



COVID-19 and the Impacts to Facilities

Course # - BalaAIA021

BALA

Bala Consulting Engineers – AIA CES Provider #401104229

Presenters: Andrew Horning, LEED AP BD+C
Scott M. Davis, PE

Charles Kensky, PE, LEED AP BD+C
Matthew Ezold, CTS-D

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Course Description



The COVID-19 Virus has forever changed our perspective on cleanliness, personal interaction and our environment. The thought of a post-pandemic state brings us hope. But what does a post pandemic environment look like and how does it operate? From filters and air changes in HVAC systems to sanitization and touchless toilet fixtures as well as technology integrations for access control and bio-scanning, there are short and long-term strategies building owners can implement to increase the safety of their building. This session will provide research developed by Bala, healthcare, and industry professionals that takes an in depth look at building systems strategies, coupled with architectural elements, and will provide guidance and recommendations to reduce the risk of exposure within the workplace.

Learning Objectives



- Participants will learn how to apply protective measures to new and existing HVAC systems such as filtration, bi-polar ionization, UVC light, pressurization and air flow, humidification, sanitization, and air purification.
- Participants will learn about recommended plumbing solutions to protect against respiratory, touch, and fecal-oral transmission with special attention on restrooms.
- Participants will learn about the technological measures such as thermographic screening, remote collaboration, and Wi-Fi capabilities to keep the workplace a safe environment to be in.
- Participants will learn about controlled access solutions for people entering the workplace, such as de-densification, employee PPE, and the importance of disinfecting all surfaces.

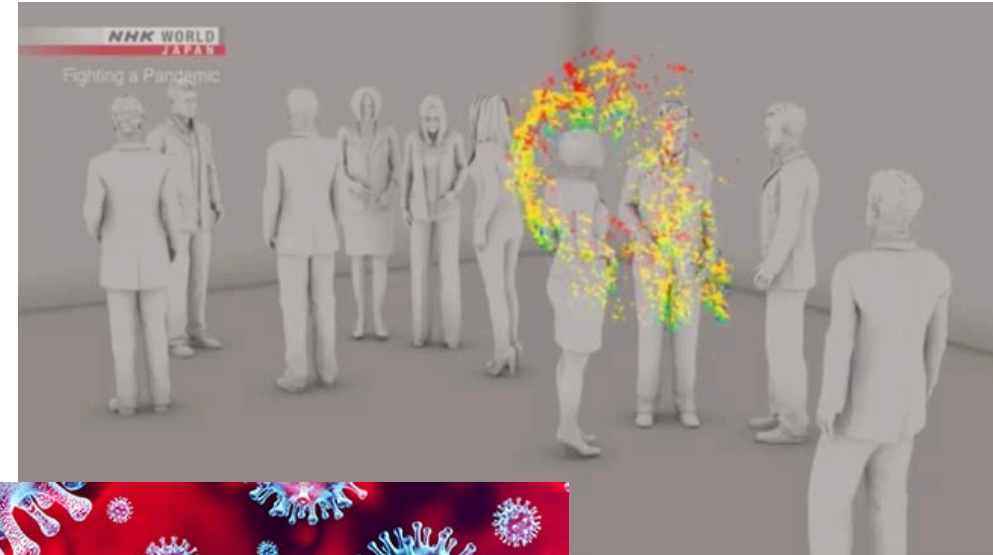
Overview

- The Virus
- HVAC Solutions
- Plumbing Solutions
- Electrical Solutions
- Technology Solutions
- Workplace Environment Solutions
- Other Markets (Long Term Care, Multi-family, K-12, Higher Ed)



The Virus – Fast Facts

- COVID-19 is caused by the SARS-Cov-2 virus
- Highly Contagious
- How it's spread:
 - Humans
 - Surfaces
 - Airborne Water Droplets/Dust Particles
- Presence:
 - Aerosol = Up to 3 hours
 - Copper = Up to 4 hours
 - Cardboard = Up to 24 hours
 - Plastic = Up to 3-4 days
 - Stainless Steel = Up to 3-4 days



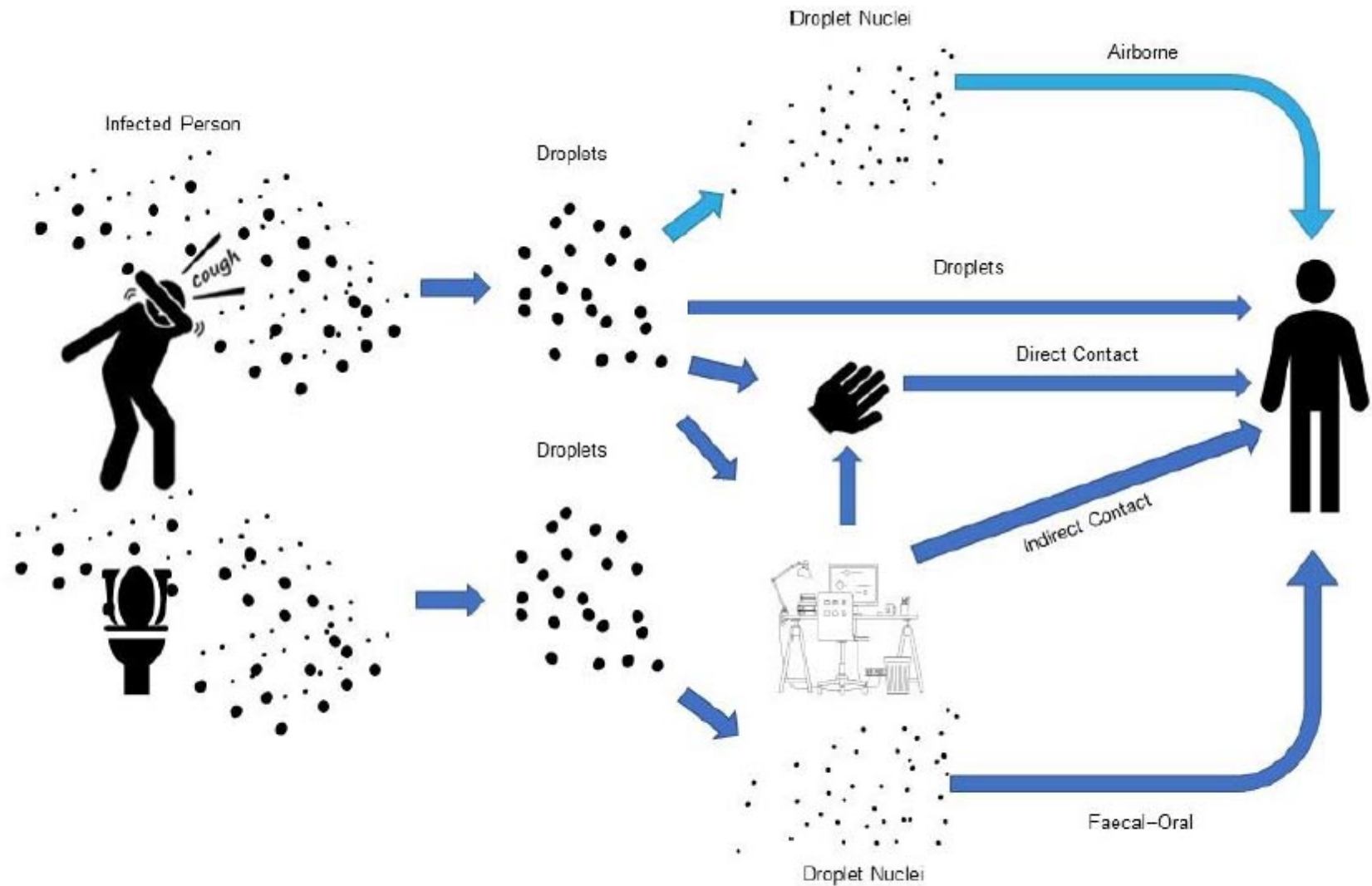


Figure 1. WHO reported exposure mechanisms of COVID-19 SARS-CoV-2 droplets (dark blue colour). Light blue colour: airborne mechanism that is known from SARS-CoV-1 and other flu, currently there is no reported evidence specifically for SARS-CoV-2 (figure: courtesy Francesco Franchimon).

The Virus

High Risk

- Older adults, with risk increasing by age
- People who serious chronic medical conditions:
 - Heart Disease
 - Diabetes
 - Lung Disease
 - Compromised Immune System
 - Asthma

Precautionary Steps

- Personal Protection Equipment (PPE)
- Isolation – Maintaining safe distances between people and contaminated surfaces.
- Cleaning/Disinfection

HVAC Solutions

Effective Measures

- Install filtration, bi-polar ionization and UV light within ductwork
- Implement pressurization control and/or enhance current practices
- Increase outside airflow
- Deactivate demand control ventilation system
- Operate systems longer and with higher outside air content to flush spaces (at night purge)
- Operate exhaust systems serving communal spaces continuously
- Maintain minimum humidity levels (between 40-60% RH)
- Sanitize ductwork with aerosol sprays or UV light
- Use portable air purifiers to clean and increase ACPH

HVAC Solutions

Filtration

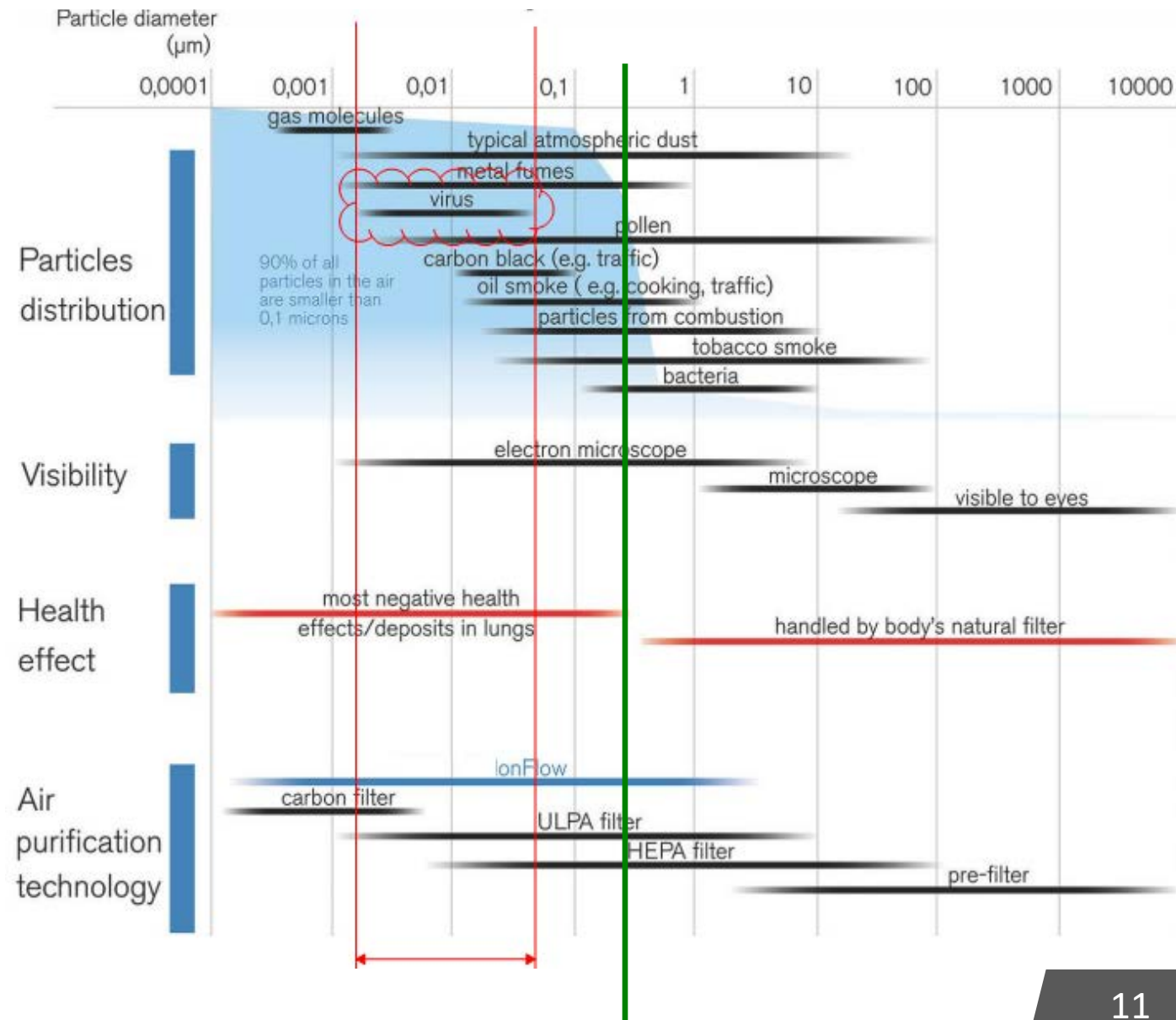
- Viruses are very small and can pass through filters - *if independently suspended in air*
- The coronavirus often attaches to airborne particulate (dust & vapor droplets) which can be captured by high efficiency filters
- HEPA filters rated at 0.3 micron particulate
 - Will capture smaller particulate
 - Capture improves with loading
 - ULPA has higher efficiencies

Advantage

- High Percentage of virus captured

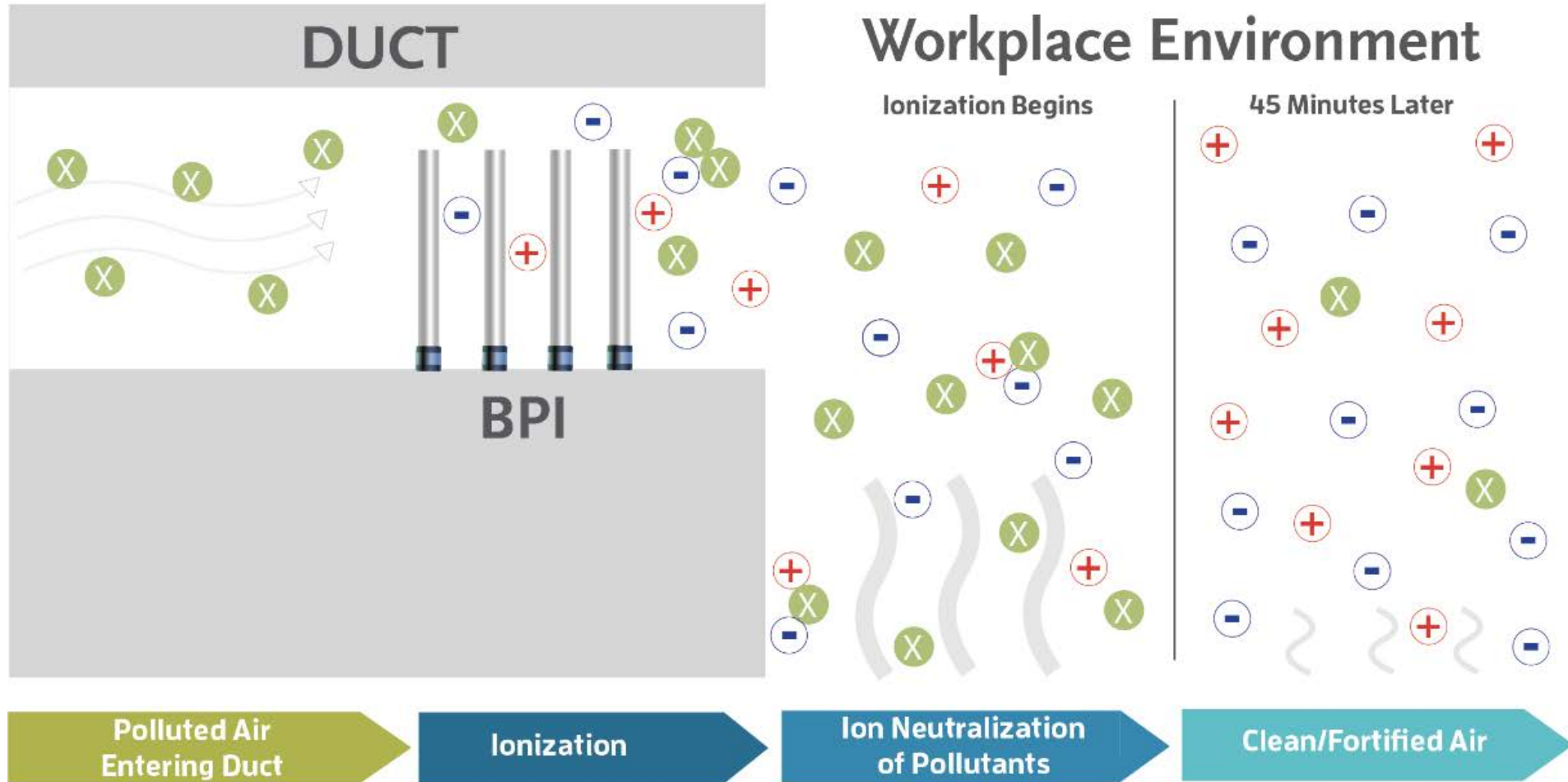
Disadvantages

- A percentage still passes through
- Increased pressure drop



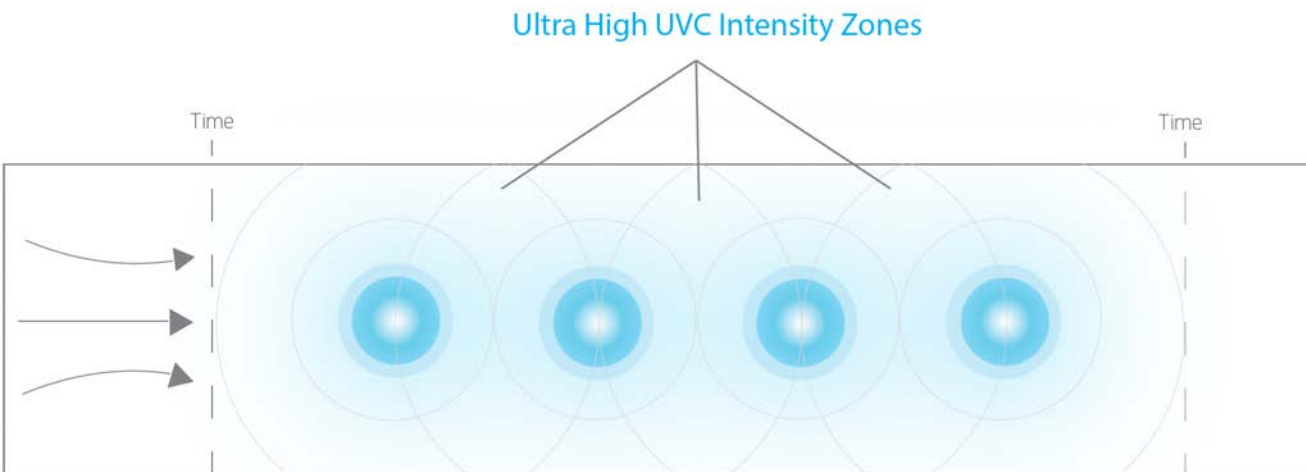
HVAC Solutions

Bi-Polar Ionization



HVAC Solutions

UVC Light



Photocatalytic Oxidation

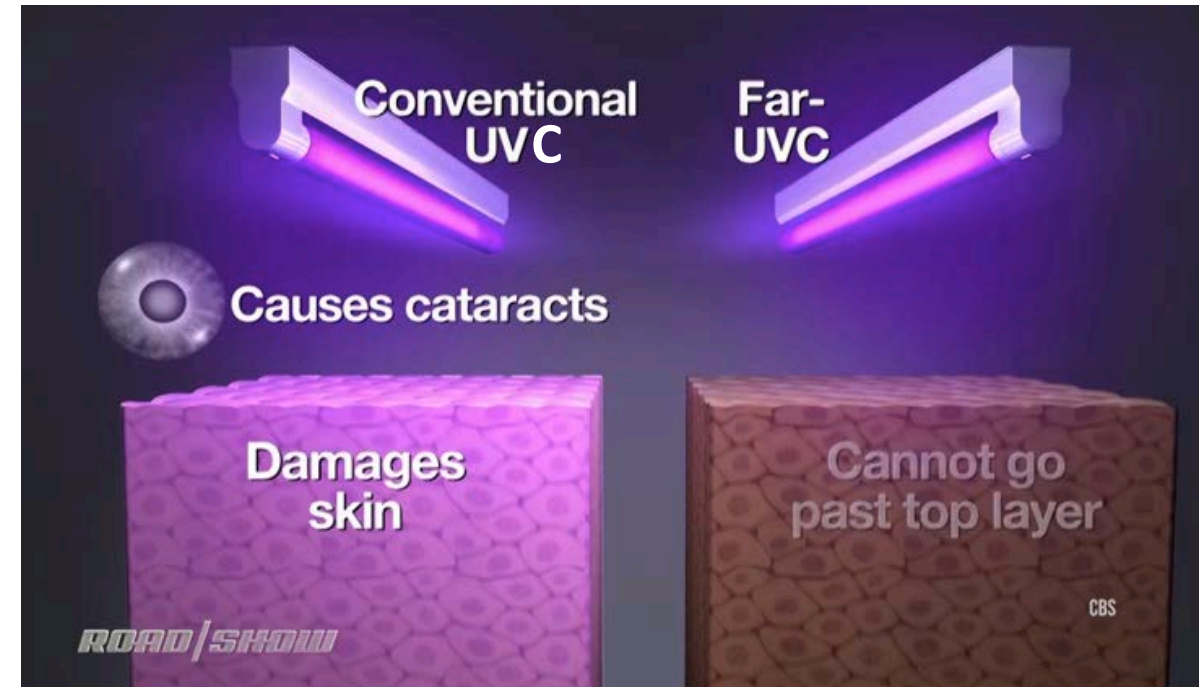


Note: Manufacturers recommend 10 second exposure to the UVC bulb, with lamps being 6-12" apart.

HVAC Solutions

Far-UVC Light (207-222 nm)

- UVC light sources can be carcinogenic and cataractogenic
- Far-UVC inactivates bacteria and viruses without harm to human skin when proper filters are applied to prohibit standard UVC light release
- Inactivates viral, bacterial, and fungal cells in minutes with correct intensity
- Far-UVC lamps do not contain mercury

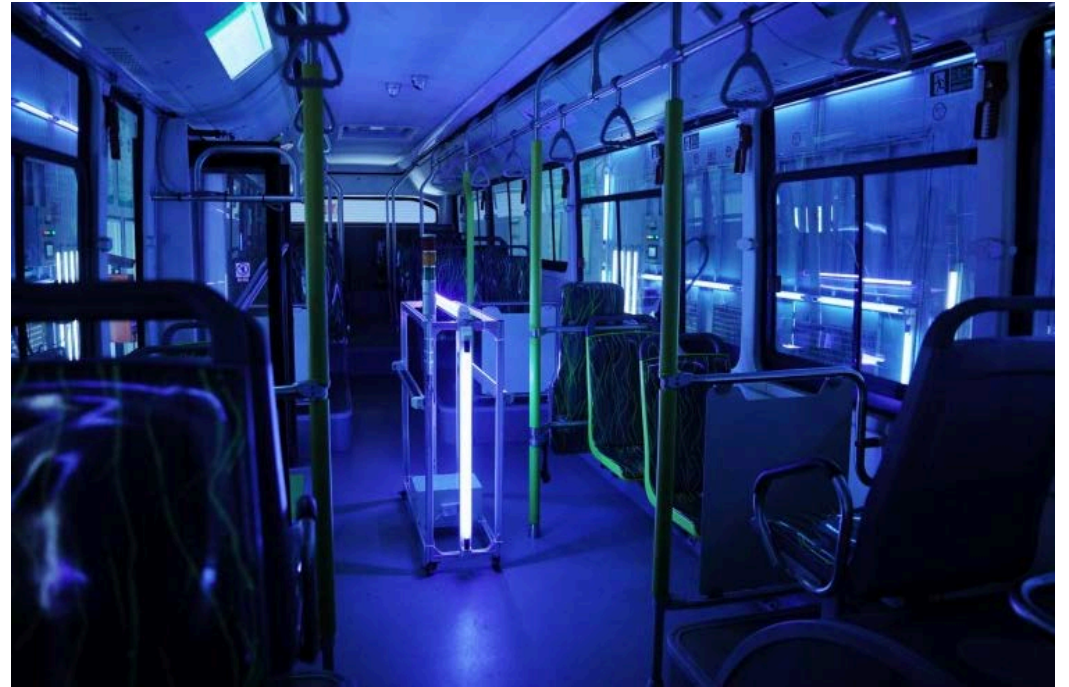


HVAC Solutions

UVC Disinfection Process



Source: AFP

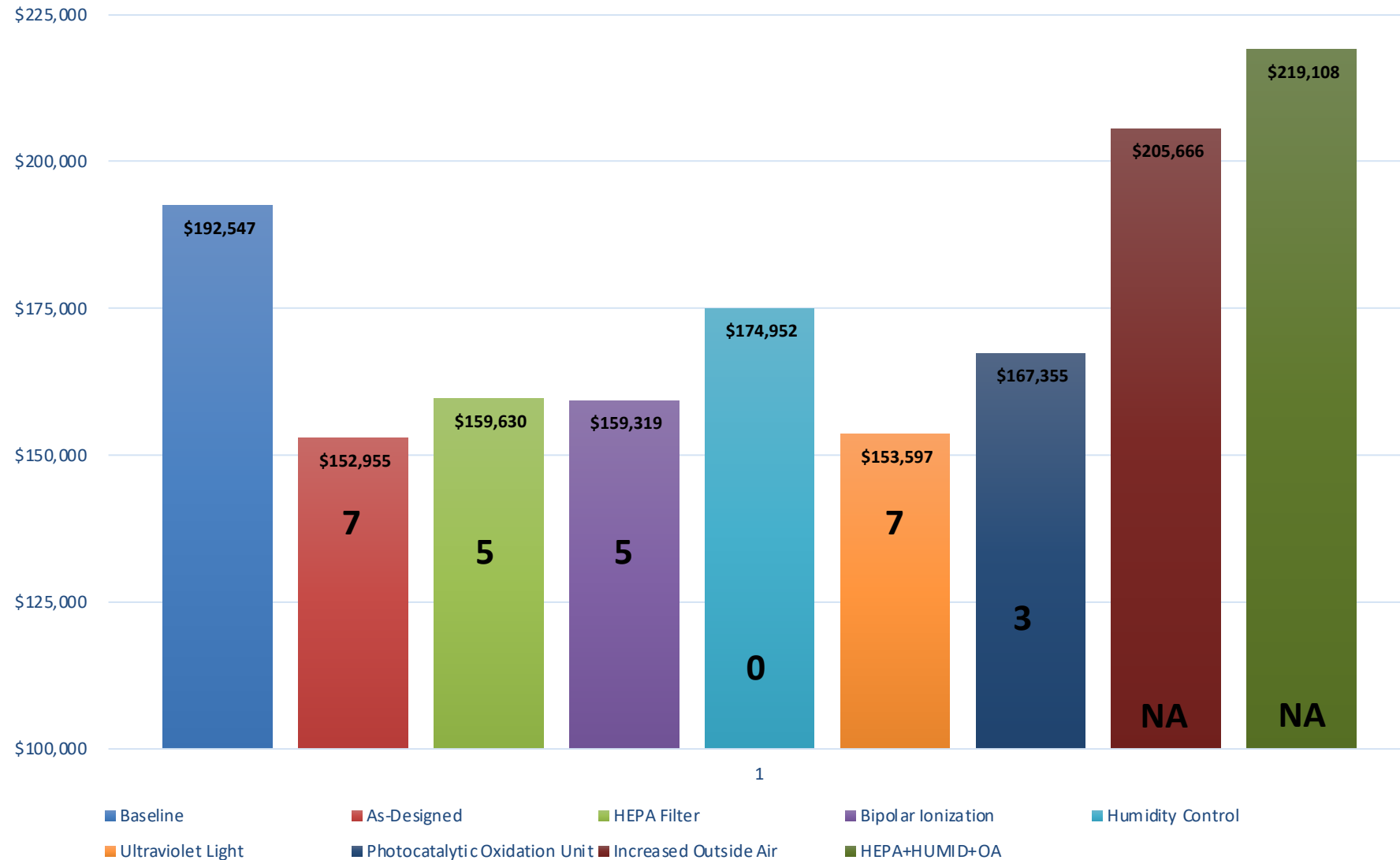


HVAC Solutions

System Applications

Systems to Apply Solutions	Filtration	UVC Lights/PCO	Bi Polar Ionization	Portable Purifiers	Humidification	Increase Outside Air
Centralized VAV System	Yes	Yes	Yes	As needed	Yes	Yes
Systems that recirculate air locally	Yes	Yes	Yes	As needed	Maybe	Maybe
Chilled Beams DOAS	Yes	Yes	Yes	As needed	Yes – on DOAS	Yes
PTAC and VTAC (ducted)	No	Yes	Yes - VTAC	Yes	Yes - VTAC	N/A
Induction Units DOAS	Yes	Yes	Yes	As needed	Yes – On DOAS	Maybe
Baseboard Heating	No	No	No	Yes	No	N/A

Energy Impacts



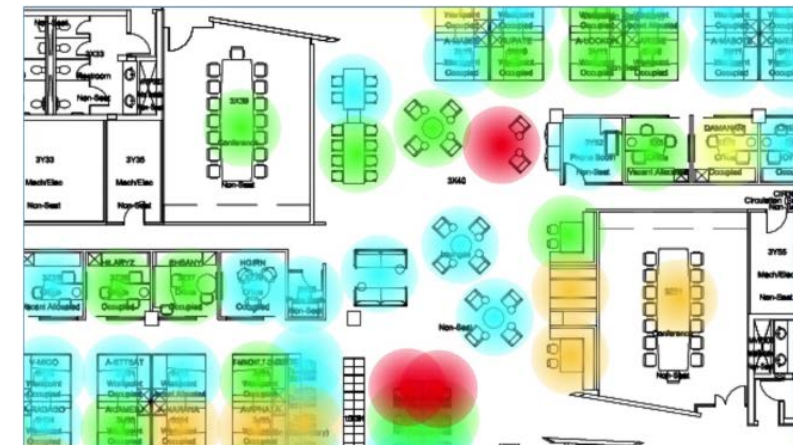
Plumbing Solutions

- Far-UVC or UVC lamps under lids of water closets. For water closets without lids, lids would need to be added.
- Spray disinfectant to bowl of water during and after each flush
- Far-UVC or UVC lamp to disinfect stall after use
- Hands free toilet fixtures
- Limit use of stalls with adjacent occupancy
- Close lids when flushing toilets
- Far-UVC or UVC lamps in lids of waste bins
- Bathroom attendant to wipe down



Technology Strategies

- Patience – allow technology to catch up to use cases and developing supply chains
- Pair technology with policy to evaluate total impact
- Identify how risk profiles change per building, floor, section
- Focus on mobility - inside and outside the workplace
- Address touch use cases
- Sunset platforms underutilized during the remote work period
- Plan for future resilience
- Focus on tracking space, not users
- KISS – keep it simple.....
- Regularly evaluate technology impact on users



Workplace Environment Solutions

Barrier/Controlled Access

- Single controlled access point for personnel and public entry
- Independent controlled access for materials
- Walk-Off Mats
- Disinfectant Misting vs. Wipe Down
- Pressurization
- Body Temperature screening via non-contact systems

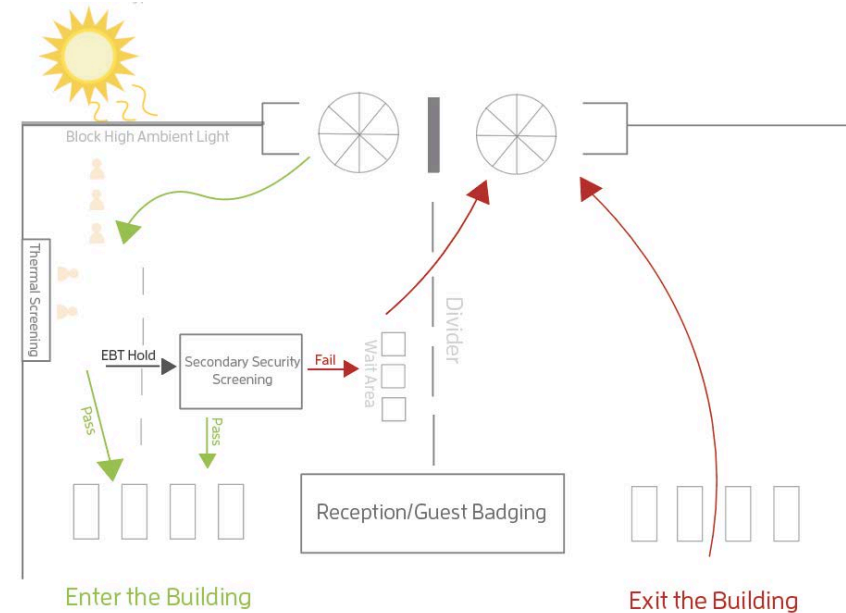


Image courtesy of of CRI

Workplace Environment Solutions

Workplace Separation

Minimize risk

- De-densify – shift work, spread out seating, work remote
- One-way movement
- Employ mandatory PPE
- Limit points of congestion
- Reconsider the use of conference rooms

Personal Protective Equipment

- Gloves
- Sanitizer Stations/Wipes
- Face masks
- Respirator



Workplace Environment Solutions

Cleaning the Workplace



Recommended Actions

- Sanitize all surfaces
- Wipe down desks and workspaces
- Wipe all packages and mail
- Wipe all door handles
- Frequent cleaning of communal spaces
- Disinfect restrooms
- Utilize UV systems to clean overnight
- Sanitizing mister at entrances

Solutions

Short Term Measures

Strategy	Objective
De-Densification - Shift Work - Working From Home	Reduce people in workplace
Control Access to Space	Restrict staff, visitors and materials
Walk Off Mats	Barrier control
PPE	Staff and Maintenance Workers
Frequent Cleaning	Clean spaces and materials entering
Increase Ventilation (with existing HVAC)	Introduce more fresh air
Add Flush Cycles	Staggered periods of increased outside air to accommodate increased cleaning
Alter Space Pressurization (with existing HVAC)	Increase Negative - Restrooms Negative - Communal spaces
Deploy Portable Purifiers	Locate throughout spaces
Hands Free Fixtures	Restrooms and Communal spaces
Touch Technology	Deactivate public touchscreens

Long Term Measures

Strategy	Objective
UV Lamps in HVAC Systems	Locate in ductwork and/or equipment
UV Lamps in Space	Locate at ceiling or desk level
Humidification	Add to HVAC to achieve 40-60% humidity
Bi-Polar Ionization	Add to HVAC
Increased Ventilation	Modify or add units
Increased Filtration	Modify or add units, increase fan power
Alter Space Pressurization	Modify or add units, increase fan power
Controls Upgrade	Automate to reduce maintenance demands
UV Lamps in Restrooms	Locate in stalls/at fixtures

COVID-19 Sustainability Impacts

	Social	Technological	Environmental	Economic	Political
Positives	<ul style="list-style-type: none"> • Cleaner indoor air quality • Better remote connection • Education on safety measures • Changes in social structure caused by social distancing 	<ul style="list-style-type: none"> • Cleaner air in buildings with newer technology using UVC, far-UVC, and higher efficiency filters • More frequent air filter changes • Automation innovation 	<ul style="list-style-type: none"> • Increased climate issue awareness • Reduced emissions and pollution • WFH successful • Higher value on nature 	<ul style="list-style-type: none"> • Allow the economy to expand again • Technology business will grow • Continued materialism – but online • Emergency preparedness changes • Job creation 	<ul style="list-style-type: none"> • Major disruption across the board. • Healthcare and emergency preparedness may change • Address equity among citizens
Negatives	<ul style="list-style-type: none"> • Continued social distancing enforced • Adjust to wearing PPE • Work hours may shift • If children are still at home, workers will need to stay home • New forms of unsafe waste • Employee stress concerns 	<ul style="list-style-type: none"> • Maintaining air pressure • Treating a greater volume of air • Cleaning more frequently • Increasing filtration may not capture all of the virus 	<ul style="list-style-type: none"> • HVAC filters reduce energy efficiency (more CO₂) • Increased chemical use for cleaning • Increased material solid waste (filters, PPE, etc.) • Increased online shopping, increased shipping • Supply chain management 	<ul style="list-style-type: none"> • Reduced efficiency = higher operating costs • Capital cost for new systems • Increased maintenance & cleaning costs • High unemployment and job loss • Added expenses to buy PPE 	<ul style="list-style-type: none"> • Major disruption across the board • Impacts on civil liberties • Enforcement of new standards • Prioritizing buildings

COVID-19 Impacts to the Facilities

Conclusions



- It's a multi-faceted approach
- Research changes daily
- Future mechanical systems will incorporate these strategies
- The new workplace
- Next Steps



This concludes The American Institute of Architects Continuing Education Systems Course



Andrew B. Horning, LEED AP BD+C
Vice President
COVID-19 Task Force Leader
abh@bala.com



Scott M. Davis, PE
Vice President
COVID-19 Research Leader
cbk@bala.com



Charles B. Kensky, PE, LEED AP BD+C
Executive Vice President
COVID-19 Research Leader
cbk@bala.com



Matthew F. Ezold, CTS-D
Director of Digital Planning
COVID-19 Technology Leader
mfe@bala.com