



past-president of AR ASHRAE Chapter
ASHRAE Region VIII leadership
Past chair of ASHRAE Handbook Committee
ASHRAE Standard 185.5P voting member
ASHRAE Standard 145.4P member
ASHRAE TG2.RAST voting member
ASHRAE TG4.IAQP secretary
AAEE – chapter president

Married 23 years 2 kids (15 & 13)





Company

Based in Lubbock, Texas, USA Founded in 1999 Incorporated in 2003 – Texas C Corp



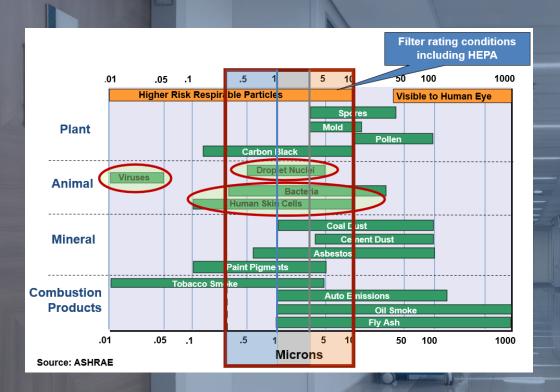
**Mission** 

To provide <u>simple</u>, <u>safe</u>, and <u>sustainable</u> air cleaning products that become valued <u>solutions</u> for our customers.





## Limitations of Particle Filters



	FILTER EFF	ICIENCY (ASF	HRAE STAND	ARD 52.2)
		Range 1 (0.3-1.0μm)	Range 2 (1.0-3.0μm)	Range 3 (3.0-10.0μm)
	MERV 8	-	20≤E <sub>2</sub>	70≤E <sub>2</sub>
	MERV 13	50≤E <sub>1</sub>	85≤E <sub>2</sub>	90≤E <sub>3</sub>
,	MERV 14	75≤E <sub>1</sub>	90≤E <sub>2</sub>	95≤E <sub>3</sub>
	MERV 15	85≤E <sub>1</sub> <95	95≤E <sub>2</sub>	95≤E <sub>3</sub>
	MERV 16	95≤E₁	95≤E <sub>2</sub>	95≤E <sub>3</sub>

HEALTHCARE SPACE FILTRATION MINIMUM REQUIREMENTS per ASHRAE STANDARD 170		
Patient Rooms	MERV 14	
Emergency Department Exam Rooms	MERV 14	
Operating Rooms	MERV 16	



# ASHRAE Position Paper on Infectious Aerosols

The magnitude of risk from aerosolized pathogens has become increasingly obvious, especially during the COVID crisis. These risks are particularly elevated in enclosed buildings.



# ASHRAE Position Paper on Filtration and Air Cleaning

Filtration and air cleaning can improve indoor air quality by physically removing airborne contaminants, inactivating viable biological particles, or transforming gaseous contaminants through chemical reactions.







#### Simple

- Clearly described cleaning process.
- Easily understood design methodology.
- Versatile installation.
- Minimal maintenance.



#### Safe

- Third-party validation.
- Passive technology with no bi-products that could be more harmful than the contaminants removed.
- 20+ years of success



#### Sustainable

- 0.05" APD at 500 FPM
- Low process energy consumption.
- Sustained performance with 15-year panel life



#### **Solution**

 Valued product that meets customer demands of good indoor air quality and low carbon footprint.

45 CENTERPOINT TECHNOLOGY







US Patent 10946116

#### photocatalytic oxidation

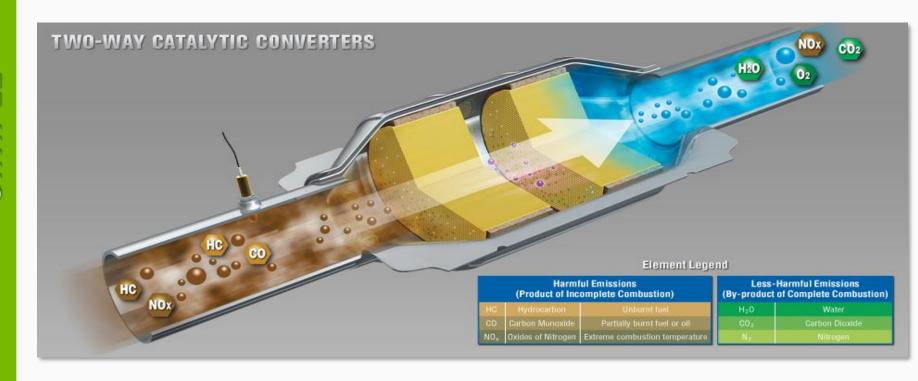
Energy from UV Lamps activates the titanium dioxide catalyst media and creates hydroxyls  $(OH^{-})$  from the water vapor  $(H_{2}O)$  in the air.

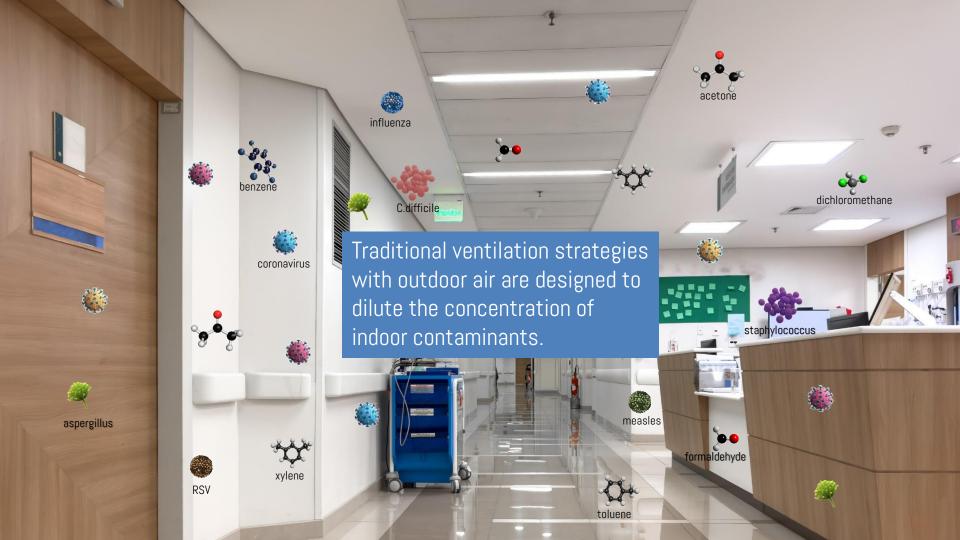
#### It is not a particle filter.

The media is pleated for Longer Residence Time of the contaminants with the hydroxyls on the catalyst media surface.



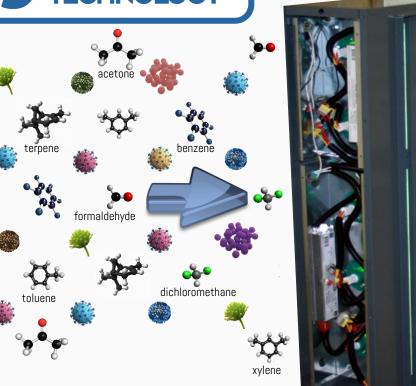
# Catalysts - Same Chemistry Different Method of Energy Activation











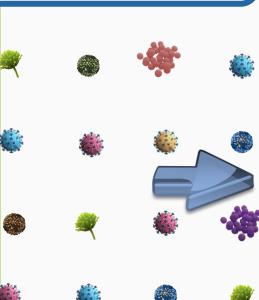


PCO produces hydroxyl radicals, (OH-), a type of Reactive Oxygen Species (ROS) that will convert gaseous compounds at the surface of the catalyst media

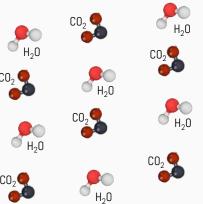
US Patent 10946116











In a <u>complete</u> <u>oxidation-reduction</u> reaction, the VOCs are converted to <u>carbon dioxide</u> and <u>water vapor</u>.

US Patent 10946116

#### **Gaseous Contaminant Control**

















AIRPORTS, MILITARY BASES, HELIPAD, AMBULANCE DRIVEWAY, GENERATOR



INDOOR AGRICULTURE, CANNABIS, FOOD STORAGE



**MYCOTOXIN RELEASE FROM MOLD** 



WILDFIRE SMOKE, CASINOS, SMOKING LOUNGE, HOSPITALITY



**RESTAURANTS, CAFETERIAS** 

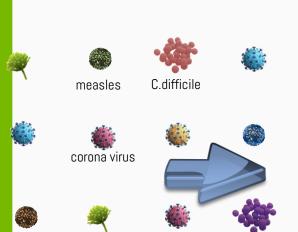


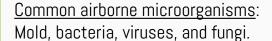
**EVIDENCE STORAGE** 

RSV









influenza

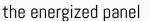
aspergillus



US Patent 10946116



Bioaerosols are attacked by Free Radicals created in

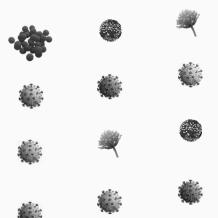


**US Patent** 

10946116



RNA / DNA Destruction = Deactivation



Single pass efficacy for VOCs and Bioaerosols

Location of the reaction is on the media surface. OH will not migrate as half-life is 1 Billionth of a second



### **Control of Microorganisms**























**SCHOOLS, UNIVERSITIES** 



**INDOOR AGRICULTURE, CANNABIS** 



**ASSISTED LIVING, NURSING FACILITIES** 



MOLD IN CONDOMINIUMS, HOTELS, MILITARY BARRACKS,



ANIMAL WELFARE, SWINE, POULTRY, VIVARIUMS





STANDARD

ASHRAE Standard 241-2023

# Control of Infectious Aerosols

Approved by the ASHRAE Standards Committee on June 24, 2023.

This Standard is under continuous maintenance by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addends or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the Standard. Instructions for how to submit a change can be found on the ASHRAE<sup>®</sup> website (www.ashrae.org/continuous-maintenance).

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ISSN 1041-2336B



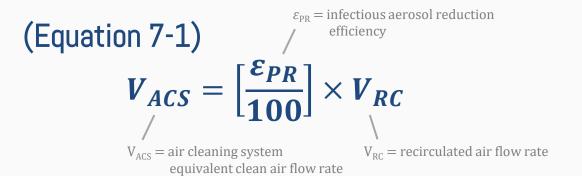
This standard includes links to online supporting files

Table 5-1	Minimum	Equivalent	Clean Airflo	w per Perso	n in Breath	ing Zone in IRMM
-----------	---------	------------	--------------	-------------	-------------	------------------

	ECAi
Occupancy Category	cfm/person
Correctional Facilities	
Cell	30
Dayroom	40
Commercial/Retail	
Food and beverage facilities	60
Gym	80
Office	30
Retail	40
Transportation waiting	60
<b>Educational Facilities</b>	
Classroom	40
Lecture hall	50

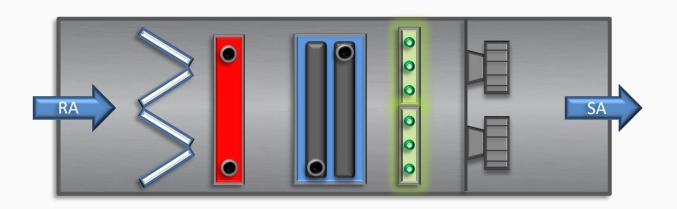
$$\sum \left[ z_f \times (V_{OT} + V_{MVS}) \right] + \sum V_{ACS} + V_{NV} \ge V_{ECAi}$$
zone outdoor air multizone air air cleaning system fraction intake flow cleaning system ECA flow rate flow rate flow rate ventilation





 $\varepsilon_{\rm PR}$  is determined with Table 7-1 or Appendix A methods:

- Standard 52.2
- ISO 16890
- AHAM AC-1
- 3<sup>rd</sup> Party
- AHAM AC-5
- Standard 185.1







**STANDARD** 

ASHRAE Standard 241-2023

# Control of Infectious Aerosols

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This standard includes links to online supporting files.

Requires testing with MS2 – bacteriophage, single stranded RNA, more resilient than enveloped viruses

Microorganism	Resilience
SARS-CoV-2, measles, RSV, influenza	Low, lipid membranes are more susceptible to disruption
C.Difficile	Extremely high, strong protein coat
Tuberculosis	High, waxy cell wall
MS2, Norovirus	Moderate to high, lack lipid envelope
MRSA, MDROs	Moderate, cell walls of vegetative bacteria are more susceptible than spores



#### **ASHRAE 52.2-2017**

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#### **ADDENDA**

ANSI/ASHRAE Addendum c to ANSI/ASHRAE Standard 52.2-2017

#### Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size

Approved by ASHRAE and the American National Standards Institute on January 21, 2022.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addends or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard, Instructions for how to submit a change can be found on the ASHRAE<sup>T</sup> webside, (https://www.ashrae.org/continuous-maintenance).

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#### (January 2022) Addendum C

Added Appendix L - criteria for determining single pass efficiency of microorganisms in removal or inactivation

Equation L-1

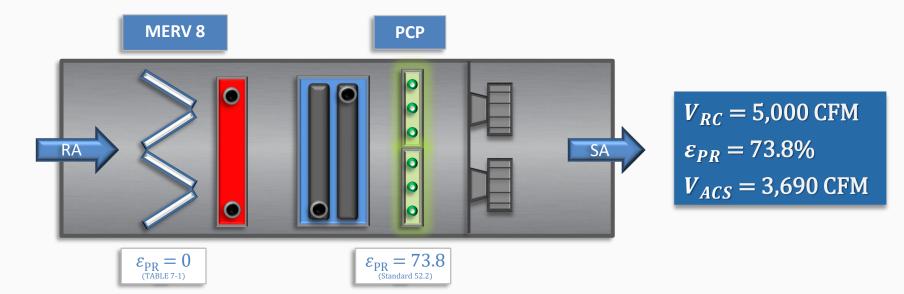
$$n(\%) = \left(1 - \frac{C_{downstream}}{C_{upstream}}\right) \times 100$$



#### (Equation 7-1)

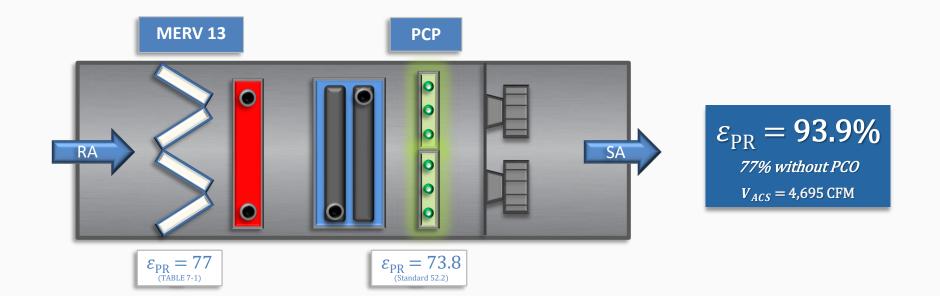
$$V_{ACS} = \left[\frac{\varepsilon_{PR}}{100}\right] \times V_{RC}$$

Applying 4S Centerpoint Technology with 73.8% single pass efficiency provides enough air to satisfy most equivalent clean air requirements in ASHRAE Standard 241.



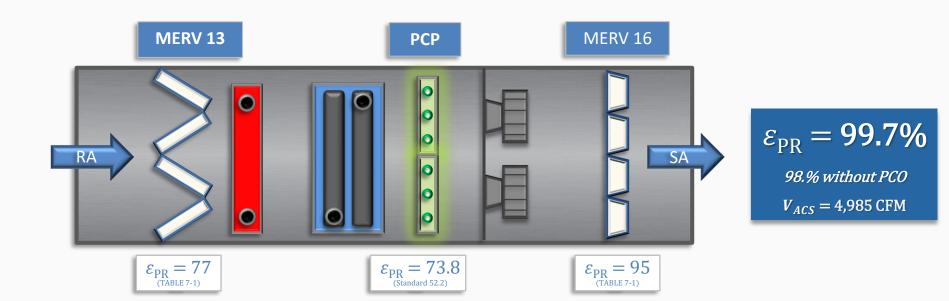


Using Equation 7-2b, two products with efficacy on microorganisms add up to much improved air cleaning system efficiency and significant equivalent clean air to the space.





Using Equation 7-2c, three products with efficacy on microorganisms add up to significant overall air cleaning system efficiency and maximizes equivalent clean air to the space.





#### ASHRAE STANDARD 185.5P and 185.3





ANSI/ASHRAE Standard 185,3-2024

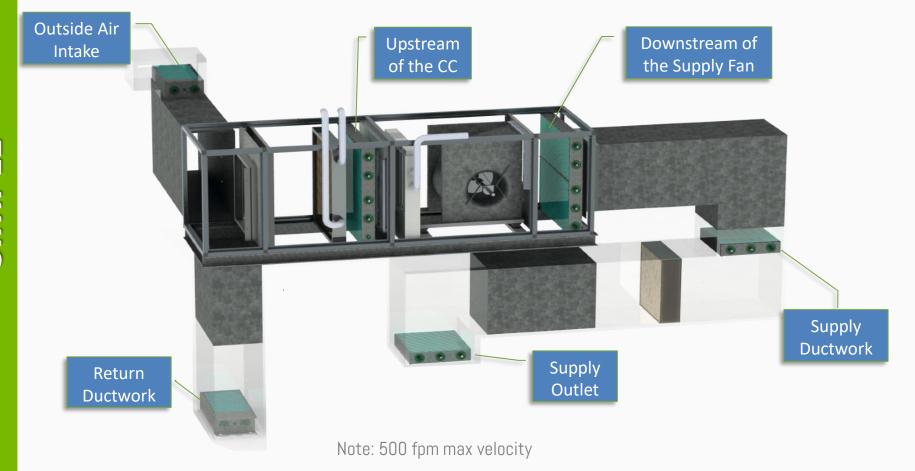
Method of Testing Commercial and Industrial In-Room Air-Cleaning Devices and Systems for Microorganism Bioaerosol Removal or Inactivation in a Test Chamber

Microbiological testing of in-room air cleaners in a sealed chamber

overansing.



### POSSIBLE LOCATIONS TO INSTALL 45 CENTERPOINT









Portable Designs for when the HVAC system cannot accommodate 4S Centerpoint Technology.







## **KESTREL**

Airflow: 50 CFM

Power: 120/1

Weight: 14.7 lbs

Lamp Life: 16 months

Catalyst Life: 15 years

Filter: MERV 13

Installation









**Airflow: 300-500 CFM** 

Lamp Life: 16 months









**Airflow: 275-825 CFM** 

Lamp Life: 16 months

Catalyst Life: 15 years

Filter: MERV 13 up to HEPA







## CONDOR

**Airflow**: 1200-2600 CFM

Power: 120/1

Weight: 197 lbs

Lamp Life: 16 months

Catalyst Life: 15 years

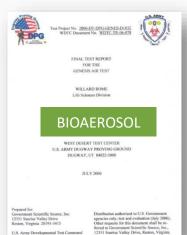
Filter: MERV 13 up to HEPA

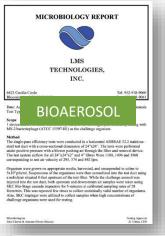
Installation



#### VALIDATION by THIRD-PARTY TESTING LABORATORIES

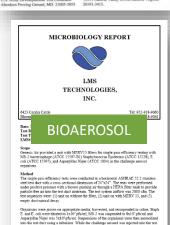












Microbiologists
Kokee Gousse & Actions Stiven Status.
Page 1 of 4





Testing showed around a 70 to 75% single pass reduction of TVOCs and a 50% reduction of TVOCs in the occupied space under these adverse conditions. It might be noted during this test sample the Genesis Air system wasn't turned on until the testing started. This accounts for

the high TVOC levels in the meeting room. Also note how quickly the room's TVOC levels

dropped when the system was initially turned on.

ı

BIOAEROSOL

was 0.31 kg TCIDSDIM (lass than half of one log nelucibre). For spray 4-6 (Genesia Air panel onto filter), there was a significant reduction in either with between the asymptom in significantly less value deleted after the aerosol based through the Genesia Air panel, pr 96/3, and a 1.55 (og TCIDSDIM) reduction. For spray F-1 (Genesia Air ow with MERY 13 flare) there was also a statistically significant reduction. For spray F-1 (Genesia Air ow with MERY 13 flare) there was also a statistically significant reduction in viable virus from Biosampler 1 to 2, pr 9165, thrighing the valids virus detection below the lower limit of detection. (LOU) with an exerced los or reduction. TCIDSDIM restart than or ceasile 0.3.7.

Table 1. Nebulizer sprays 1-9 with viral concentration per mil at the source nebulizer and at both the upstream Biosampler 1 and downstream Biosampler 2. LLOD – Lower Limit of Detection

	Dose applied through nebulizer	Biosampler 1 (Upstream)	Biosampler 2 (Downstream)	Average % Reduction	
Spray 1	3,290,000	232,000	107,000	63	
Spray 2	14,000,000	45,100	45,100		
Spray 3	8,920,000	147,000	36,900		
Spray 4	6,810,000	55,100	6,520	95	
Spray 5	14,700,000	237,000	2,320		
Spray 6	23,700,000	192,000	3,690		
Spray 7	4,990,000	94,000	<60 (LLOD)	>99.99	
Spray 8	6,810,000	23,700	<60 (LLOD)		
Spray 9	14,700,000	14,700	<60 (LLOD)		

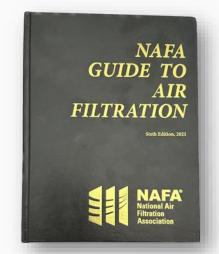
OnSite - LLC | www.onsite-lic.com | jwagner@onsite-lic.com | dgreeley@onsite-lic.com

# TEST, VERIFICATION AND CERTIFICATIONS by THIRD-PARTY INSTITUTIONS SINCE 2003











UL File No. E326567



Tested under ASHRAE standard 52.2



CARB No. G-11-040



OSP No. VMA-47561-01 and -02



EPA/FIFRA No. 87447-TX-001



22-08-20325/E22-08-046882/NB0009



# HOSPITALS





Stanford Hospital - Palo Alto, CA

# **HOSPITALS**



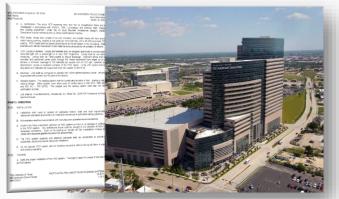


UC Davis – New Tower 14 floors with pavilion UCSF - Helen Diller Medical Center at Parnassus Heights — 15 floors

# HOSPITALS, LABS & CLEANROOMS

# GENESIS AI

## **Hospital MD Anderson Pavilion Houston**



### Hospital St Christopher's Hospital for Children, Philadelphia



#### **Hospital John Muir Medical. Center, Concord CA**



#### 1. Source Location

- a. Close proximity to freeway
- b. Non attainment area
- c. Close proximity to Helicopter Landing Pad
- d. Ongoing construction

#### 2. Type of Problem

- a. Ultra fine particles from outdoor pollution and high outdoor TVOC load.
- b. Stage 1 for helicopter odors
- c. Stage 2 Critical areas bio aerosol reduction

#### 3. Personnel Location & Challenges

- a. Limited access behind air handles
- b. Dedicated fresh air unit for
- c. Five story 168 bed facility
- d. Field Retro

#### 4. Equipment sizing and location

- a. One custom dedicated fresh air unit
- b. Stage 2, three AHUS

## **Hospitals, Labs & Cleanrooms**

- Abbot Laboratories, North Chicago
- Alleghany Health, Pittsburgh, PA
- Atlanta Medical Center (TENET) Atlanta, Georgia
- Baylor Medical Invetro Clinic, Dallas, Texas
- Brookwood Medical Center, Birmingham, Alabama
- Carillion New River Valley Medical Center, Christiansburg, VA
- CCMC Ambulatory Service Center, Bloomfield, Connecticut
- Citrus Memorial Health Center, Inverness, Florida
- Citizens Medical Center, Wichita, Kansas
- Conroe Regional Hospital, Conroe, Texas
- Cypress Fairbanks Medical Center Houston, Texas
- Deaconess IVF Center, Boston Massachusetts
- Del Ray Medical Center. Del Ray Florida
- Durango Mexica Hospital, Mexico
- Florida Hospital, APOPKA FL
- Forbes Regional Hospital ER, Pittsburgh, Pennsylvania
- Fort Smith Health Care Center, Yellow Knife, NT Canada
- Gunderson Lutheran Hospital, Lacrosse, Wisconsin
- Integrated Cancer Center, El Paso, Texas
- John Muir Hospital, Oakland, California
- Kingsbrook Medical Center, Brooklyn New York
- Las Cruces Surgical Center, Las Cruces, New Mexico
- Lahey Clinic, Boston, Massachusetts
- Mid Michigan Medical Center, Midland, Michigan
- M.D.Anderson Pavillion
- NE Alabama Medical Center, Anniston, Alabama
- New Albany Medical Center, Columbus, Ohio
- New York Presbyterian Hospital, New York NY
- St Christopher's Hospital For Children, Philadelphia
- Stanford Hospital, Stanford CA
- West Boca Medical Center, Boca Raton, FL
- West Virginia University Hospital, Morgantown, WV
- William P Clements Jr. University Hospital (UTSW), Dallas TX

# COMPANIES by CATEGORY













**FLORIDA** 

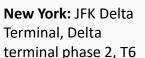
**HOSPITAL** 

The skill to heal. The spirit to care.®









San Francisco: T2,

T3, Control Tower, Admin Building, Lounge, Delta Club,

Los Angeles: Phase

**Hotel Corridor** 

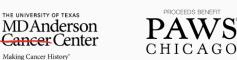
1, Phase 2





















Smithsonian

Archives of American Art









Malaysia Mall

BRIGGS&STRATTON













Palm Beach

San Diego: T1, T2,























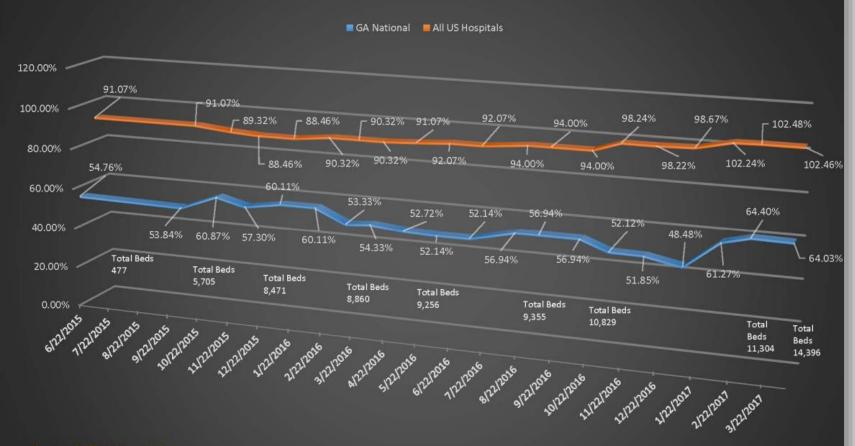




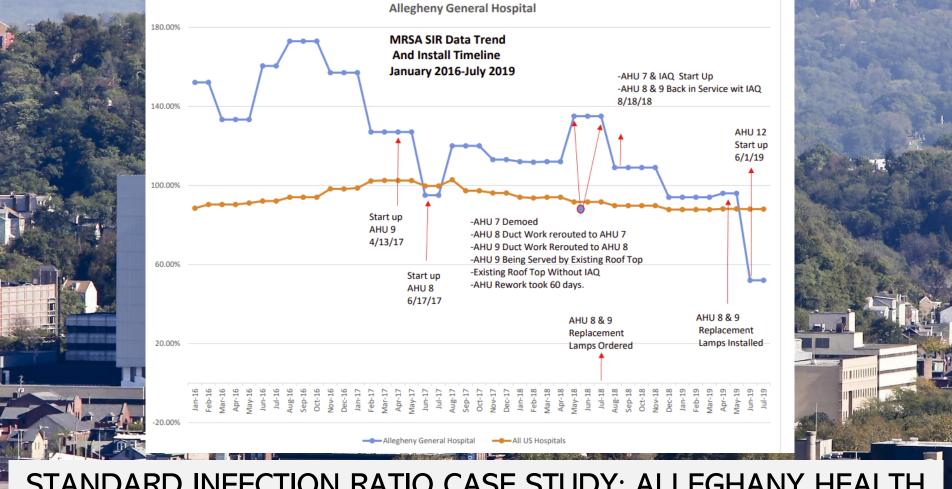


# National MRSA Standard Infection Rate (SIR) Comparison Chart





National All US Hospitals

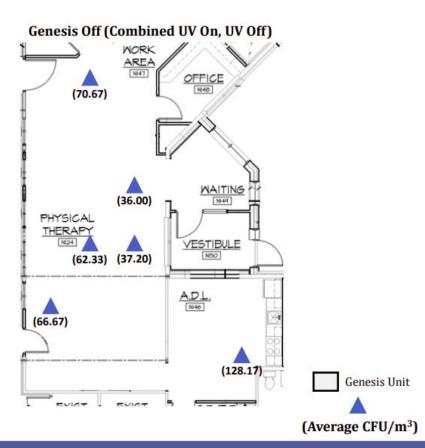


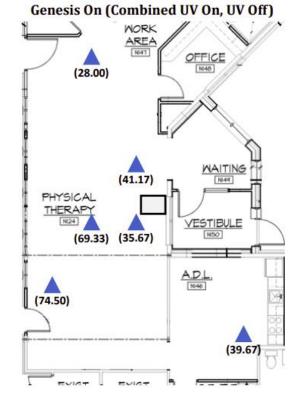
STANDARD INFECTION RATIO CASE STUDY: ALLEGHANY HEALTH

## Microbial Assay Analysis – Combined Floorplans





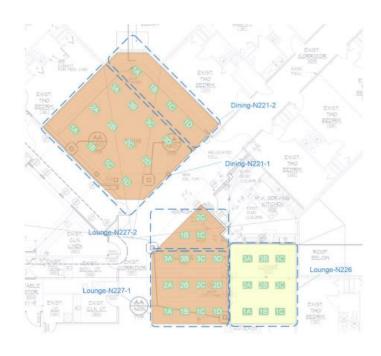












## Tests (permutations):

## N221 Dining

Baseline (16 locations)

## N226 Lounge

1. Baseline (9 locations)

### N227 Lounge

1. Baseline (12 locations)





Odor control challenge led to replacement of carbon filters and resulted in improved performance at lower energy and maintenance cost.





