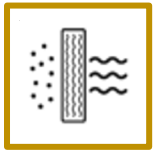
Cost:
For a 1000 ft^2,
MERV 13 costs $50/year



Other Spaces – Characteristics

Name	Level	Area (ft^2)	Max number of People	Served by
Janitors office	Cellar	30	2	N/A
Box office	Orchestra	65	2	ACU-1
Building Manager Office	Tech	240	2	FCU

Box office



In-room filtration = MERV 7

Design outside air = 0 CFM

Janitors & Building Manager office

Central or in-room filtration = N/A

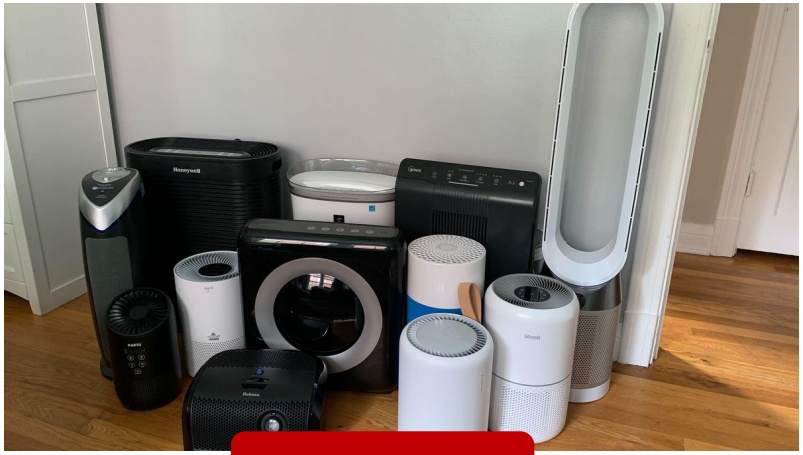
Design outside air = 0 CFM

“I don’t have outside air or I can’t change my filter, so I’m doomed”

Air cleaner considerations

- **Types:** Portable, stand-alone, plug-in, ceiling or wall mounted
- **Technologies:** HEPA + Fan

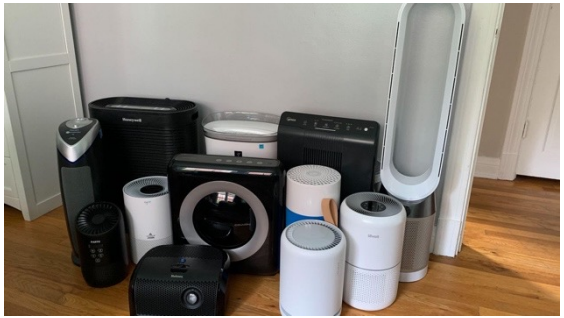
Rules of thumb: CADR = 2/3 x room ft^2. CADR = 300 for every 500 ft^2



Portable

Fixed

“I don’t have outside air or I can’t change my filter, so I’m doomed”



Consumer Fraud Alert:

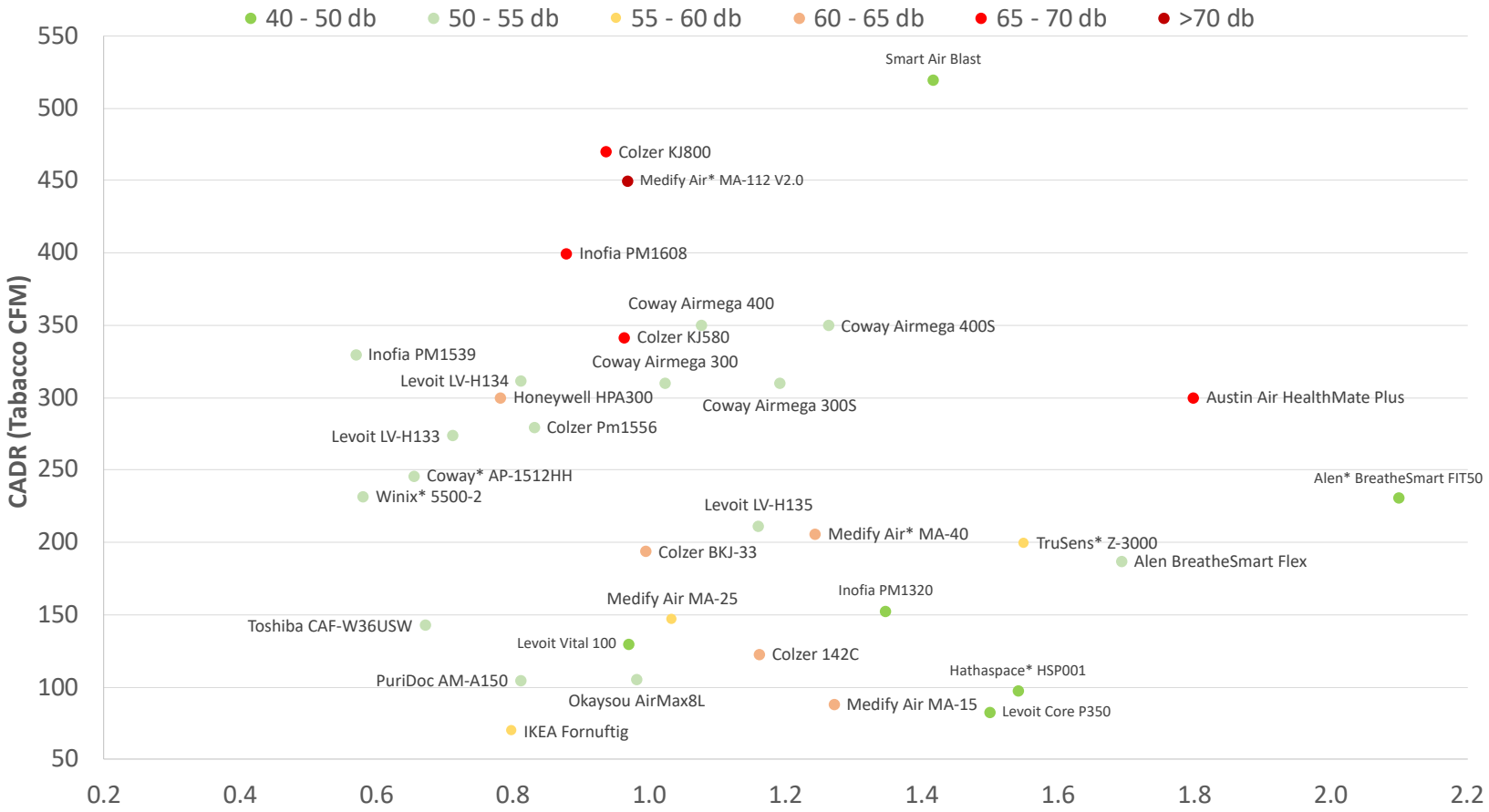
HEPA-type
HEPA-like
HEPA-style
99% HEPA
HEPAsilent
HEPA Ultra
Ionic HEPA
HEPAFast
HEPA Efficiency
HEPA Functions
HEPA Action
Plasma HEPA
Super HEPA
HyperHEPA

are ALL subpar versions of what constitutes a HEPA air filter.

Either HEPA or NOT HEPA.

Data compiled by Marwa Zaatari

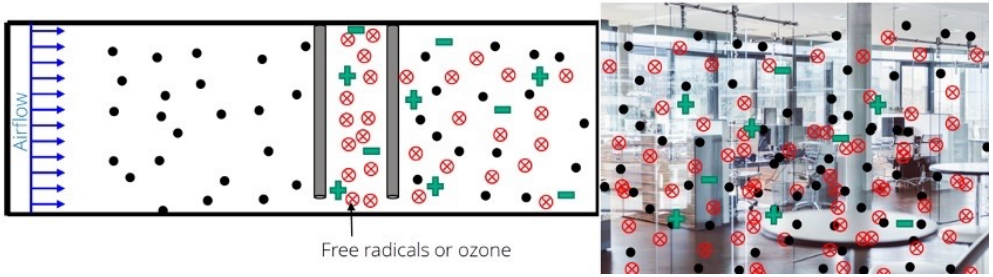
Portable Air Cleaners Comparison



*have an ionizer but can be turned off

MYTH "There is a magic bullet to IAQ"

Understand what is Electronic Air Cleaning - EAC?



Chemistry Fact 1: Free radicals and/or ozone produced

Chemistry Fact 2: Indiscriminate and unpredictable reactions

Lots of names:

- Photocatalytic Oxidation (PCO), UV PCO
- Photocatalytic Activation
- Ionization
- Bi-polar ionization (BPI)
- Needlepoint ionization
- Plasma
- Hydro-Peroxide plasma
- NCCO (Nano Confined Catalytic Oxidation)
- Activated Oxygen
- High voltage coronas
- Hydroxylation
- UV Sanitizer + negative ions
- Cold catalyst filter
- Ionic purifier + composite catalyst
- Fragrance Sponge
- Plasma wave
- Surface irradiation

But the mechanism is the same:

Technologies utilize various methods to create reactive ions, mixtures of reactive oxygen species (ROS), ozone, hydroxyl radicals, superoxide anions, etc. in air that react with airborne contaminants.

Check open letter: https://medium.com/open-letter-to-address-the-use-of-electronic-air/no-to-ionizers-plasma-uvpco-bc1570b2fb9b

MYTH "There is a magic bullet to IAQ"

Needle Point Bi-Polar Ionization

What the manufacturer claims? I will focus on three claims:

- Reduction of PM count by agglomeration
- Surface inactivation of COV-2
- Removal of VOCs + formaldehyde

From manufacturer website:
device +MERV 8 reduced particle count concentration by 89.7%

Total Particle Counts

Date	Before	After
6/17/2013	2015	
6/25/2014		208*

Total Particle Count Reduction 89.7%

*GPS-iBar installed & activated 6 months prior to "After" testing

From manufacturer website: report 99.8% SARS-COV-2 surface inactivation

Pathogen	Time in Chamber	Rate of Reduction	Test Agency
SARS-CoV-2**	30 minutes	99.8% Inactivation rate measured on aluminum and other surfaces	Innovative Bioanaylsis

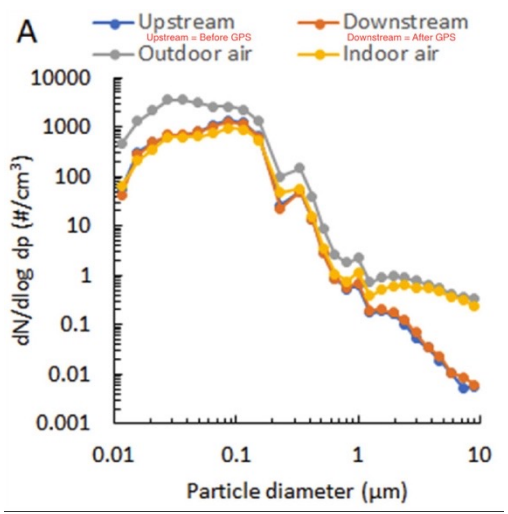
Please note that testing the reduction rate of SARS-Cov-2 with the GPS NPBI product is an evolving process and additional testing is anticipated to be conducted in the future. While this is not a surface disinfectant, this testing demonstrates a decrease in active virus on surfaces through particle aggregation.

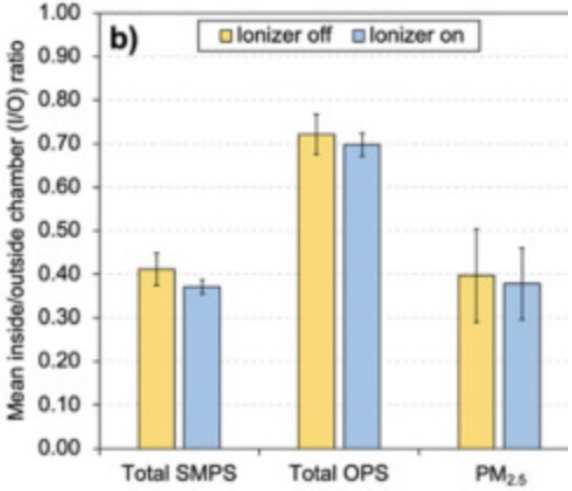
**Not an FDA Cleared Air Purification System

MYTH "There is a magic bullet to IAQ"

Needle Point Bi-Polar Ionization

What the independent studies by subject matter experts found (device tested is produced by GPS). → Claim of reduction of particulate matter concentration: False





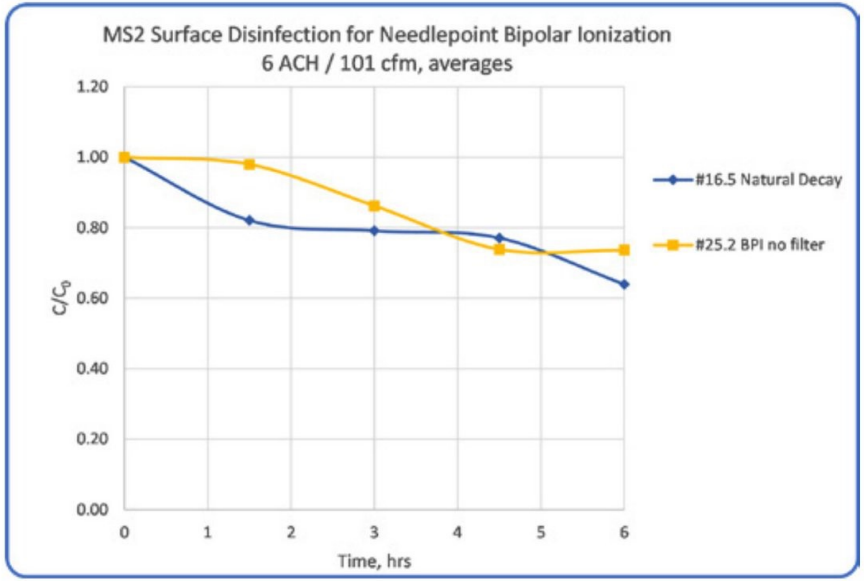
https://www.sciencedirect.com/science/article/pii/S036013232100158X

MYTH "There is a magic bullet to IAQ"

Needle Point Bi-Polar Ionization

What the independent studies by subject matter experts found (device tested is produced by GPS).
--> Claim of surface inactivation of virus: False. Not different than letting the virus naturally decay.

No killing of viruses on surfaces



https://www.jp.trane.com/content/dam/Trane/Commercial/global/about-us/wellsphere/Technology%20Whitepaper%20-%20Bipolar%20Ionization.pdf

MYTH "There is a magic bullet to IAQ"

Needle Point Bi-Polar Ionization

What the independent studies by subject matter experts found (device tested is produced by GPS).
→ Claim of no by-products: False. The device increased some VOCs.

Both the laboratory and field data collected herein suggest that other unintended byproduct formation (e.g., of smaller, potentially oxidized VOCs) is likely occurring, with some consistencies observed in both constituent reductions (e.g., xylenes, ethylbenzene, and 1,2-dichloroethane) and increases (e.g., acetone, ethanol, and toluene), with some consistencies observed between both the chamber tests and field tests. The concept behind ionization with respect to VOCs is that if the

Claim of formaldehyde (a known human cancerogenic) removal:
False.

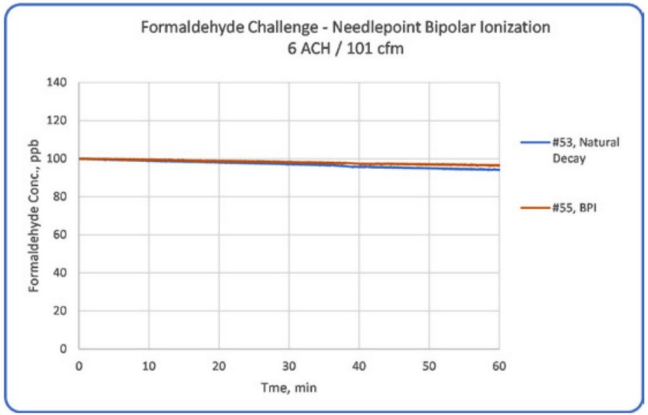


Figure 5: Testing of NPBI device against formaldehyde with airflow of 6 ACH.

$/Risk Reduction?

“To Rebuild and Reimagine the United States Post-Pandemic, We Must Put Creative Workers to Work”

Americans for the Arts

Marwa Zaatari, PhD
Partner at Dzine Partners

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@marwa_zaatari

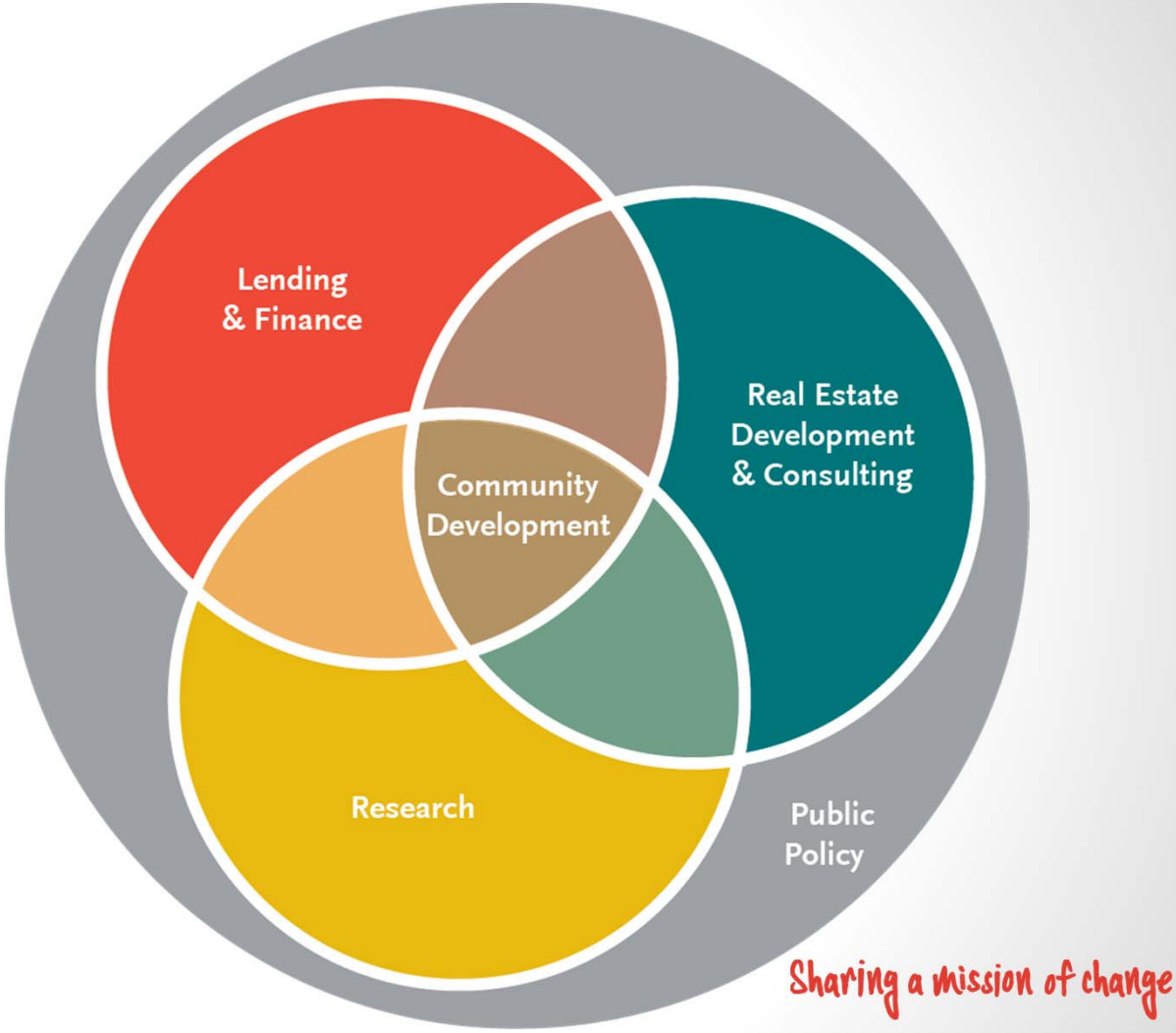
A mission-driven lender

A real estate consultant

A community developer

A social impact accelerator

Working to strengthen nonprofits and the communities they serve by providing leadership, capital, and real estate solutions.



Sharing a mission of change

Capital Solutions

IFF Loan Products

Facility loans for acquisition, construction, renovation, maintenance, and leasehold improvements

- Capital campaign bridge loans
- Subordinate mortgage loans
- Equipment and vehicle loans
- Loan Amount: **$10,000 to $7 million**
- Term: 5 to 15 years; up to 20-year amortization
- Competitive Interest Rates

Loan Program Features

- Up to **95%** of project cost (5% cash needed)
- <u>No appraisals required</u>
- No prepayment penalty
- Typically no loan covenants
- IFF Special financing products
- Affordable housing loans

Identifying Potential Funding Sources

IFF's Role

Assist with debt and equity funding sources

- Evaluate client's debt capacity
- Provide loans through IFF's capital solutions team
- Provide guidance on smart resource allocation

Pursue alternate funding sources

- Identify potential grants and assist with grant applications
- Assist with applications for Small Business Improvement Fund, Neighborhood Opportunity Fund and other special funding sources

Real Estate Solutions

Full-scale real estate solutions: For nonprofits in low-income communities or serving disadvantaged populations.

Sector expertise bringing best practices in facility design for arts and culture, early childhood education, schools, health care, affordable housing, and other sectors.

Affordable, flexible and responsive consulting services.

Real Estate Solutions

- **Facility Feasibility Analysis** – Create a facility vision, compare facility options, and prepare your staff and board to execute
- **Facility Assessment** – Identify immediate, intermediate, and long-term facility needs for a building you own or want to buy (scope and cost estimates)
- **Building or Property Search –** Identify available properties, view properties and confirm scope and costs for renovation or new construction
- **Design and Construction Oversight** – Support on the selection of a qualified architect and contract, bring best practices in design for your sector, and deliver your facility on time and on budget

Kate Ansorge
Managing Director – Chicago Real Estate Services
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Brett Mueller
Senior Lender
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Sharing a mission of change

April 15, 2021

Lawyers for the Creative Arts

"Curtains Up! Safety Measures and Costs"

CHICAGO COMMUNITY LOAN FUND

Helping create communities where people thrive

CHICAGO COMMUNITY LOAN FUND

Helping create communities where people thrive

Overview

- Chicago Community Loan Fund
  - Who we are
  - What we do
- How We can help
- Q & A

CHICAGO COMMUNITY LOAN FUND
Helping create communities where people thrive

About CCLF: Roots in the Community

- Mission: community economic development
- Established in 1991
- Original investment: $200,000
- Over 30 individual investors
- Capitalized over $121,000,000
- Lending Capital over $106,000,000

CHICAGO COMMUNITY LOAN FUND

Helping create communities where people thrive

CCLF is a **Community Development Financial Institution (CDFI),** sometimes called an Opportunity Finance Organization.

How CCLF works:

- Individuals, foundations, corporations, government and religious organizations invest in CCLF at below-market rates
- CCLF re-lends these funds to groups engaged in community development & social services

CHICAGO COMMUNITY LOAN FUND

Helping create communities where people thrive

What are CDFIs?

Differ from conventional financial institutions

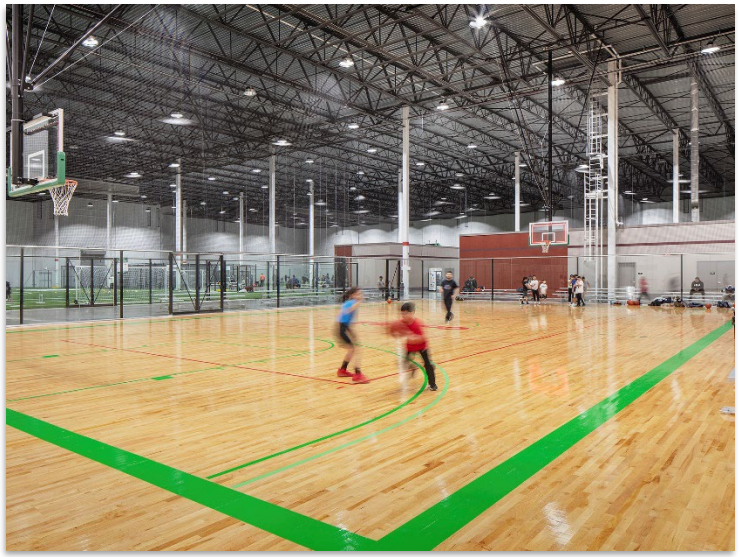
- Mission-driven vs. shareholder driven
- Provide Technical Assistance
- *Seek* overlooked opportunities
- Provide products/services to communities and individuals traditional lenders miss: **Opportunity Finance!**

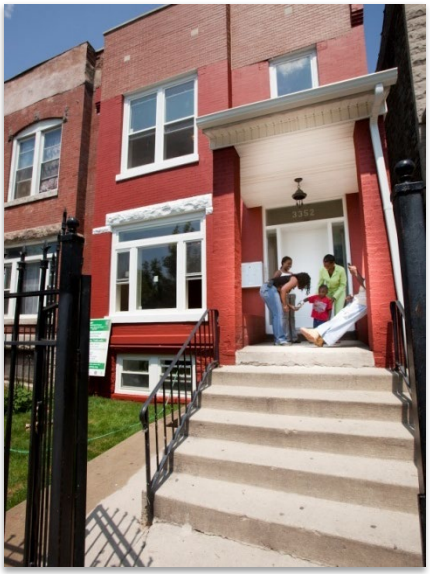
CHICAGO COMMUNITY LOAN FUND

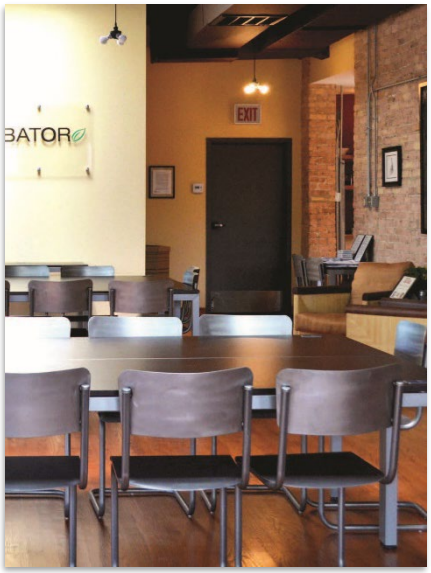
Helping create communities where people thrive

Key Roles

- Primary lender to smaller developers on small projects
- Go-to predevelopment/gap lender for large projects
- Go-to lender for alternative economic development projects ("safety net")
- Customized project technical assistance with emphasis on sustainability







Types of Projects

- Affordable housing
  - Single-family and multi-family
  - Rental and for-sale
  - Cooperatives
- Social service facilities
- Retail, commercial, or industrial facilities
- Social enterprises

CHICAGO COMMUNITY LOAN FUND

Helping create communities where people thrive

Eligible Organizations

- Nonprofits and for-profit corporations
- Worker-owned cooperatives
- Housing Cooperatives
- Organizations of all sizes and ages, including start-ups
- All loans must benefit low- or middle-income households and communities

CHICAGO COMMUNITY LOAN FUND

Helping create communities where people thrive

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Impact Across Chicagoland

As of 4th quarter 2020, **CCLF has:**

- **closed 544 loans** totaling over **$253 million in financing to over 275 unique customers**
  - These loans will:
    - Leverage more than **$1.5 billion** in additional public and private sector capital for community projects.
      - Create **6,339 jobs**
      - **12 million square feet** of commercial real estate and nonprofit facility space.
      - and **over 11,300 housing units**

Technical Assistance Resources

- Workshops
- Referrals
- Comprehensive Development Assistance

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How We Can Help

Solutions Driven

- Build to suit
  - Example Loan Types
    - Predevelopment
    - Acquisition
    - Construction
    - Rehab
    - Mini-perm
    - Perm
    - Hybrid
  - Terms
    - Up to 20-years
  - Amortization
    - Up to 30-years
  - Competitive pricing

Thank You!

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