




ADDRESSING AIR QUALITY IN JAIL & PRISON CASES

In the Age of COVID-19

January 7, 2021

BIOS



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AGENDA

4:45pm - 4:55pm

Basic ventilation information & timeline of COVID info released by CDC

4:55pm - 5:05pm

Recommendations for prison compliance with standards

5:05pm - 5:15pm

Questions attorneys should ask, including discovery requests

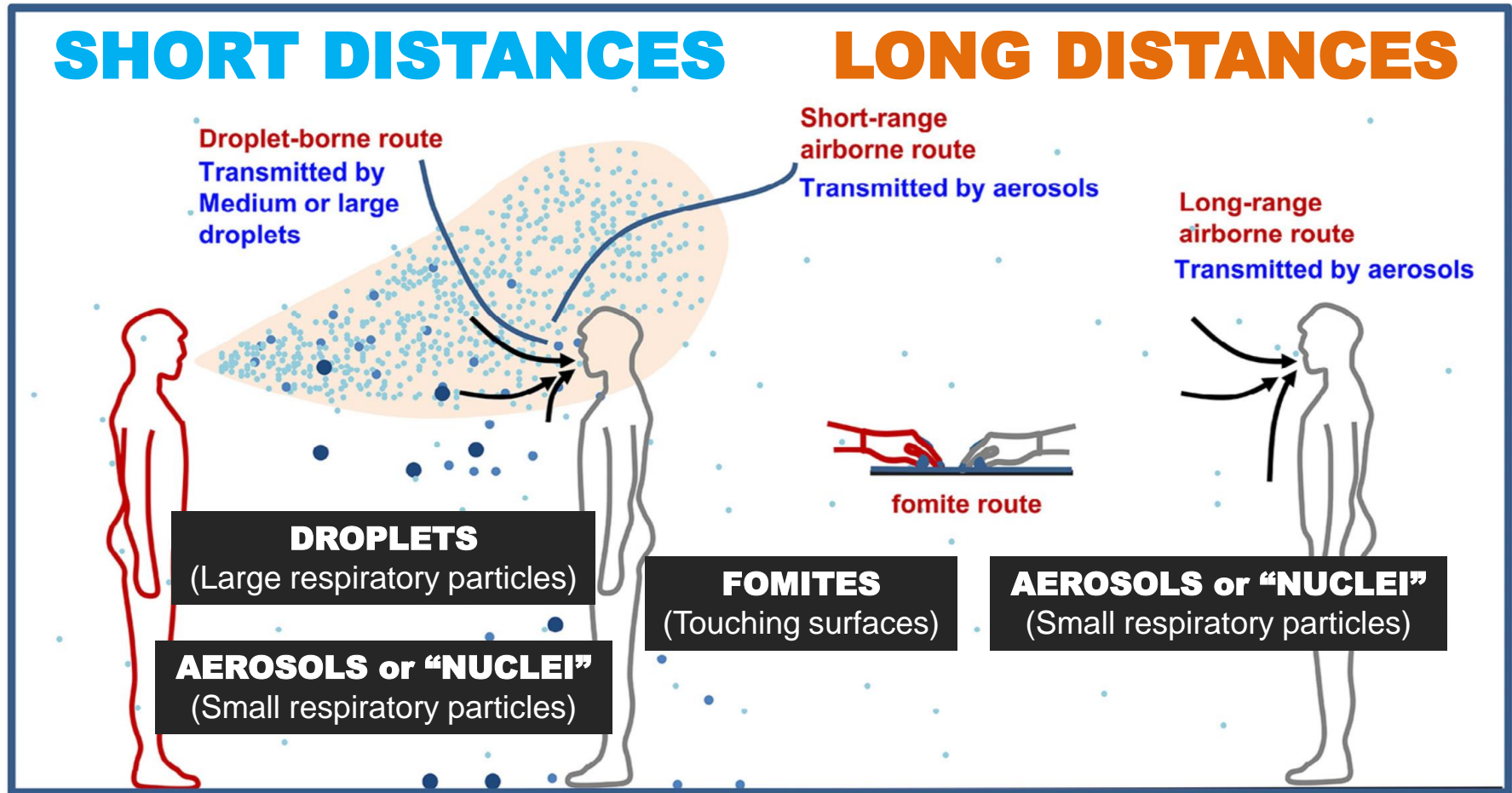
5:15pm - 5:20pm

Other expert recommendations (will be included in shared materials)

5:20pm - 5:45pm

Q&A

HOW DO RESPIRATORY VIRUSES SPREAD?



- Large droplets ($>100\text{ }\mu\text{m}$) : Fast deposition due to the domination of gravitational force
- Medium droplets between $5\text{ and }100\text{ }\mu\text{m}$
- Small droplets or droplet nuclei, or aerosols ($<5\text{ }\mu\text{m}$): Responsible for airborne transmission

RESPIRATORY PARTICLE EMISSIONS BROUGHT TO YOU BY *MYTHBUSTERS*

<http://dsc.discovery.com/tv-shows/mythbusters/videos/slow-motion-sneezes.htm>



HOW IS SARS-COV-2 SPREAD?

- **CDC, March 2020:** “The virus is thought to spread mainly from person-to-person (between people who are in close contact with one another (within about 6 feet); through respiratory droplets produced when an infected person coughs or sneezes). These droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.”
- “It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or possibly their eyes, but this is not thought to be the main way the virus spreads.”

HOW IS SARS-COV-2 SPREAD?

CDC, October 2020:

The epidemiology of SARS-CoV-2 indicates that most infections are spread through close contact, not airborne transmission

Airborne transmission of SARS-CoV-2 can occur under special circumstances

- **Enclosed spaces** within which an infectious person either exposed susceptible people at the same time or to which susceptible people were exposed shortly after the infectious person had left the space.
- **Prolonged exposure to respiratory particles**, often generated with expiratory exertion (e.g., shouting, singing, exercising) that increased the concentration of suspended respiratory droplets in the air space.
- **Inadequate ventilation or air handling** that allowed a build-up of suspended small respiratory droplets and particles.

TRANSMISSION BY 'AEROSOLS' VS. 'DROPLETS'

- If COVID-19 is transmitted only through droplets and touching surfaces, then distancing and hand-washing is all we need
- If COVID-19 is also transmitted through aerosols/airborne routes, then we need more than distancing and hand-washing:
 - Universal face masking
 - Improved ventilation
 - Filtration/air cleaning

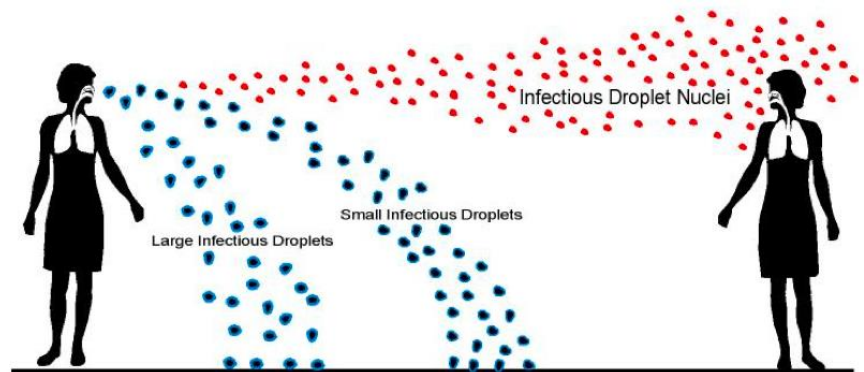


Figure taken directly from Welty 2009 presentation to FIC for IAQ, US EPA

CDC: PREVENTING COVID-19 TRANSMISSION

Updated Oct. 28, 2020

Protect Yourself and Others

The best way to prevent illness is to avoid being exposed to this virus. You can take steps to slow the spread.

- **Stay at least 6 feet away from others**, whenever possible. This is very important in preventing the spread of COVID-19.
- **Cover your mouth and nose with a mask** when around others. This helps reduce the risk of spread both by close contact and by airborne transmission.
- **Wash your hands** often with soap and water. If soap and water are not available, use a hand sanitizer that contains at least 60% alcohol.
- **Avoid crowded indoor spaces and ensure indoor spaces are properly ventilated** by bringing in outdoor air as much as possible. In general, being outdoors and in spaces with good ventilation reduces the risk of exposure to infectious respiratory droplets.
- **Stay home and isolate** from others when sick.
- **Routinely clean and disinfect** frequently touched surfaces **and take other steps to stop the spread at home.**

VENTILATION & INDOOR AIR QUALITY (IAQ)

Ventilation Definitions (ASHRAE 62.1):

1. The process of **supplying air to or removing air from a space** for the purpose of **controlling air contaminant levels**, humidity, or temperature within the space.
2. The process of supplying or removing air by **natural or mechanical** means to or from any space. **Such air may or may not have been conditioned.**

Acceptable Indoor Air Quality: air in which there are no known contaminants **at harmful concentrations** as determined by **cognizant authorities** and with which a **substantial majority** (80% or more) of the people exposed do not express dissatisfaction

ASHRAE is the American Society of Heating Refrigeration Air-conditioning Engineers

HVAC



SPACE HEATER - **HEATING**



AIR HANDLER WITH OA LOUVER - **VENTILATION**

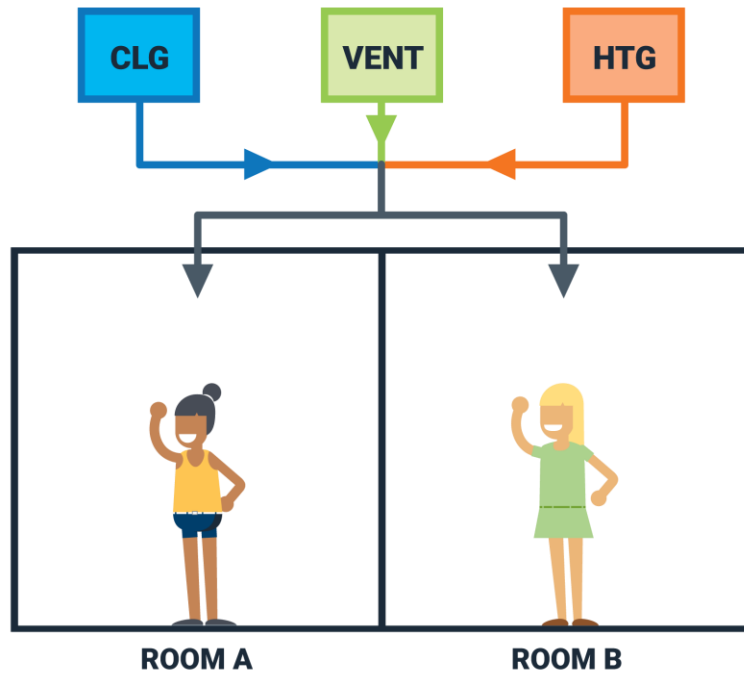


WINDOW AIR CONDITIONER - **AIR CONDITIONING**

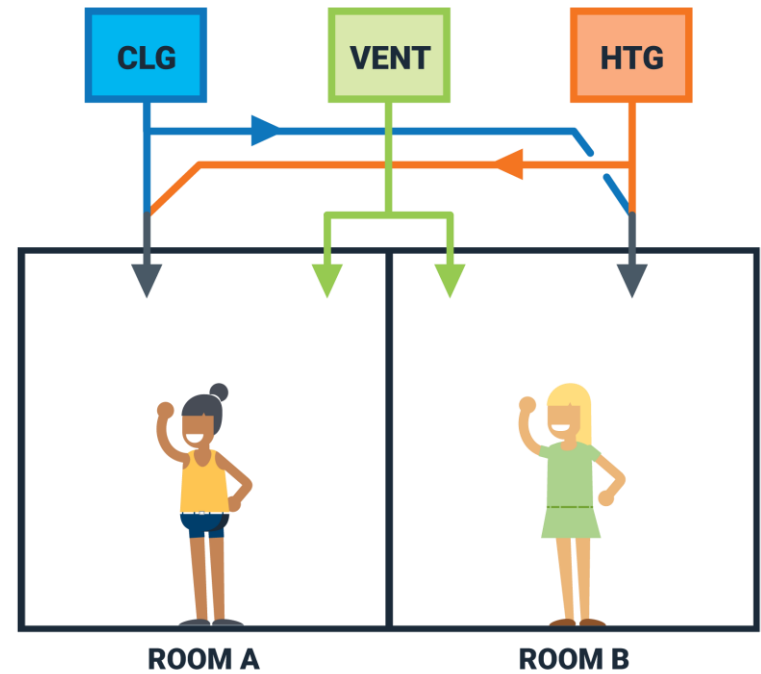


WINDOW - **VENTILATION**

VENTILATION

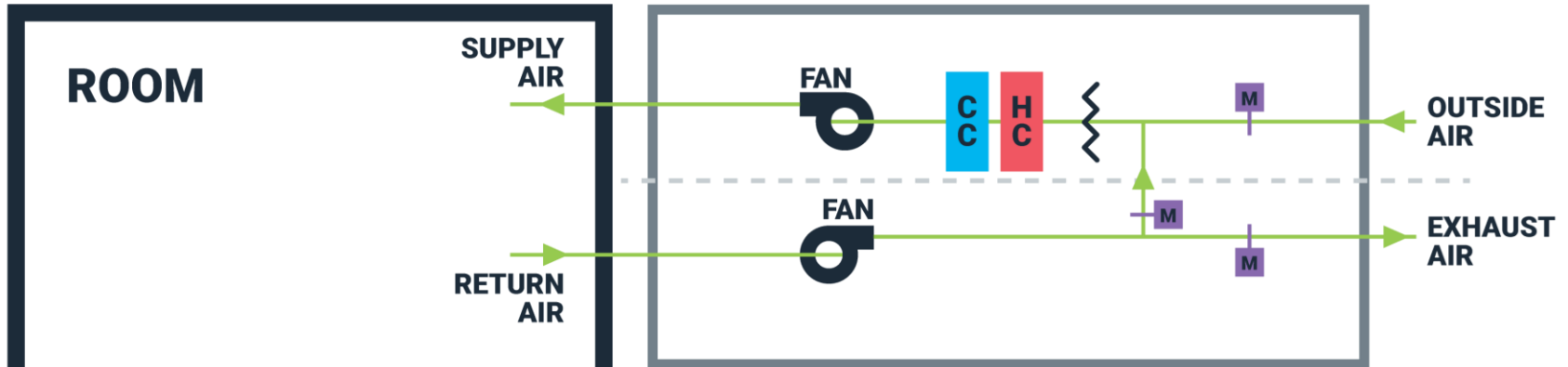


COUPLED OR MIXED MODE



DECOUPLED

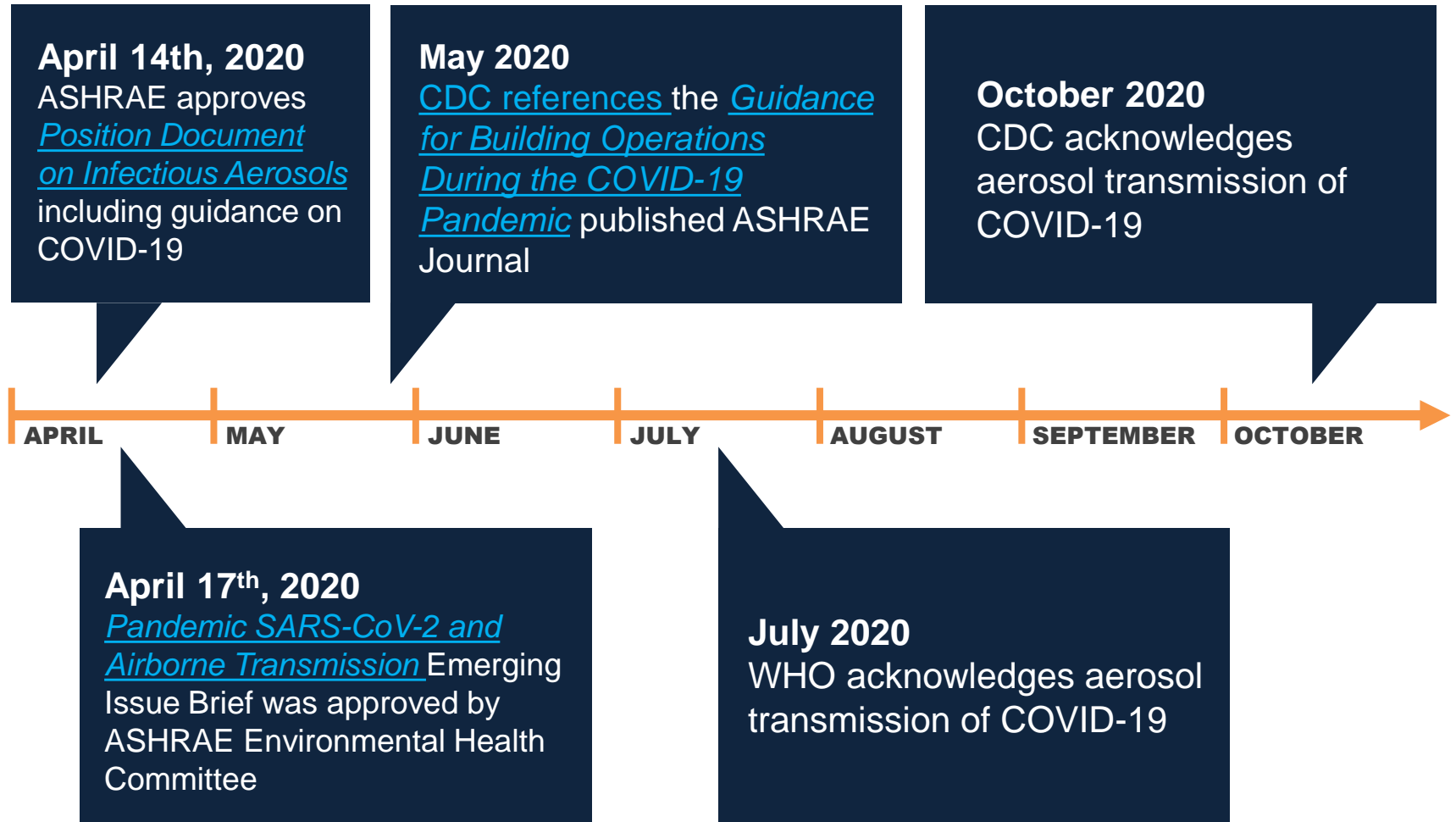
AIR HANDLING UNITS



H: Heating
V: Ventilation
A: Air
C: Conditioning



TIMELINE OF COVID INFO RELEASED BY ASHRAE AND CDC



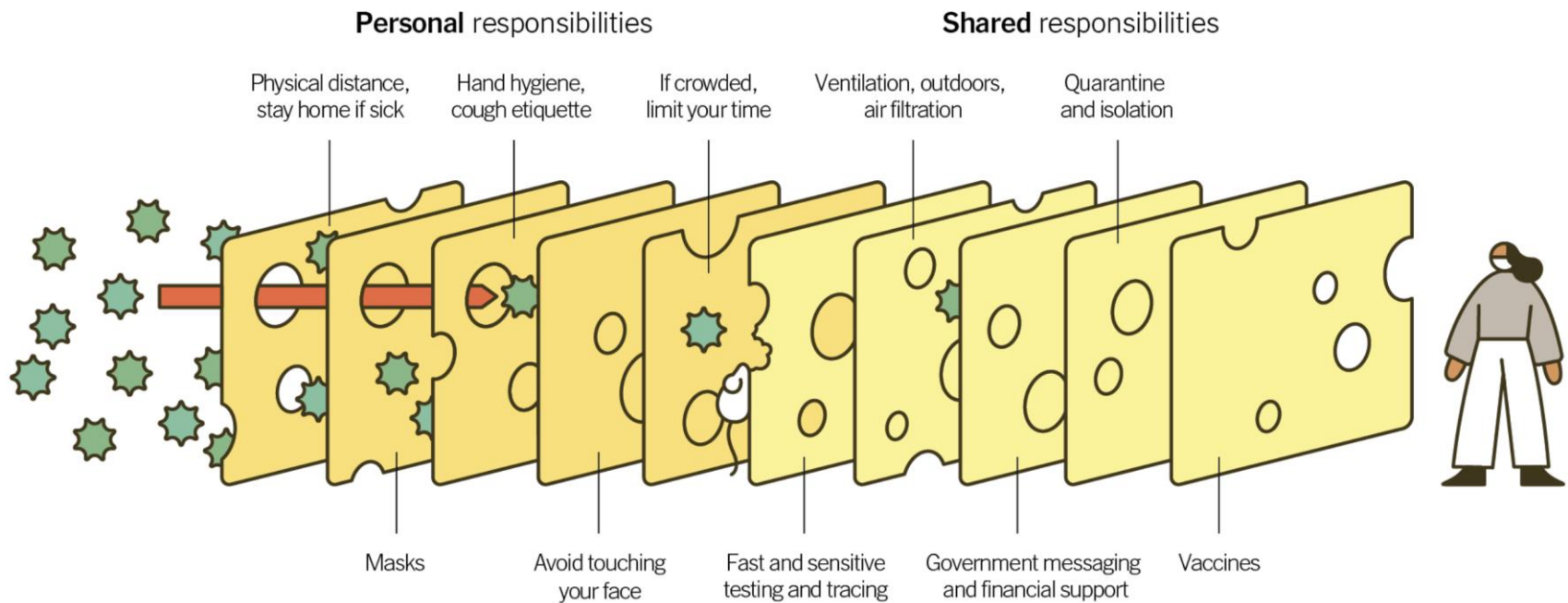
CDC GUIDELINES - VENTILATION & AIR-TREATMENT

[CDC's Guidelines](#) are qualitative rather than specific

- **Dilution**
 - Increase ventilation, by increasing airflow or further opening outdoor air dampers.
 - Industry practice for increased ventilation is 30% (LEED Increased ventilation effectiveness credit)
 - Increase fresh air with open windows, doors and fans.
 - Decrease occupancy where ventilation can't increase.
- **Filtration**
 - Improve filtration as high as possible without significantly reducing design air flow.
 - Consider portable HEPA fan / filtration systems
- **UVGI**
 - Consider using ultraviolet germicidal irradiation (UVGI) as a supplement to help inactivate SARS-CoV-2, especially if options for increasing room ventilation are limited

Guidance refers to ASHRAE 62.1 and [ASHRAE Guidance for Building Operations During the COVID-19 Pandemic](#)

VENTILATION AND AIR CLEANING IN CONTEXT



Source: Adapted from Ian M. Mackay (virologydownunder.com) and James T. Reason. Illustration by Rose Wong

FRESH AIR REQUIREMENTS

ASHRAE 62.1 Guidelines

Occupancy Category	PEOPLE OUTDOOR AIR RATE R_p		AREA OUTDOOR AIR RATE R_a	
	cfm/ person	L/s* person	cfm/ft ²	L/s*m ²
Correctional Facilities				
Cell	5	2.5	0.12	0.6
Dayroom	5	2.5	0.06	0.3
Guard Stations	5	2.5	0.06	0.3
Booking/Waiting	7.5	3.8	0.06	0.3

FRESH AIR REQUIREMENTS

In this example layout, 8 people are in a 25' x 17.5' sleeping dorm

PEOPLE BASED REQUIREMENT:

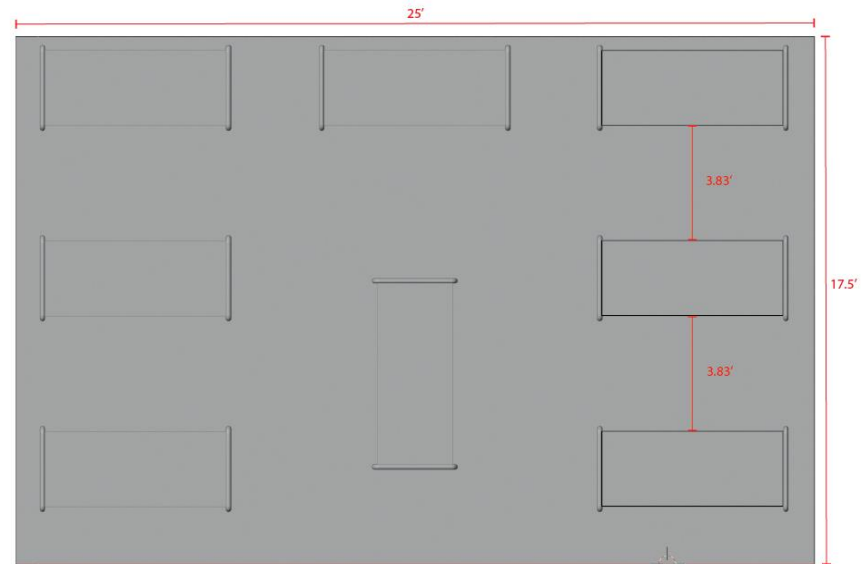
5 CFM/person * 8 people = 40 CFM

AREA BASED REQUIREMENT:

25 ft * 17.5 ft * 0.12 CFM/ft² = 52.5 CFM

TOTAL FRESH AIR:

92.5 CFM



Assuming 10 foot ceilings, this is equal to 1.3 air changes per hour.

If ceilings were 20 feet, the air change rate would be half (0.65)

FRESH AIR REQUIREMENTS

In this example layout, 2 people are in a 8' x 10' cell.

PEOPLE BASED VENTILATION REQUIREMENT:

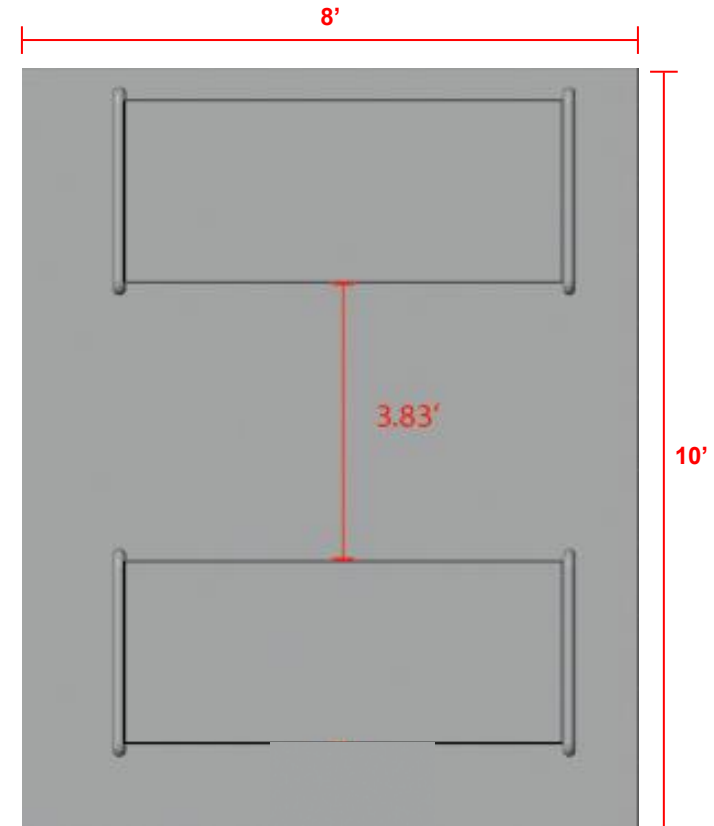
5 CFM/person * 2 people = 10 CFM

AREA BASED VENTILATION REQUIREMENT:

8 ft * 10 ft * 0.12 CFM/ft² = 9.6 CFM

TOTAL FRESH AIR:

19.6 CFM



Assuming 10 foot ceilings, this is equal to 1.5 air changes per hour.

AIR CLEANING/TREATMENT TECHNOLOGIES

AIR-CLEANING TECHNOLOGY	TARGETED POLLUTANT(S)	TEST STANDARDS (RATING METRICS)
Fibrous media filters	Particles	Filters: ASHRAE 52.2 (MERV) ISO 16890 (ePM) ISO 29463 (HEPA) Proprietary test standards (FPR, MPR) Portable air cleaners: AHAM AC-1 (CADR)
Electrostatic precipitation (ESP)	Particles	No rating; some ozone emission standards (ANSI/UL 867)
Ionizers	Particles	None specifically
Ultraviolet germicidal irradiation (UVGI)	Microbial particles	Air: ASHRAE 185.1 Surfaces: ASHRAE 185.2

FILTRATION



MERV: Minimum Efficiency Reporting Value

- MERV rating is based on removal efficiency of different sized particles.
- Higher MERV rating removes smaller particles at higher efficiency.
- MERV 16 (highest rating) removes 95% of particles at 0.3 microns (μm)



HEPA: High-Efficiency Particulate Air

- This type of air filter can theoretically remove at least 99.97% of dust, pollen, mold, bacteria, and any airborne particles with a size of 0.3 microns (μm)

FILTRATION

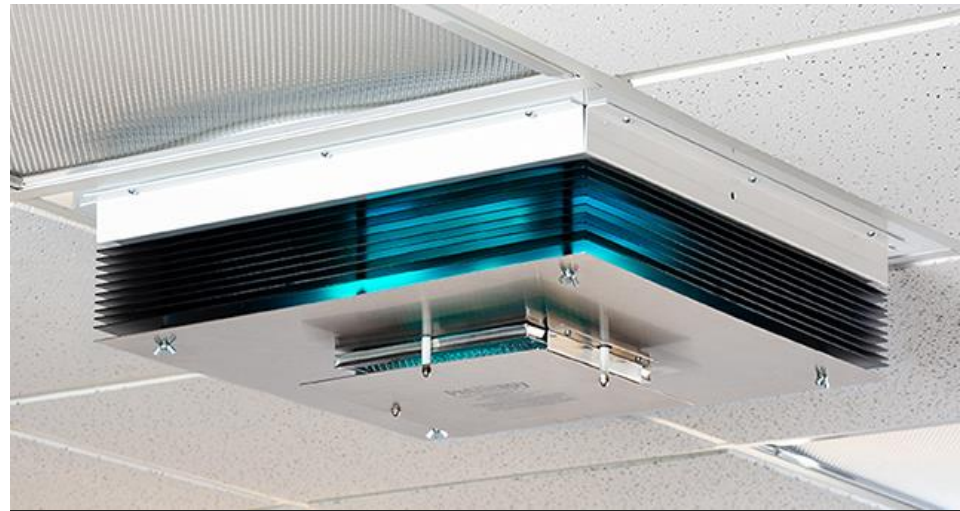
ASHRAE 52.2 Table E-1 Application Guidelines

MERV RATING	CONTROLLED PARTICLE SIZE	CONTROLLED CONTAMINANTS	APPLICATIONS
1 to 4	>10.0 µm	<ul style="list-style-type: none">• Pollen• Dust Mites• Textile Fibers	<ul style="list-style-type: none">• Minimum Filtration• Residential• Window ACs
5 to 8	3.0 to 10.0 µm	<ul style="list-style-type: none">• Mold• Spores• Hair Spray• Dusting Aids	<ul style="list-style-type: none">• Commercial Buildings• Better Residential• Industrial Workplaces• Paint Booth Inlet
9 to 12	1.0 to 3.0 µm	<ul style="list-style-type: none">• Legionella• Auto Emissions• Humidifier Dust	<ul style="list-style-type: none">• Superior Residential• Better Commercial• Hospital Laboratories
13 to 16	0.3 to 1.0 µm	<ul style="list-style-type: none">• Bacteria• Sneeze Droplet Nuclei• Most Smoke	<ul style="list-style-type: none">• Hospital Inpatient• Surgery• Smoking Lounge• Superior Commercial

ULTRAVIOLET GERMICIDAL IRRADIATION (UVGI)



ROBOTS



SPACE - UPPER AIR



PORTABLE



IN AIRFLOW

RECOGNITION OF AEROSOL TRANSMISSION

Wild West for Air Cleaners

What will it take to make diners feel safe indoors? Nearly 60% feel uneasy eating inside, so restaurants try sterilizing UV wands, tabletop air purifiers as winter looms.

By ALEXIA ELEJALDE-RUIZ
CHICAGO TRIBUNE | SEP 25, 2020 AT 7:11 AM

Chicago Tribune

Francesca's is spending about \$100,000 to outfit the HVAC units in all of its restaurants with bipolar ionization technology, which kills viruses through a chemical reaction. Menus will have a blurb explaining the technology and servers will be trained to describe it to customers, Harris said.

In addition to the tabletop ionic air purifiers, which are optional for guests, he bought multiple UV-C germicidal sterilizing wands for cleaning between customers, and supplied after-hours cleaning crews with sterilizing foggers. Floor purifiers that suck in air and kill viruses in 400-degree ceramic chambers, before cooling and releasing the air back into the environment, are placed every 500 feet.

Worries about COVID-19 spreading through the vents send Chicago building owners in search of cleaner air. 'You can't put a force field around your property.'

By RYAN ORI
CHICAGO TRIBUNE | JUL 27, 2020 AT 10:41 AM

Chicago Tribune

Riverside Investment & Development, a developer of some of Chicago's highest-rent office towers, said it has received far more questions about air quality from tenants and prospective tenants in recent months than it ever did before the pandemic.

Only 20% of the workers surveyed said they thought regularly about air quality or the overall health of people in their building before the pandemic, but more than 80% said they expected to do so in the future.

The New York Times

By Apoorva Mandavilli

Sept. 27, 2020

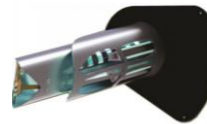
How to Keep the Coronavirus at Bay Indoors

Tips for dodging the virus as Americans retreat from colder weather: Open the windows, buy an air filter — and forget the UV lights.

Some devices generate ozone — yes, that ozone, a respiratory hazard — while others produce dangerous hydroxyl radicals that may injure cells. There are products that claim to rely on "bipolar ionization" to break down the coronavirus, but they may also produce ultrafine particles that are dangerous when inhaled.

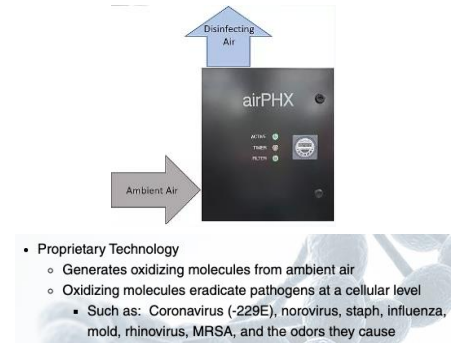


This patented Thermodynamic TSS Technology destroys mold, dust mites, bacteria, viruses, pollens, pet dander, tobacco and other organic allergens. Airfree also reduces indoor harmful ozone levels. It is perfect for mold contaminated areas as well as asthma and allergy sufferers. **Airfree's exclusive technology is completely silent and does not require any filters or maintenance.**



✓ Doctor recommends sterilize your car & home to prevent diseases in these times.

☀ With 4 blue negative ion lamps kills 99.9% of germs, viruses and bacteria. Sanitize your surroundings now!



Reducing airborne viruses through better indoor air

GPS offers revolutionary technology that fights pathogens and provides cleaner, safer air. Our patented needlepoint bipolar ionization (NPBI™) technology can be found in more than 250,000 installations worldwide.

the POWER of IONS



RAISES QUESTIONS/CONCERNS ABOUT:

- Effectiveness for controlling SARS-CoV-2
- Adverse consequences (e.g., byproduct formation)
- Many unproven technologies with bold marketing claims

ASHRAE HANDBOOK ON JUSTICE FACILITIES

2019 ASHRAE® HANDBOOK

Heating, Ventilating, and Air-Conditioning Applications

Chapter 10 Justice Facilities

- Minimum outdoor air requirements for various areas in justice (correctional) facilities can be found in ASHRAE *Standard* 62.1.
- Filtration and Ultraviolet (UV) Lights: Most areas in justice facilities use pleated throwaway filters with a minimum efficiency reporting value of at least MERV 8. **Higher-efficiency filters, such as HEPA or MERV 14 filters, may be required for clinic areas and isolation cells, and UV lights may also be installed to reduce bacteria and the spread of disease.** (*Chapter 10, Section 2: General System Requirements*)
- **Maintain negative room pressure** and negative air pressures in accordance with ASHRAE 62.1, especially when the room or **cell contains a toilet.**

CDC INTERIM GUIDANCE ON MANAGEMENT OF COVID-19 IN CORRECTIONAL AND DETENTION FACILITIES

Updated Dec. 31, 2020

- Encourage all staff and incarcerated/detained persons to wear a **cloth face mask** as much as safely possible, to prevent transmission of SARS-CoV-2 through respiratory droplets that are created when a person talks, coughs, or sneezes (“source control”).
- Provide cloth face masks (unless **contraindicated**) and perform pre-intake symptom screening and temperature checks for all new entrants in order to identify and immediately place individuals with symptoms under medical isolation. Screening should take place in an outdoor space prior to entry, in the sally port, or at the point of entry into the facility immediately upon entry, before beginning the intake process. See **Screening section** below for the wording of screening questions and a recommended procedure to safely perform a temperature check. Staff performing temperature checks should wear recommended PPE (see **PPE section** below).
- If possible, designate a room near each housing unit for healthcare staff to evaluate individuals with COVID-19 symptoms, rather than having symptomatic individuals walk through the facility to be evaluated in the medical unit.

CDC INTERIM GUIDANCE ON MANAGEMENT OF COVID-19 IN CORRECTIONAL AND DETENTION FACILITIES

Updated Dec. 31, 2020

If the facility is housing individuals with confirmed COVID-19 as a cohort:

- **Only individuals with laboratory-confirmed COVID-19 should be placed under medical isolation as a cohort. Do not cohort those with confirmed COVID-19 with those with suspected COVID-19, with close contacts of individuals with confirmed or suspected COVID-19, or with those with undiagnosed respiratory infection who do not meet the criteria for suspected COVID-19.**
- Ensure that cohorted groups of people with confirmed COVID-19 wear masks whenever anyone else (including staff) enters the isolation space. (Anyone who has trouble breathing, or is unconscious, incapacitated or otherwise unable to remove the mask without assistance should not wear a mask.)
- When choosing a space to cohort groups of people with confirmed COVID-19, use a well-ventilated room with solid walls and a solid door that closes fully.
- Use one large space for cohorted medical isolation rather than several smaller spaces. This practice will conserve PPE and reduce the chance of cross-contamination across different parts of the facility.

CDC INTERIM GUIDANCE ON MANAGEMENT OF COVID-19 IN CORRECTIONAL AND DETENTION FACILITIES

Updated Dec. 31, 2020

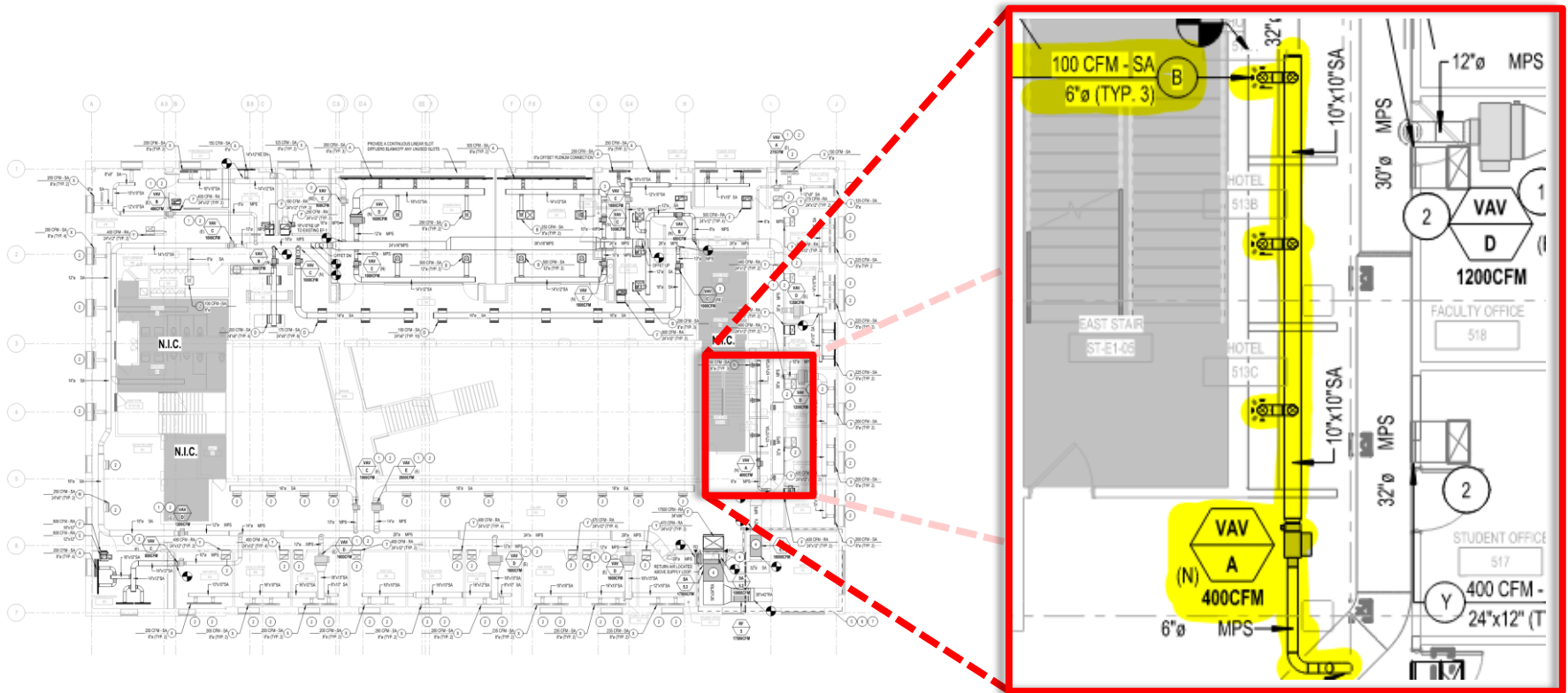
Cohorted Quarantine for Multiple Close Contacts (who test negative)

Facilities should make every possible effort to individually quarantine close contacts of individuals with confirmed or suspected COVID-19. Cohorting multiple quarantined close contacts could transmit SARS-CoV-2 from those who are infected to those who are uninfected. Cohorting should only be practiced if there are no other available options.

In order of preference, multiple quarantined individuals should be housed:

- **IDEAL:** Separately, in single cells with solid walls (i.e., not bars) and solid doors that close fully
- Separately, in single cells with solid walls but without solid doors
- As a cohort, in a large, well-ventilated cell with solid walls, a solid door that closes fully, and at least 6 feet of personal space assigned to each individual in all directions
- As a cohort, in a large, well-ventilated cell with solid walls and at least 6 feet of personal space assigned to each individual in all directions, but without a solid door
- As a cohort, in single cells without solid walls or solid doors (i.e., cells enclosed entirely with bars), preferably with an empty cell between occupied cells creating at least 6 feet of space between individuals. (Although individuals are in single cells in this scenario, the airflow between cells essentially makes it a cohort arrangement in the context of COVID-19.)
- As a cohort, in multi-person cells without solid walls or solid doors (i.e., cells enclosed entirely with bars), preferably with an empty cell between occupied cells. Employ social distancing strategies related to housing in the Prevention section to maintain at least 6 feet of space between individuals housed in the same cell.

MECHANICAL HVAC PLANS



VENTILATION SCHEDULE

VENTILATION SCHEDULE									
Room Number	Room Name (FNU)	Room Purpose (see Table 402.3)	Floor Area	Mechanical Ventilation (CFM)				Equipment	
				Supply Air	Exhaust Air	Supply Air	Exhaust Air	Tag of equipment supplying air to the room	Tag of equipment exhausting air from the room
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
87-81-00	EAST STAIR	Corridor	738	N/A	N/A	-	-	-	N/C
87-81-00	WEST STAIR	Corridor	230	N/A	N/A	-	-	-	N/C
8008	BRIDGE	Corridor	189	N/A	N/A	-	-	-	N/C
901	CONFERENCE ROOM	Offices and computer rooms	250	150.00	75.00	800.00	800.00	AHU-5	RF-5
902	ELECTRICAL ROOM	Storage/Archive	54	N/A	N/A	400.00	400.00	-	N/C
903	IMP OFFICE	Offices and computer rooms	173	103.00	51.50	400.00	400.00	AHU-5	RF-5
904	FACULTY OFFICE	Offices and computer rooms	160	99.00	49.50	400.00	400.00	AHU-5	RF-5
905	IMP OFFICE	Offices and computer rooms	160	99.00	49.50	400.00	400.00	AHU-5	RF-5
906	IMP OFFICE	Offices and computer rooms	160	99.00	49.50	400.00	400.00	AHU-5	RF-5
907	FACULTY OFFICE	Offices and computer rooms	160	99.00	49.50	400.00	400.00	AHU-5	RF-5
908	FACULTY OFFICE	Offices and computer rooms	160	99.00	49.50	400.00	400.00	AHU-5	RF-5
909	IMP OFFICE	Offices and computer rooms	168	99.00	49.50	470.00	470.00	AHU-5	RF-5
910	STUDENT OFFICE	Offices and computer rooms	168	99.00	49.50	470.00	470.00	AHU-5	RF-5
911	STUDENT OFFICE	Offices and computer rooms	168	99.00	49.50	470.00	470.00	AHU-5	RF-5
513A	HOTEL	Offices and computer rooms	27	16.20	8.10	100.00	100.00	AHU-5	RF-5
513B	HOTEL	Offices and computer rooms	26	15.60	7.80	100.00	100.00	AHU-5	RF-5
513C	HOTEL	Offices and computer rooms	27	16.20	8.10	100.00	100.00	AHU-5	RF-5
912	MECHANICAL ROOM	Storage/Archive	51	N/A	N/A	-	-	AHU-5	RF-5
916	STUDENT OFFICE	Offices and computer rooms	121	72.60	36.30	400.00	400.00	AHU-5	RF-5
917	IMP OFFICE	Offices and computer rooms	107	64.20	32.10	400.00	400.00	AHU-5	RF-5
918	FACULTY OFFICE	Offices and computer rooms	107	64.20	32.10	400.00	400.00	AHU-5	RF-5
919	POST DOC	Offices and computer rooms	123	73.80	36.90	400.00	400.00	AHU-5	RF-5
920	ELECTRICAL ROOM	Storage/Archive	55	N/A	N/A	-	-	AHU-5	N/C
921	FACULTY OFFICE	Offices and computer rooms	127	76.20	38.10	400.00	400.00	AHU-5	RF-5
922	VOICE/DATA	Storage/Archive	129	N/A	N/A	-	-	-	N/C
923	FACULTY OFFICE	Offices and computer rooms	148	88.80	44.40	400.00	400.00	AHU-5	RF-5
924	FACULTY OFFICE	Offices and computer rooms	142	85.20	42.60	275.00	275.00	AHU-5	RF-5
925	STUDENT OFFICE	Offices and computer rooms	140	86.40	43.20	500.00	500.00	AHU-5	RF-5
926	STUDENT OFFICE	Offices and computer rooms	188	112.80	56.40	500.00	500.00	AHU-5	RF-5
927	STORAGE ROOM	Storage/Archive	34	N/A	N/A	-	-	AHU-5	RF-5
928	STUDENT LAB	Class Room/Auditorium	238	261.00	130.50	800.00	800.00	AHU-5	RF-5
929	CLASSROOM	Class Room/Auditorium	429	343.20	171.60	2000.00	2000.00	AHU-5	RF-5
930A	STORAGE ROOM	Storage/Archive	41	N/A	N/A	-	-	AHU-5	RF-5
931	CLASSROOM	Class Room/Auditorium	1,211	1016.80	508.40	2700.00	2700.00	AHU-5	RF-5
932	FACULTY OFFICE	Offices and computer rooms	161	108.60	54.30	250.00	250.00	AHU-5	RF-5
933	IMP OFFICE	Offices and computer rooms	107	64.20	32.10	150.00	150.00	AHU-5	RF-5
936	WORK LOUNGE	Lunch Room - no cooking	234	261.00	130.50	800.00	800.00	AHU-5	RF-5
937	CONFERENCE ROOM	Offices and computer rooms	129	77.40	38.70	400.00	400.00	AHU-5	RF-5
938	EMPTY ROOM	Storage/Archive	129	N/A	N/A	100.00	100.00	AHU-5	RF-5
939	PRESIDENT'S OFFICE	Offices and computer rooms	201	120.60	60.30	400.00	400.00	AHU-5	RF-5
940	RESTROOM	Restroom	174	N/A	227.80	-	250.00	-	TRF
943	RESTROOM	Restroom	142	N/A	202.80	-	300.00	-	TRF
951	ADMINISTRATION	Offices and computer rooms	85	51.00	25.50	100.00	100.00	AHU-5	RF-5
791	ELEVATOR LOBBY	Corridor	435	N/A	N/A	600.00	600.00	AHU-5	RF-5
792	WEST CORRIDOR	Corridor	496	N/A	N/A	600.00	600.00	AHU-5	RF-5
793	IMP OFFICE	Offices and computer rooms	1,275	643.20	321.60	3000.00	3000.00	AHU-5	RF-5
794	EAST CORRIDOR	Corridor	829	N/A	N/A	100.00	100.00	AHU-5	RF-5
795	COLLABORATION	Offices and computer rooms	795	477.00	238.50	1000.00	1000.00	AHU-5	RF-5
797	CENTRAL STAIR	Corridor	162	N/A	N/A	-	-	-	N/C

513A	HOTEL	Offices and computer rooms	27	16.20	8.10	100.00	100.00	AHU-5	RF-5	
513B	HOTEL	Offices and computer rooms	26	15.60	7.80	100.00	100.00	AHU-5	RF-5	
513C	HOTEL	Offices and computer rooms	27	16.20	8.10	100.00	100.00	AHU-5	RF-5	

TEST AND BALANCE (TAB REPORT)



...ensuring the function of your facility meets the requirements of your operations.

Chicago, IL

Air & Hydronic Test & Balance Report

CEPro Project: TB.200626.02

CEPro, Inc.

3350 Salt Creek Lane, Suite 116
Arlington Heights, IL 60005

Phone: 847.636.7710
Fax: 847.655.6087
www.ceproinc.com

TAB REPORT - EQUIPMENT A



Air Handling Unit

PROJECT: Chicago, IL
LOCATION: TB.200626.02
PROJECT #:

Critical Environments Professionals, Inc.
3350 Salt Creek Lane - Suite 116
Arlington Heights, IL 60005
Phone: (847) 636-7710 / Fax: (847) 635-6067
www.ceproinc.com

DATE: 10/5/2020
CONTACT:

Design Outside Airflow 2500 CFM
Final Outside Airflow 2707 CFM

SYSTEM/UNIT: AHU-03
AREA: LEVEL 3

Tested By:
Date: 10/5/2020

Unit Data	
Condition	EXISTING UNIT
Installed Location	317 MECHANICAL
Manufacturer	CARRIER
Model Number	39MN25C0107WG44XDS
Serial Number	4907U36882
Unit Type	DRAW-THRU
AHU-03 Return Fan	
Manufacturer	GREENHECK
Model Number	QF1-20-11-75-X
Serial Number	11337335 0608

Starter Data	
AHU-03 Return Fan	
Starter Manufacturer	DANFOSS VFD
AHU-03 Supply Fan	
Starter Manufacturer	ABB VFD

Test Data	
Design Supply Airflow	12500 CFM
Final Supply Airflow	14026 CFM
Design Return Airflow	10000 CFM
Design Outside Airflow	2500 CFM
Final Outside Airflow	2707 CFM
GRK Damper Position	94 %
R/A Damper Position	66 %
E/A Damper Position	34 %
AHU-03 Return Fan	
Design Airflow	10000 CFM
Final Airflow	9927 CFM
Design Fan RPM	2415 RPM
Actual Fan RPM	2063 RPM
Actual Motor RPM	1780 RPM
Operating Volts T1-T2	448.0 Volts
Operating Volts T2-T3	448.0 Volts
Operating Volts T1-T3	449.0 Volts
Operating Amps T1	7.0 Amps
Operating Amps T2	7.0 Amps
Operating Amps T3	6.9 Amps
Operating Hertz	60.0 Hz
Calculated Brake Horsepower	5.25 BHP
AHU-03 Supply Fan	
Design Airflow	12500 CFM
Final Airflow	14026 CFM
Design Fan RPM	2043 RPM
Actual Fan RPM	2142 RPM
Max Fan RPM	2570 RPM
Actual Motor RPM	1780 RPM
Operating Volts T1-T2	460.0 Volts
Operating Amps T1	22.2 Amps
Operating Hertz	60.0 Hz

Motor Data	
AHU-03 Return Fan	
Motor Manufacturer	BALDOR
Motor Drive Type	BELT DRIVE
Motor Frame	213T
Rated Horsepower (Per Motor)	7-1/2 HP
Motor RPM	1770 RPM
Nameplate Voltage	208-230/460 Volts
Phase	3 Phase
Service Factor	1.15
Power Factor	79.0 %
Nominal Efficiency	91.7 %
Full Load Amps (Per Motor)	21-19.2/9.6 Amps
AHU-03 Supply Fan	
Motor Manufacturer	BALDOR
Motor Drive Type	BELT DRIVE
Motor Frame	256T
Rated Horsepower (Per Motor)	20 HP
Motor RPM	1780 RPM
Nameplate Voltage	230/460 Volts
Phase	3 Phase
Service Factor	1.15
Power Factor	86.0 %
Nominal Efficiency	91.0 %
Full Load Amps (Per Motor)	48/24 Amps

Sheave Data	
AHU-03 Return Fan	
Motor Sheave Model	2AK59
Motor Sheave O.D.	5-3/4 in.
Motor Sheave Bushing	Q1 x 1-3/8
Fan Sheave O.D.	5-1/2 in.
Sheave Centerline Dist.	23-3/4 in.
Belt (Qty) Size	(2) AP62
Motor Adj (+)	1 in.
Motor Adj (-)	2 in.
AHU-03 Supply Fan	
Motor Sheave MFR	BROWNING
Motor Sheave Model	3B62SD
Motor Sheave Bushing	SD x 1-5/8
Fan Sheave MFR	BROWNING
Fan Sheave Model	3B5V52
Fan Sheave Bushing	B x 2-3/16
Sheave Centerline Dist.	26-7/8 in.
Belt (Qty) Size	(3) BX70
Motor Adj (+)	3 in.
Motor Adj (-)	1 in.

Test Pressures	
Supply S.P. Set Point	1.50 in w.g.
AHU-03 Return Fan	
Fan Inlet S.P.	-0.79 in. w.c.

CEPro, Inc.

Page 5 of 74

TAB REPORT - EQUIPMENT B

SYSTEM/UNIT: AHU-05/VAV-A

Tested By: Tony Derse

Date: 9/22/2020

Unit Data	
Condition	NEW UNIT
Control Type	ELECTRONIC
Box Inlet Size	6 in.
VAV Address	29
K Factor	2.7080

Term Box Test Data	
Preliminary Max Primary Airflow	292 CFM
Design Max Primary Airflow	300 CFM
Final Max Primary Airflow	300 CFM
Design Min Primary Airflow	200 CFM
Final Min Primary Airflow	195 CFM
Design Reheat Airflow	200 CFM
Final Reheat Airflow	195 CFM

AHU-05/VAV-A Supply Outlet Summary

System/Unit	Area Served	Outlet Type	Size	Design CFM	Prelim CFM	Final CFM	% of Design	Instr.	AK Factor	Final FPM
Outlet-01	513C HOTEL	CD	6	100	97	99	99.0	HOOD	1.000	
Outlet-02	513B HOTEL	CD	6	100	92	95	95.0	HOOD	1.000	
Outlet-03	513A HOTEL	CD	6	100	103	106	106.0	HOOD	1.000	
Totals:				300	292	300	100.0	-	-	-

Design CFM	Prelim CFM	Final CFM
100	97	99
100	92	95
100	103	106
300	292	300

OA

AFMS

BACNET-MSTP COMMUNICATION

AI

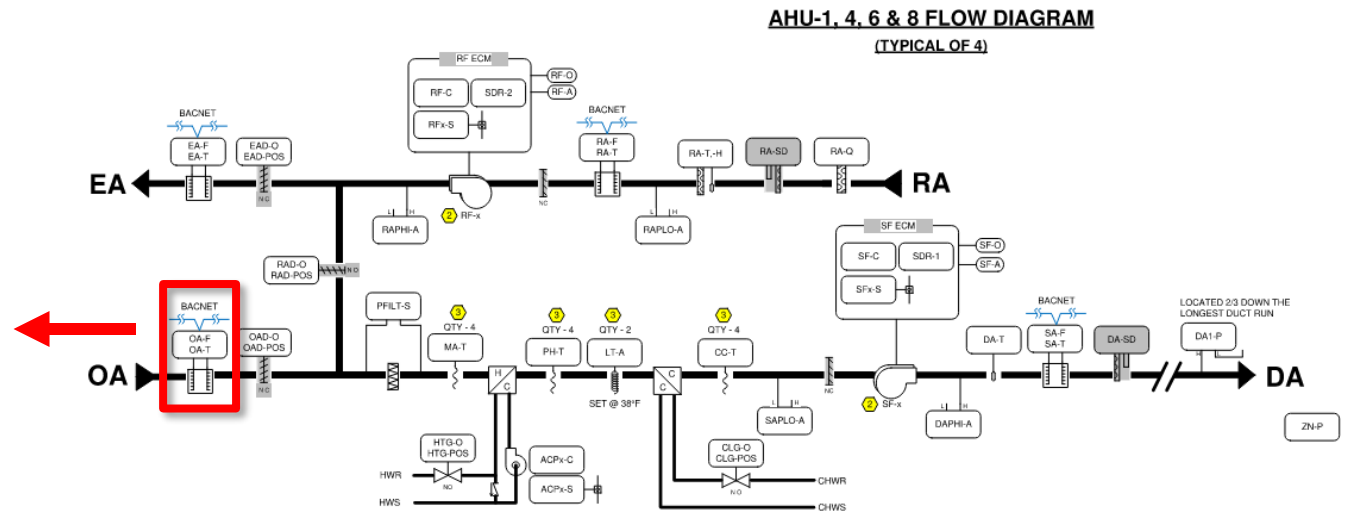
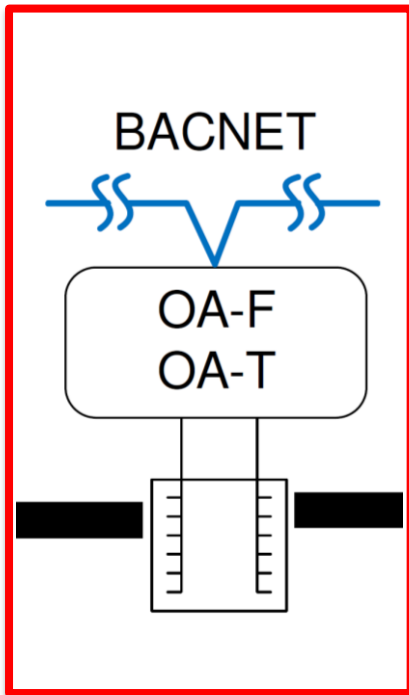
AI

OA AFMS AIR TEMP

OA AFMS AIR FLOW



TEMPERATURE CONTROLS - AS-BUILT



DISCOVERY & QUESTIONS

Purpose is to Determine

- Follow Standards
- Ventilation Rates – Design and Current
- System Type and Age
- Type of Air Treatment
- Type of Controls
- Quality of Maintenance

DISCOVERY

Request No. 1:

The following documents related to air ventilation in the Jail:

- a) the most-recent Test and Balance Report performed on any and all HVAC systems in the Jail;
- b) the outdoor ventilation rates (in cubic feet per minute, per square foot, and per person);
- c) a schematic of the Jail's layout and dimensions;
- d) design drawings of the HVAC system(s) in place in the Jail, including any schedules detailing equipment and capacity, building automation system (BAS) design and sequences and "as built" plans and BAS "as-builts";
- e) mechanical plans showing how air is supplied throughout the Jail; and,
- f) the area and ceiling height, design occupancy, and actual median daily population of Detainees and staff.
- g) maintenance logs of filter changes for the last 36 months at each air handling system indicating the MERV rating of the filters being used.
- h) any condition assessment reports completed to assess the condition of any of the HVAC systems at the Jail.

DISCOVERY

Request No. 2:

The following documents related to the air filtration in the Jail:

- a) architectural plans showing the location of air filters and the total number of filters

Request No. 3:

All materials and communications prepared in connection with the last indoor air quality report for the Jail, including work papers.

QUESTIONS FOR PRISON OFFICIALS

Interrogatory No. 1

Is your facility following CDC and ASHRAE guidelines for infection control?

Interrogatory No. 2

Can you confirm that the ventilation and filtration systems are consistent with CDC/ASHRAE guidelines and operating as intended?

QUESTIONS FOR PRISON OFFICIALS

Interrogatory No. 3:

Please provide the following information for each space/room/ cell (space) enclosed by walls which inmates are permitted to occupy:

1. Room Name for the space.
2. Type (use) of space.
3. Floor Area of the space in square feet.
4. Total number of inmates housed in the space.
5. Total supply airflow in cubic feet per minute (cfm) supplied into the space.
6. Total return airflow in cfm returned from the space.
7. Total exhaust airflow in cfm exhausted from the space directly to the outdoors.
8. Temperature setpoint maintained in the space.
9. Humidity setpoint maintained in the space.
10. Tag for the air handling or fan system (AHU) supplying the space.
11. Total peak design supply, return, exhaust and outside airflow for the AHU serving the space.
12. Source (design documents or Test and Balance Report or measurement) of airflow reported above in #5, 6, 7, 10 and 11.
13. Filter MERV rating for AHU listed in #10 above.
14. Does the AHU serving the space have an airflow measuring station mounted in the outside airflow stream.
15. Does the AHU serving the space have any Ultraviolet Germicidal Irradiation equipment installed in the supply airflow.
16. Years of service (age) of the AHU serving the space.
17. Type of AHU – constant volume or variable volume – serving the space.



ADDRESSING AIR QUALITY IN JAIL & PRISON CASES

In the Age of COVID-19

THANK YOU!

PRESENTERS



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