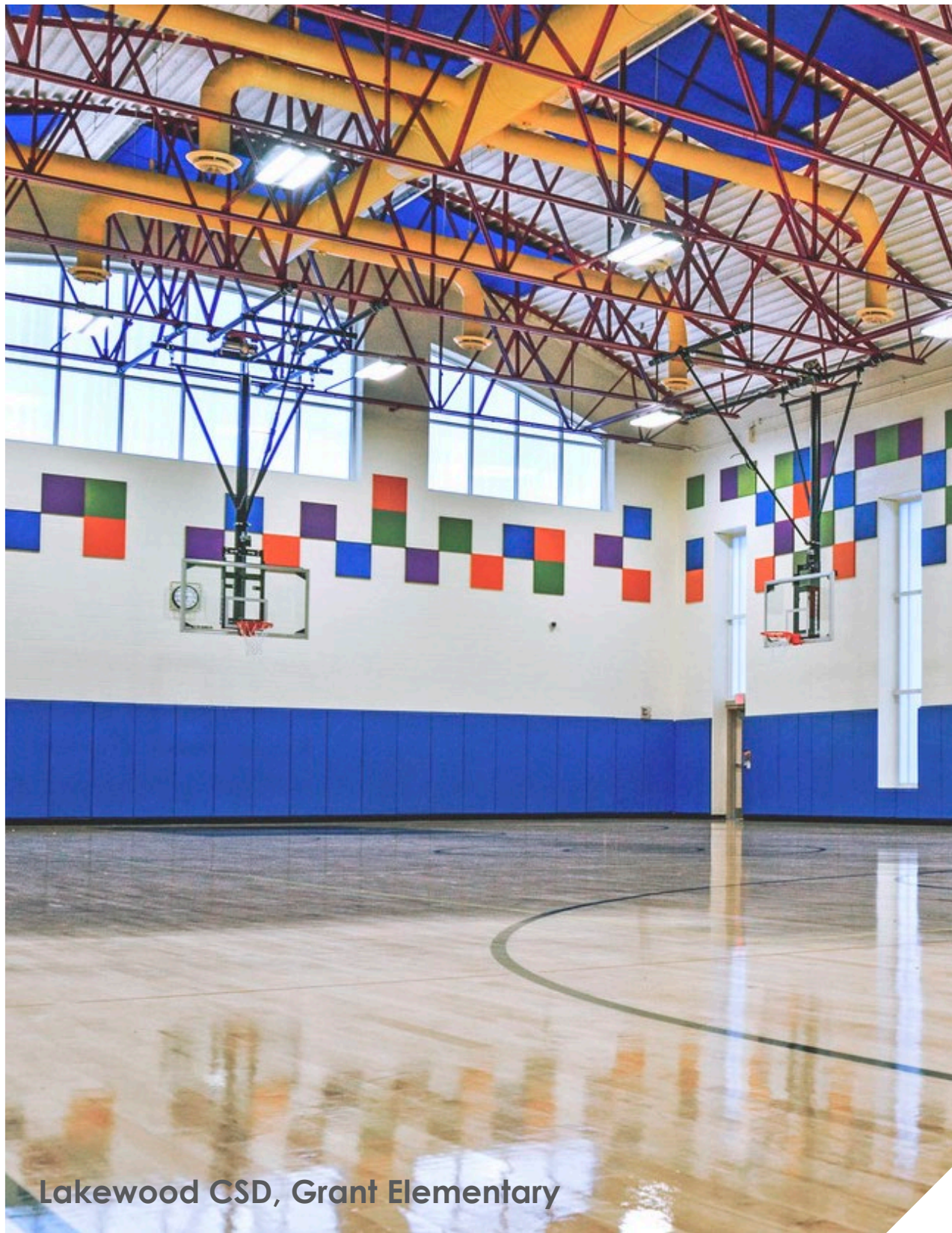


COVID-19 Impacts on HVAC Systems in Schools

Brought to you by Ohio Schools Council and GPD Group

October 7, 2020





Lakewood CSD, Grant Elementary

Agenda

Introductions

COVID-19 Understanding

Engineering Control Measures

Recommendations

Q&A

Meet the Presenters

GPD's Lead Mechanical Engineers



Brandon Marzley, PE, LEED AP BD+C

Lead Mechanical Engineer for K-12 Facilities

- 19 years experience, statewide
- Extensive design of HVAC systems in school buildings



Greg Lavriha, PE

Lead Mechanical Engineer for Healthcare Facilities

- 19 years experience, statewide
- Design of HVAC systems to reduce spread of disease

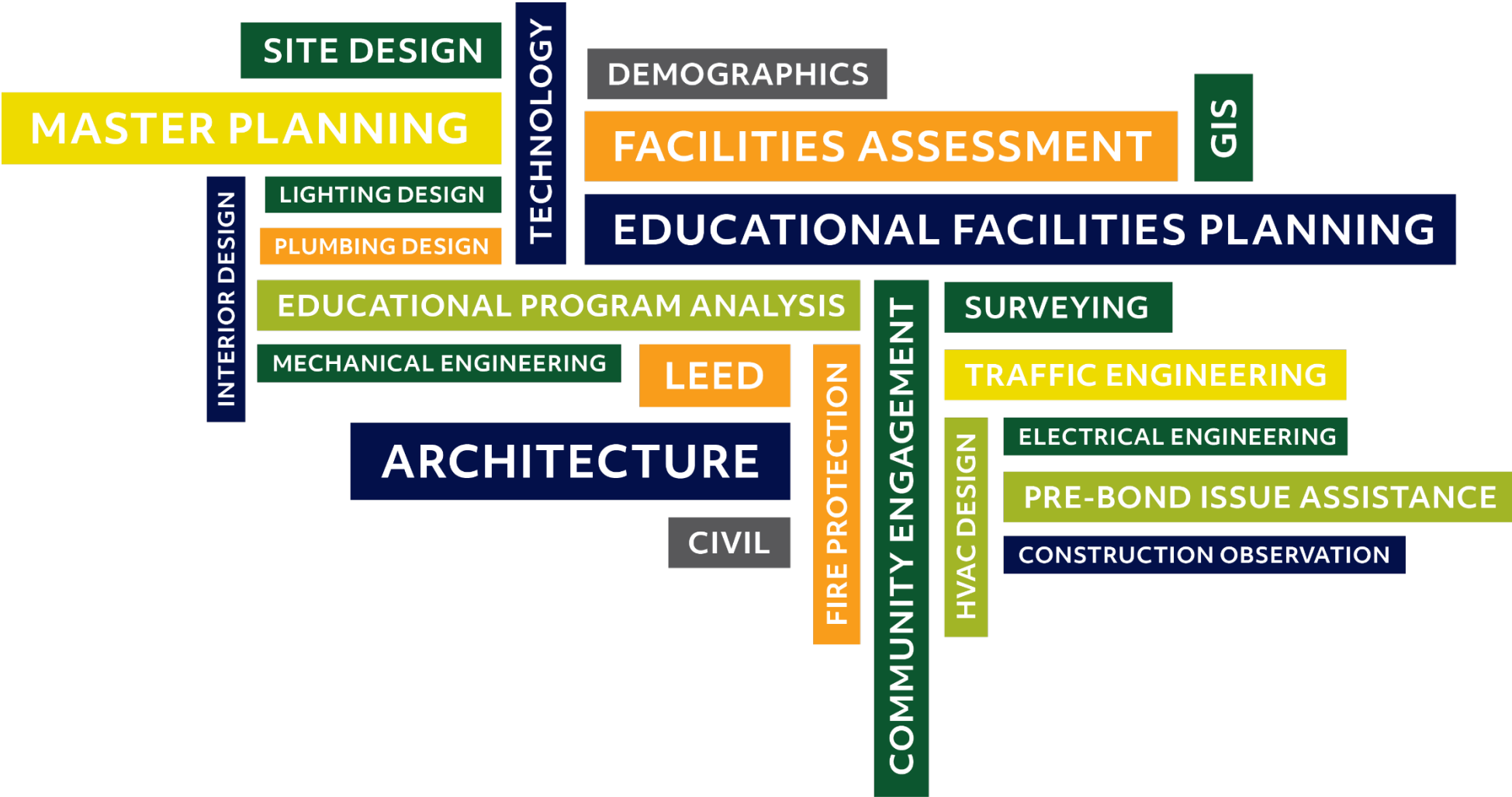


GPD Overview

59 Years in the Industry

70 Professionals
dedicated to K-12

*Full-Service A/E Firm,
Employee-Owned.*





Lakeview LSD, PK-8

Our Experience Designing for K-12 Facilities

Akron Public Schools
Amherst EVSD
Ashtabula Area CSD
Auburn CC
Barberton CSD
Berea CSD
Brecksville-Broadview Hts CSD
Brunswick CSD
Buckeye LSD (Ashtabula)
Bucyrus CSD
Canton LSD
Cleveland Hts-University Hts CSD
Cloverleaf LSD
Conneaut Area LSD
Copley-Fairlawn CSD
Coventry LSD
Cuyahoga Heights Schools
Cuyahoga Valley CC
Edison LSD (Milan)
Elgin LSD

Fairview Park CSD
Field LSD
Garfield Heights CSD
Grand Valley LSD
Highland LSD
Hudson CSD
Independence LSD
Joseph Badger LSD
Kent CSD
Kirtland LSD
Lake Center Christian
Lakeview LSD
Lakewood CSD
Lordstown LSD
Maplewood LSD
Maplewood CC
McDonald LSD
Mentor Public Schools
Monroeville LSD

New Philadelphia CSD
North Olmsted CSD
North Royalton CSD
Norton CSD
Orange CSD
Parma CSD
Perry LSD
Pleasant LSD
Portage Lakes CC
Revere LSD
Rolling Hills LSD
Rootstown LSD
Southington LSD
Strongsville CSD
Toronto CSD
Trumbull CTC
Twinsburg CSD
Warrensville Heights CSD
Wooster CSD

55+

districts in the
state of Ohio

\$700M

in construction in
the past 5 years



Our Experience Designing for Healthcare Facilities

OhioHealth

OhioHealth Primary Care Physicians (OPG)
HMH Infusion and Pharmacy
MGH Main Lobby Renovations
MGH Surgery Renovations
MMC Internal Medicine (OPG)
OhioHealth Workhealth Marion
MH 2nd Floor Planning and N/S

MetroHealth System

Comprehensive Rehab
Broadway Health Center
(Specialty Care and Family Medicine)

The Ohio state University

Arthur G. James Cancer Hospital:
Gastrointestinal Oncology Clinic

Wexner Medical Center:
Doan Hall Diagnostic Laboratories
and Cardiovascular Rehab Unit

Wexner Medical Center:
Martha Morehouse Tower
7th and 8th Floor Renovations

University Hospitals East Microbiology Lab

Nationwide Children's Hospital
OT / PT Department
Administrative and Faculty Offices

Mount Carmel

Bed Tower, Structural and
Landscape Architecture

30+

years helping
hospitals care for
their patients

\$500M

in construction in
the past 3 years



COVID-19 Understanding

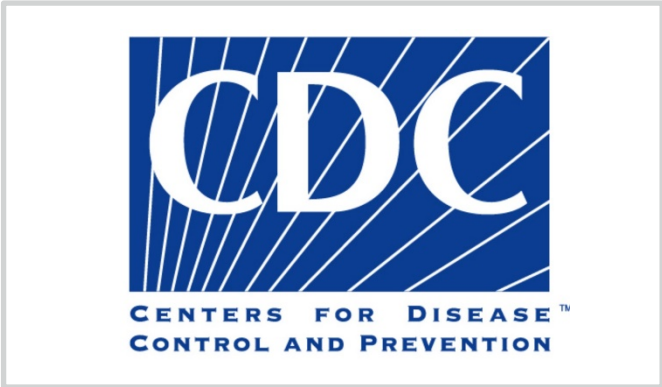


GPD / COVID-19 Statement

*The recommendations provided herein are our professional design opinion based on the referenced guidelines and criteria and as such **we cannot guarantee or warrant that the building modification recommendations will reduce, eliminate or mitigate the spread of COVID 19 or viruses in general.** This is a representation of what we understand are practices utilized by others in the current environment, which continue to evolve.*



Resources / Guidelines

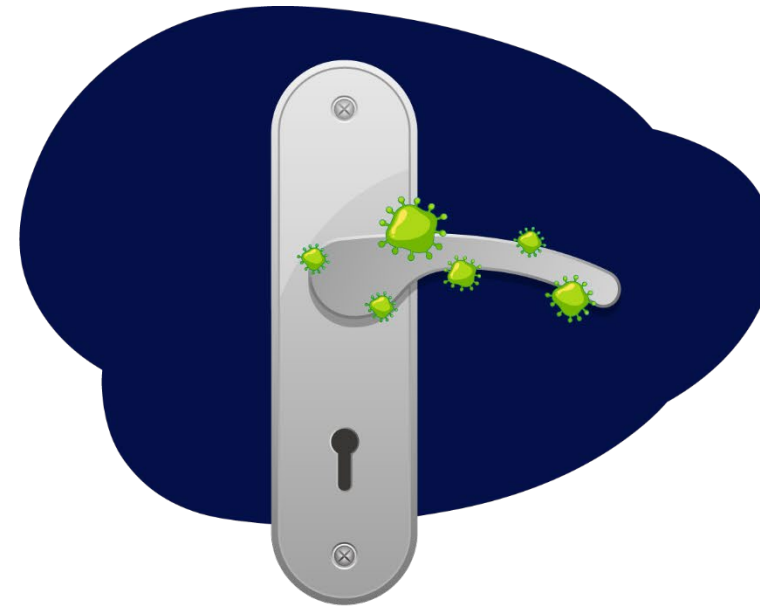


Theoretical Modes of Transmission

CDC and ASHRAE COVID-19 Guidance

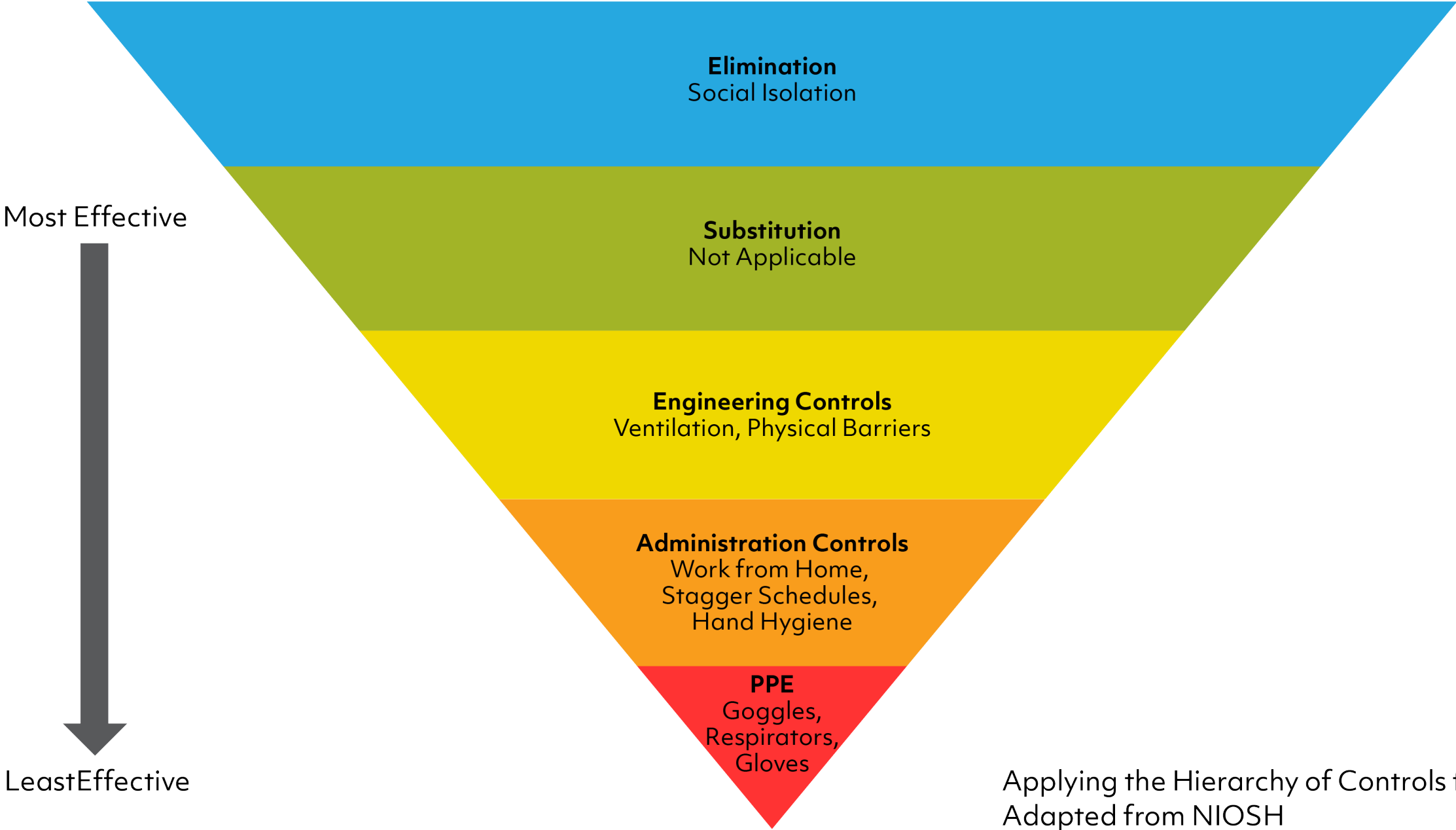
- Surface contamination
- Close contact transmission
- Airborne moisture droplets

Research continuing...



Control Measures for COVID-19

From AIHA and NIOSH



Applying the Hierarchy of Controls for COVID-19
Adapted from NIOSH





Engineering Control Measures



Risk Assessment

- Facility and maintenance
- Understanding of risk and exposure
- Hazards (Biohazard)
- Operations



Coventry LSD, High School

Risk Assessment

- Short term vs. long term
- Budget (capital and maintenance)



Independence LSD, High School Media Center



Strongsville CSD, Middle School

Temporary Control Measures

- Measure focused on a single pandemic / outbreak
- Measure designed for limited use
- Little impact / modification to existing facility





Temporary Control Measures

- Increased ventilation
- Longer operating hours (24/7)
- Demand Control Ventilation disenabled
- Building ventilation flush
- Portable disinfectors
- Portable air purifiers / filters
- Portable humidifiers / diffusers
- Operable windows



Temporary Control Measures

Increased ventilation

- ASHRAE recommends increase to 130% of minimum
- Air change rate / dilution
- Temperature and humidity concerns

Longer operating hours

- Keep facility in 24-hr operation, no set back

Demand Control Ventilation disabled

Building Flushing

- After school end, put building in economizer mode



Akron PS, Ellet CLC

Temporary Control Measures

- Portable disinfectors
- Portable air purifiers / filters
- Portable humidifiers / diffusers
- Operable windows



Lakewood CSD, Lincoln Elementary



Permanent Control Measures

- Focused on current and future viruses and bacteria
- Permanent use
- Impact / modification to existing facility HVAC
- Operation impacts
- Significant capital cost





Strongsville CSD, Middle School

Permanent Control Measures

Filtration

- MERV 13 minimum
- Virus micro levels vs. filter ratings
- HEPA filter applications (MERV 17 and up)
- Energy recovery disabled if feasible
- Operations / Maintenance

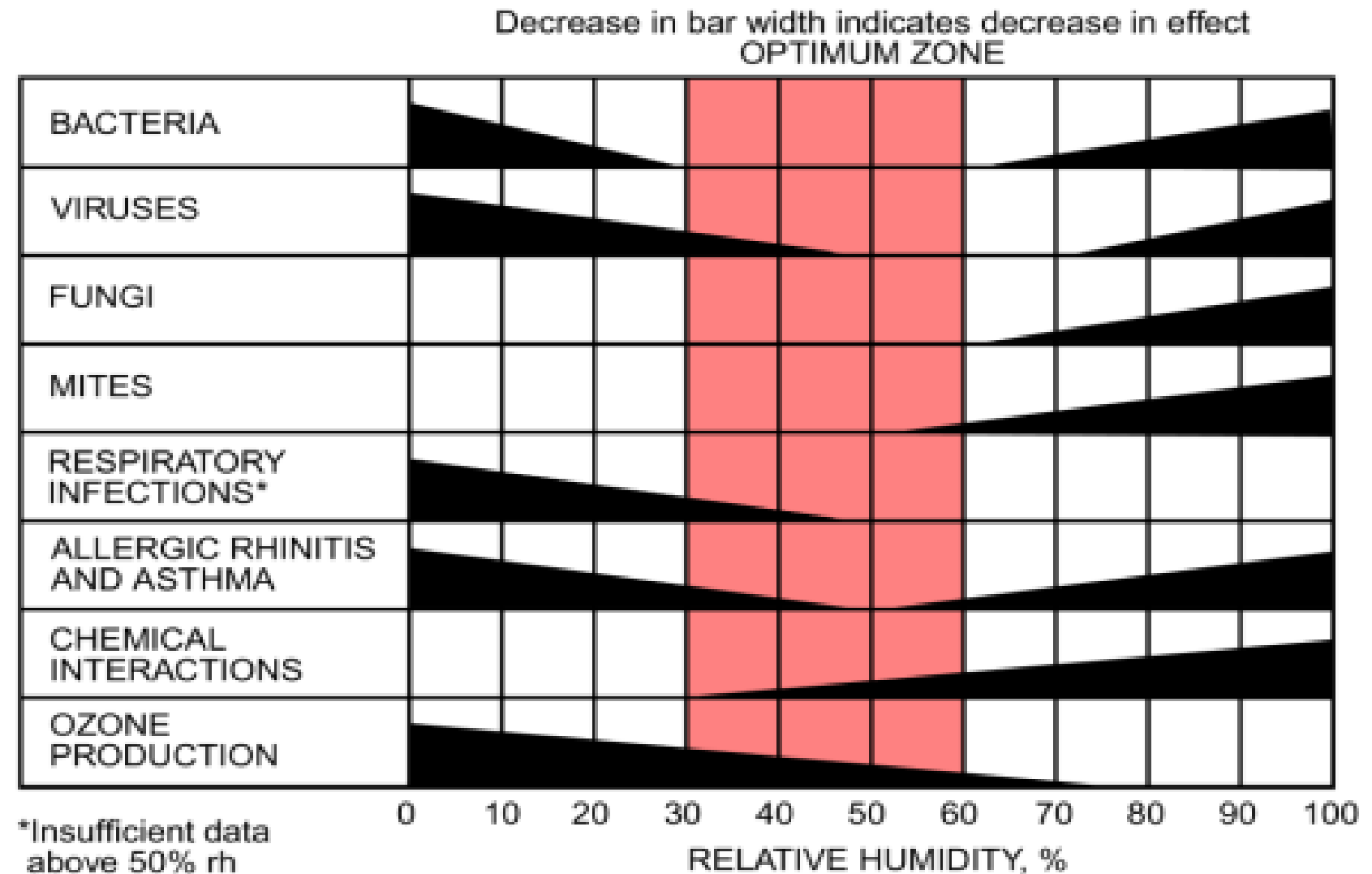


Humidity Control

ASHRAE recommends 40% - 60% RH for virus / bacteria control

School application

- Mold growth
- Condensation
- Operations and maintenance



UV Disinfection Lighting

**UV-C (UVGI) –
Germicidal for HVAC systems**

Used in healthcare for past 15+ years

- Disinfection, virus, bacteria, mold control
- Disinfect cooling coil

Decontamination

High intensity / exposure concerns

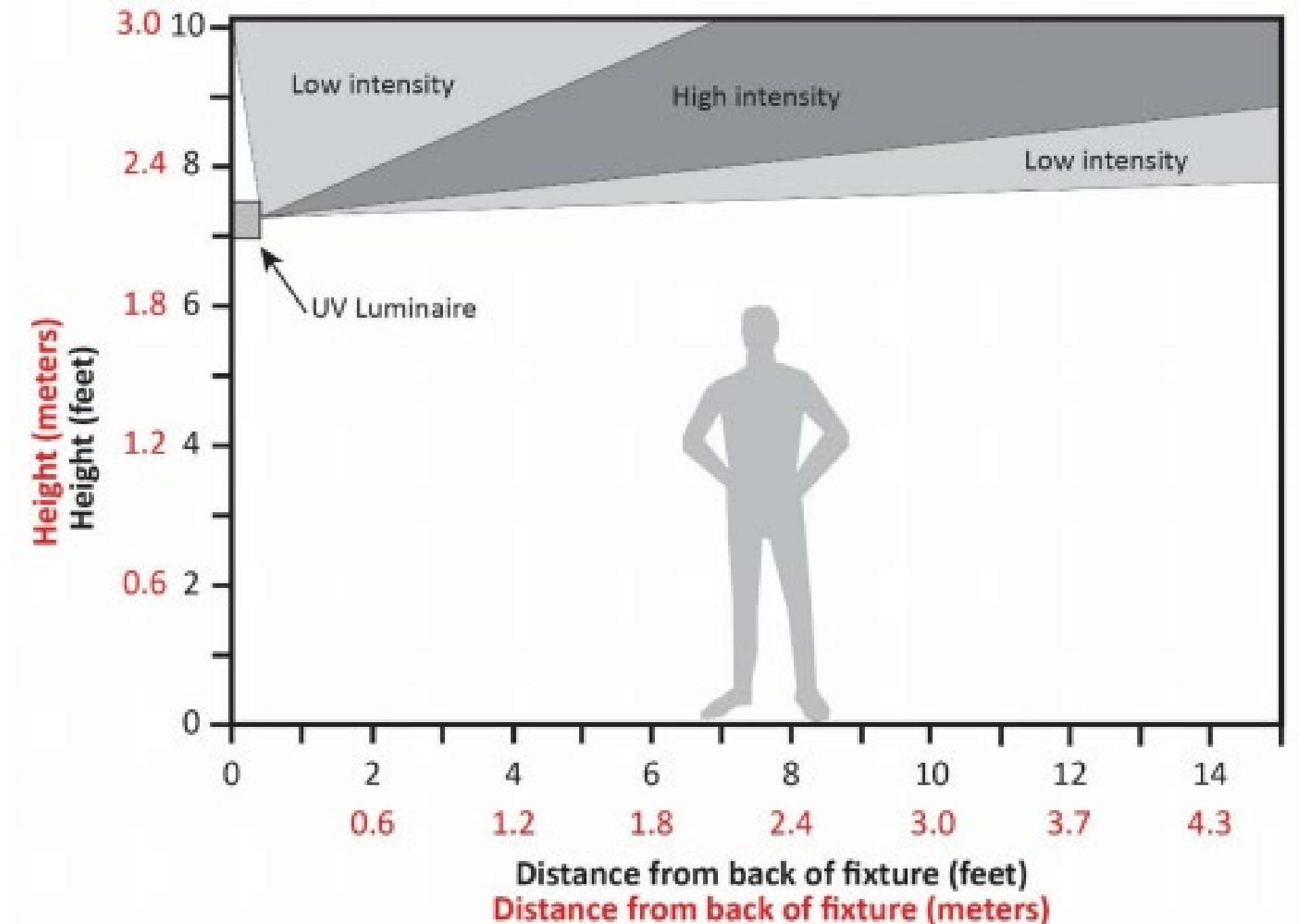
Mount in existing equipment

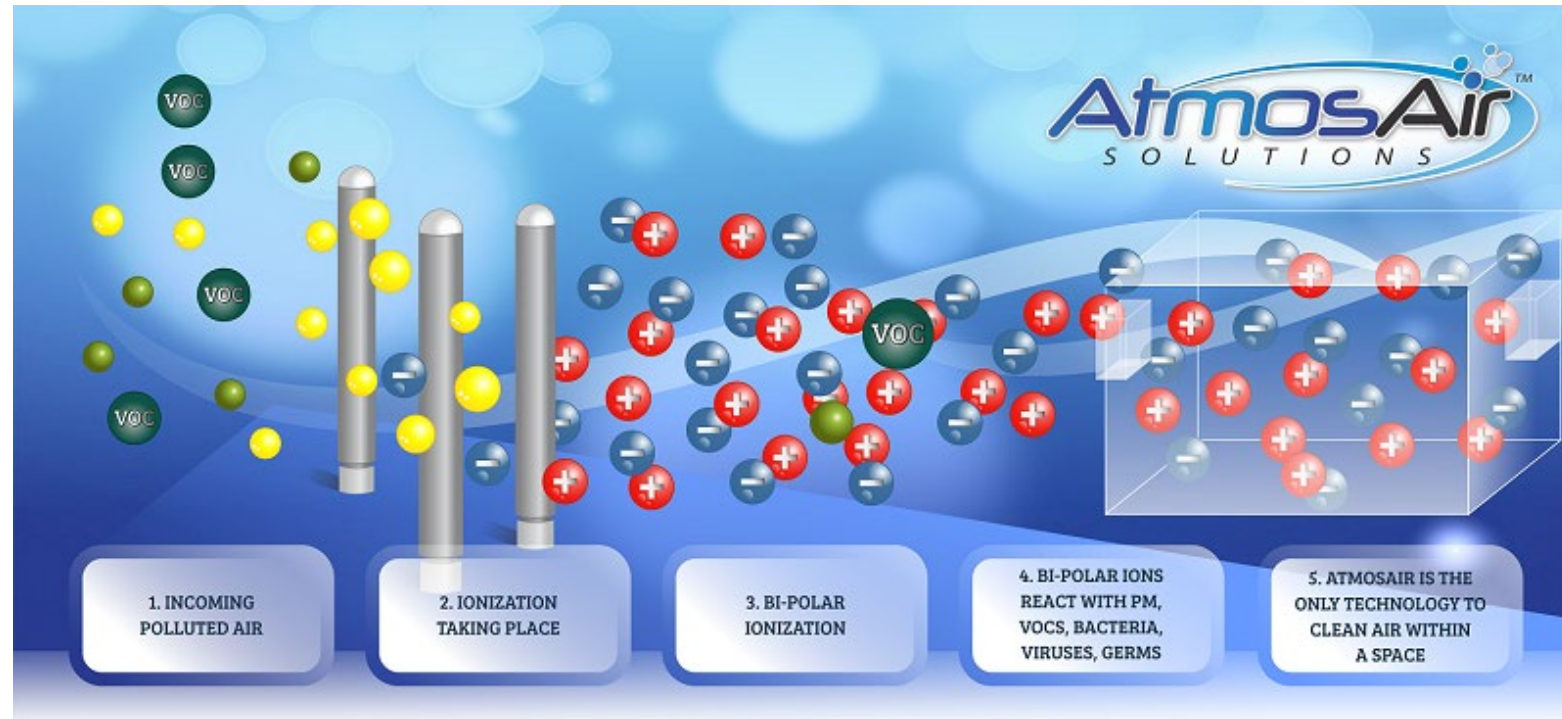
Maintenance



Localized UV / UVGI

- UV / UVGI mounted on walls in the spaces
- Used in healthcare lobbies, waiting rooms, food services, corridors
- High / low intensity / exposure concerns





Bipolar Ionization

Emerging technology in healthcare and HVAC industries

- Virus / bacteria control

Older technology vs. Needlepoint Bipolar Ionization

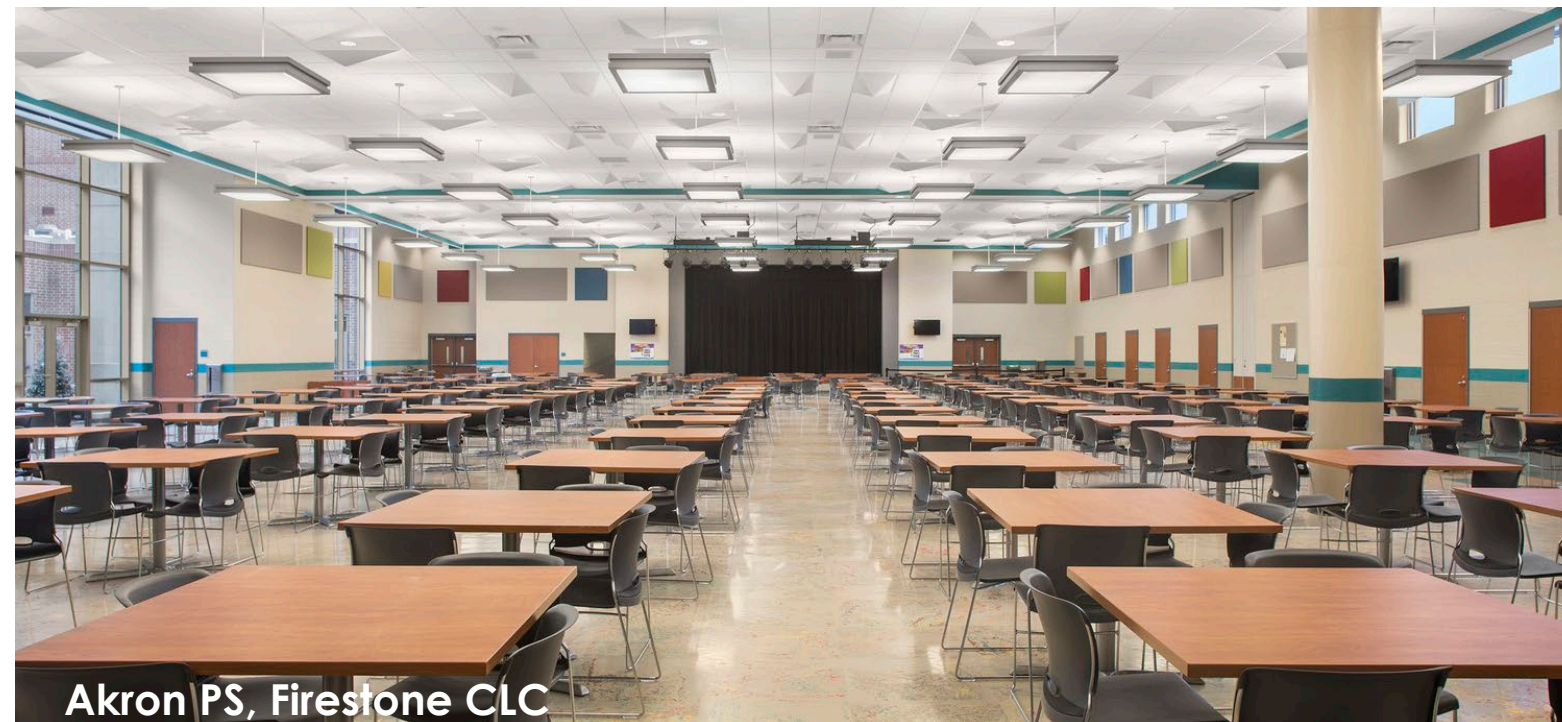
- Used as air treatment measure to reduce OA

Used positive and negative ions

Maintenance free

Scientifically-rigorous, peer-reviewed studies do not exist

- No manufacturing standards
- Concerns with ozone generation





Recommendations



Recommendations

Understanding of risk assessment

Temporary measures (based on systems with ventilation)

- Increasing ventilation, depending on system capacity
- Control changes

Temporary measures (based on systems without ventilation)

- Air purifiers

Operating cost concerns



Amherst EVSD, Powers Elementary



Berea CSD, Berea-Midpark Middle School

Recommendations

Understanding of risk assessment

Permanent measures

- Installed UV / UVGI in HVAC systems
- Installing MERV 13 filters
- Developing pandemic control logic
- Localized UVGI for clinic and lobby areas
 - Exhaust (negative pressure) high risk areas



Cost Impacts and Understanding

- Operating cost will vary
- UV-C (10,000 CFM AHU)
 - approx. \$12,000 per unit
- MERV 13 filters cost will vary
 - Fans, filters, racks
- Control logic will vary
 - approx. \$1,000 per point
- Localized UVGI
 - approx. \$2,000 - \$6,000



Hudson CSD, Middle School

Through your OSC membership, GPD, as an approved OSC consultant, can begin your building evaluations immediately.



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Q&A

