CerroZone Performance Testing: ARE Labs & In Situ Client Sites

November 2023

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Executive Summary
CerroZone Product Performance Testing

Goals

- Measure & verify CerroZone product performance in controlled and real-world environments with SafeTraces DNA-tagged aerosol challenge agent
- Quantify scaling factor for converting measured values between SafeTraces UV-sensitive aerosols and MS2 bacteriophage
- Analyze relationship between product performance and space type & configuration, HVAC system controls, and device positioning
- Leverage test results to independently and scientifically substantiate CerroZone product claims for its Net Negative Ozone Devices (NNOD)

Test Plan

- ARE Labs: Measure and verify product performance in test chamber, and correlate SafeTraces aerosol test results to MS2 bacteriophage
- Client Sites: Measure and verify product performance in Senior Living, Retail Store, and Funeral Home real-world environments

Summary

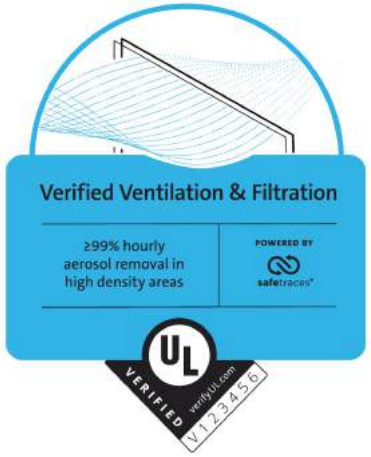
- ARE Labs: CerroZone Mini had 6.3 eACH impact on MS-2 aerosols vs 4.56 eACH impact with SafeTraces UV-sensitive aerosols
    - Testing 1.38 scaling factor for converting SafeTraces UV-sensitive aerosol values to equivalent MS2 aerosol values for this device
- Senior Living: greatest impact indicated in dining room and restroom
- Retail Store: both sample points indicated measurable impact
- Funeral Home: sampling indicated measurable impact
- Key Takeaways:
    - Testing indicated clear measurable eACH benefits provided by CerroZone devices in many test scenarios
    - Device positioning had a significant impact on real-world product performance testing results

Infection Control Guidelines
UL-SafeTraces, CDC & ASHRAE

Normal Operations

Extraordinary Events

UL + SafeTraces



Source: https://www.ul.com/services/ul-verified-ventilation-and-filtration

Centers for Disease Control & Prevention

Aim for 5 Air Changes per Hour (ACH)

When possible, aim for 5 or more air changes per hour (ACH) of clean air to help reduce the number of germs in the air.

This can be achieved through any combination of central ventilation system, natural ventilation, or additional devices that provide equivalent ACH (eACH[1]) to your existing ventilation. Supplying or exhausting an amount of air (use the larger of the two values but do not add them together) that is equal to all the air in a space is called an air change. Multiplying that amount by 5 and delivering it over one hour results in 5 ACH.

Source: https://www.cdc.gov/coronavirus/2019-ncov/community/ventilation.html

ASHRAE

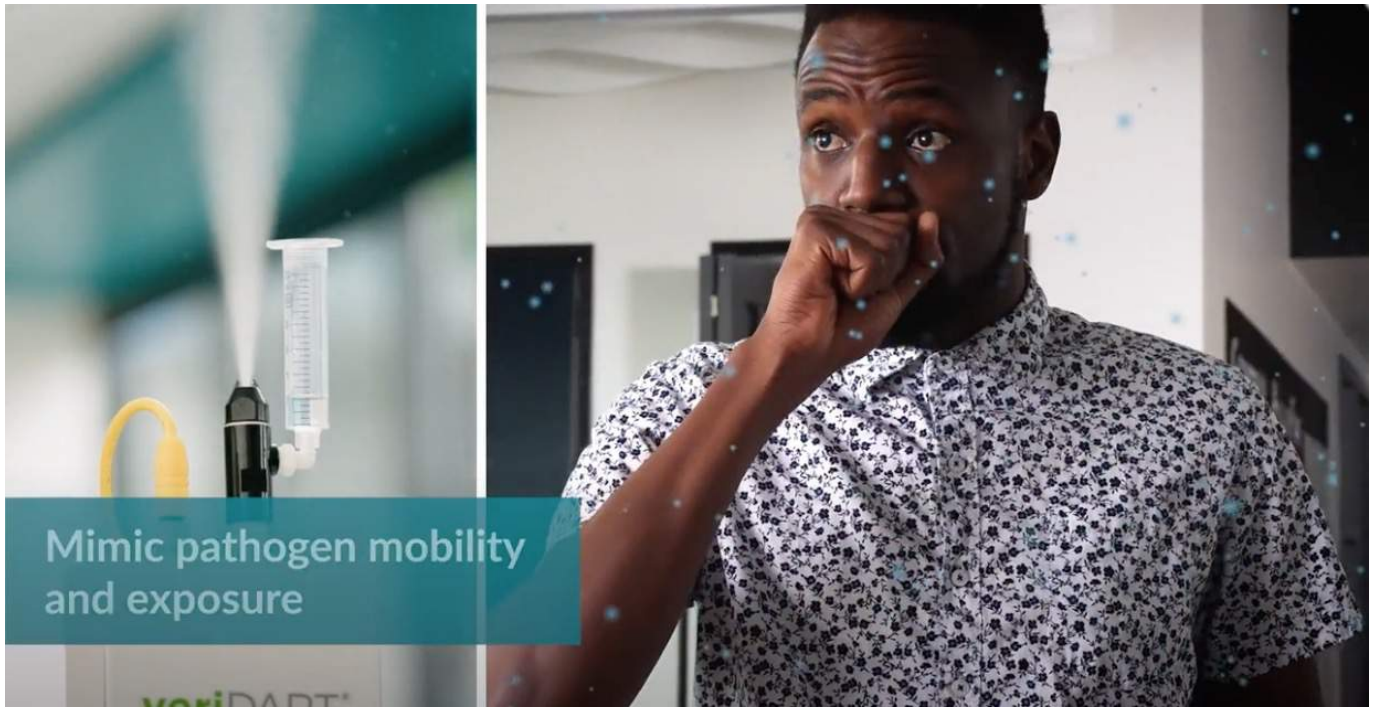
- **UL-SafeTraces Verified Ventilation & Filtration**: ≥ 99% hourly aerosol removal in high density areas (adjusted to ≥ 4.61 equivalent air changes (eACH) per hour*)
- **CDC**: ≥ 5 air changes per hour (ACH) of clean air achieved "through any combination of central ventilation system, natural ventilation, or additional devices that provide equivalent ACH (eACH) to your existing ventilation"
- **ASHRAE 241**: "Equivalent clean airflow (ECAi) is the flow rate of pathogen-free air that, if distributed uniformly within the breathing zone, would have the same effect on infectious aerosol concentration as the sum of actual outdoor airflow, filtered airflow, and inactivation of infectious aerosols" (variable by building and space type)

**Adjusted eACH values are calculated from the measured % aerosol reduction, assuming a log-linear relationship between the starting and ending aerosol concentrations, including all effects from ventilation, filtration, dilution, and deposition of aerosols in test area*

DNA-Tagged Particles

Overview

- Water-based solution with known concentrations of short-sequence DNA tags to safely simulate infectious aerosol emission, transport & exposure (FDA-GRAS, sterile)
- Aerosol tracers can carry up to 24 uniquely identifiable DNA tags via air sampling and surface swabs, enabling iterative scenario testing wo/background measurement
- ASHRAE 241-qualified challenge agent to HVAC and air cleaning systems to measure & verify in situ impact of:
  - Outdoor air
  - Filtration on recirculated air
  - Supplementary air cleaning
  - Surface deposition
  - UV-C disinfection



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Executive Summary
Test Scope

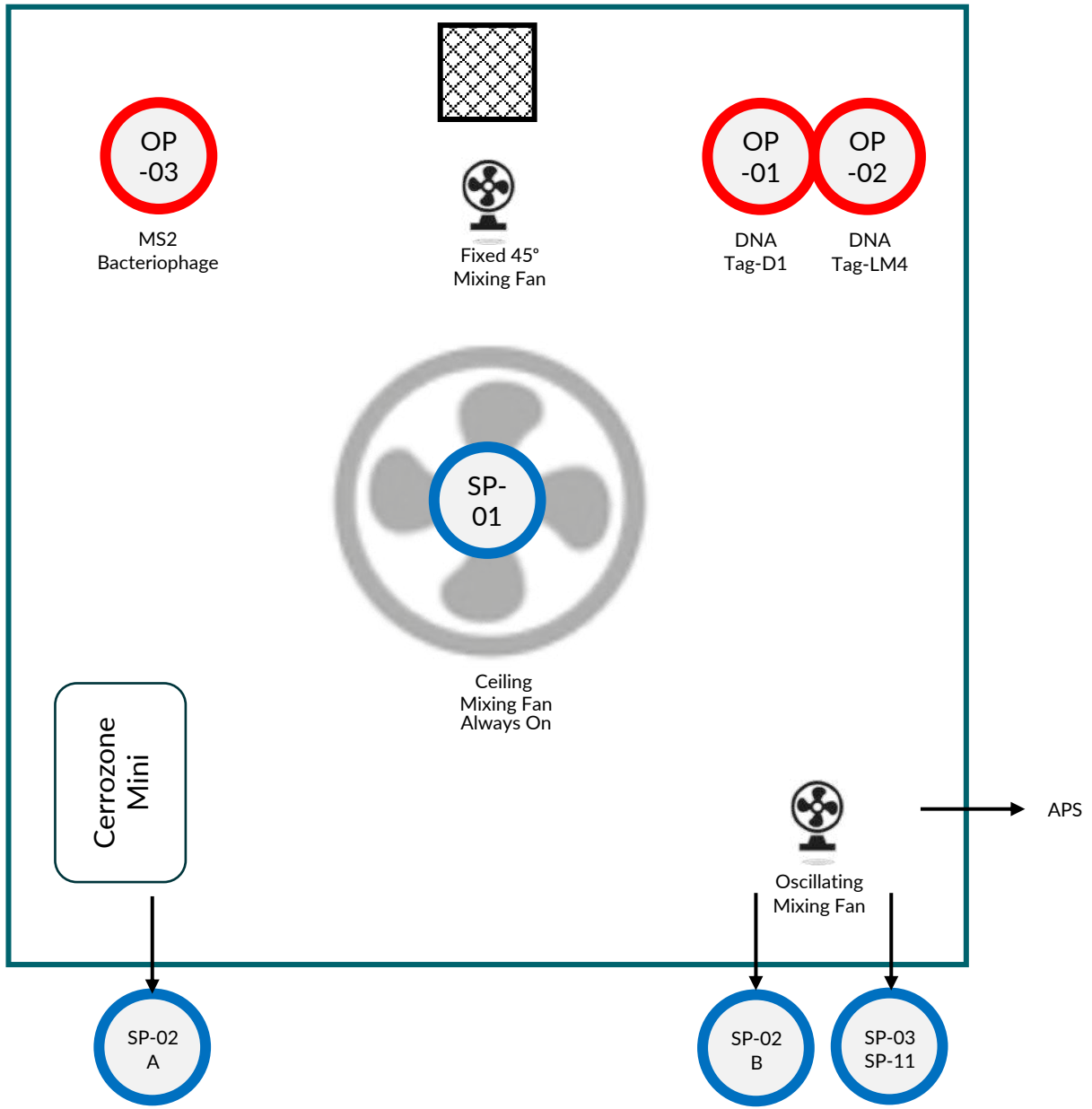
Test Location	Scenario Name	Origin Points	Sample Points	Total Samples	Sample Type	Sampling Interval
ARE Labs	Controls 1,2,3 Treatment 1,2,3	3	11	258	Air Cassette Air Bubbler Impactor	60 min
Senior Living	Dining Room Off-On Men's Restroom Off-On Office Off-On	2	1	24	Air Cassettes	20 min (Dining Room) 60 min (Other Areas)
Retail Store	In Store Off-On	2	2	16	Air Cassettes	60 min
Funeral Home	Processing Off-On	2	1	8	Air Cassettes	60 min

ARE Labs
Test Plan

Scenario	Description
1-3	Device Off (Control)
4-6	Device On (Treatment)

Overview

- Date: 2023-09-11
- Origin points: 3 (red)
- Sample points: 11 (blue)
- Test Chamber Dimensions
  - Length: 11.7 ft x Width: 10.3 ft x Height: 8.7 ft
  - Room Volume: 1,044 ft^3; 30 m^3
  - ASHRAE 241 Appendix A Compliant
- Time intervals:
  - Cassettes: 5 min, at 5.5 lpm (SafeTraces aerosols)
  - Impactor: 20 min, at 30 lpm (SafeTraces aerosols)
  - Bubbler (impingers): 10 min at 12.5 lpm (MS-2 phage)
- Execution notes:
  - Sealed chamber during all testing
  - Flushing between scenario replicates
  - Aerosols with three unique tags were released simultaneously
  - Mixing period of 5 min with fans on
  - After 5 min, mixing fans turned off
  - Ceiling fan stayed on for entire interval
  - Sampling started at 5 min for decay curve analysis



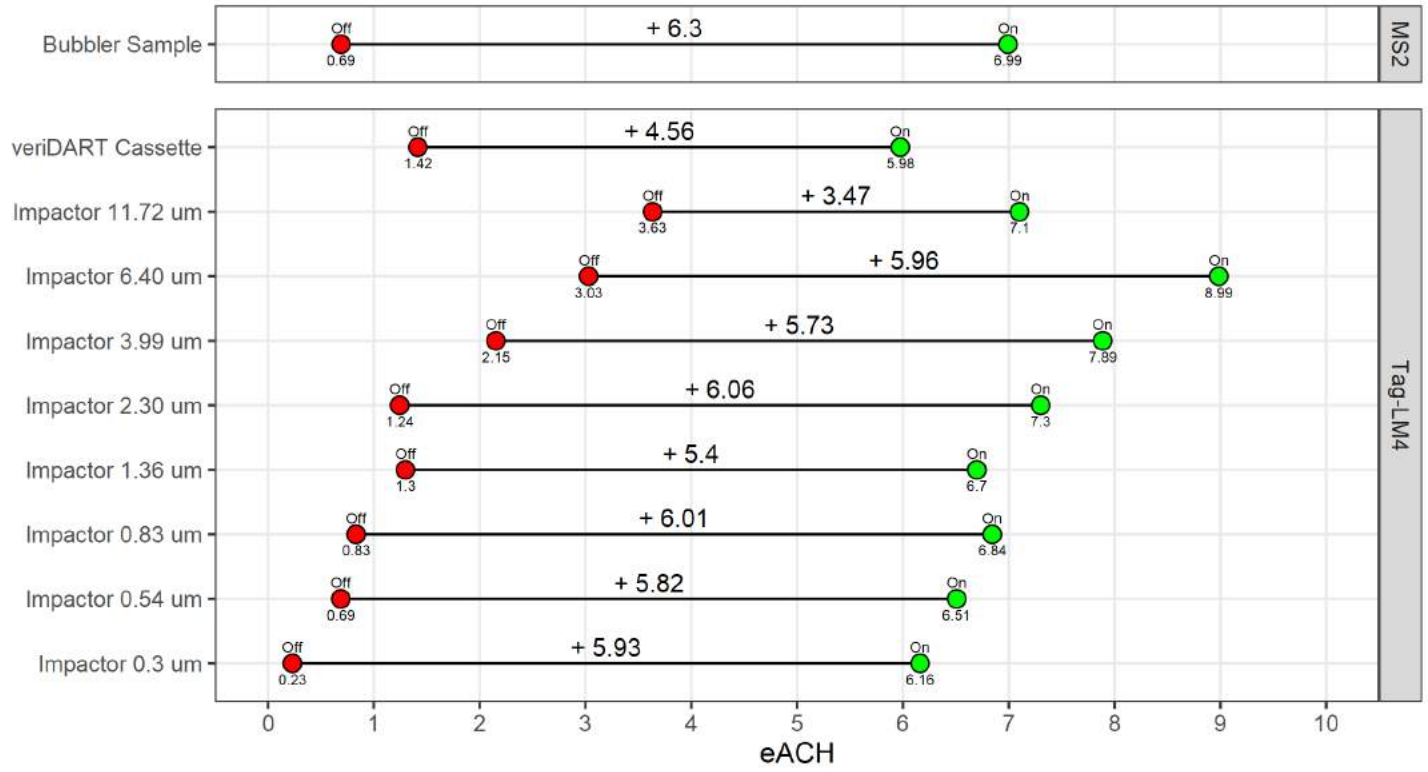
ARE Labs
Summary Results

- CerroZone Mini benefit by test method:
  - MS-2: 6.3 eACH
  - UV-Sensitive Tag LM4: 4.56 eACH (cassette)

- Correlation veriDART vs MS2:

$$\frac{MS2}{Tag - LM4} = 1.38 \frac{eACH\ MS2}{eACH\ Tag - LM4}$$

- CerroZone Mini had greatest and broadly consistent impact on particle sizes ≤ 11.72 um,, i.e. the size range most likely to stay airborne for longer time periods



Senior Living Dining Room
Summary Results

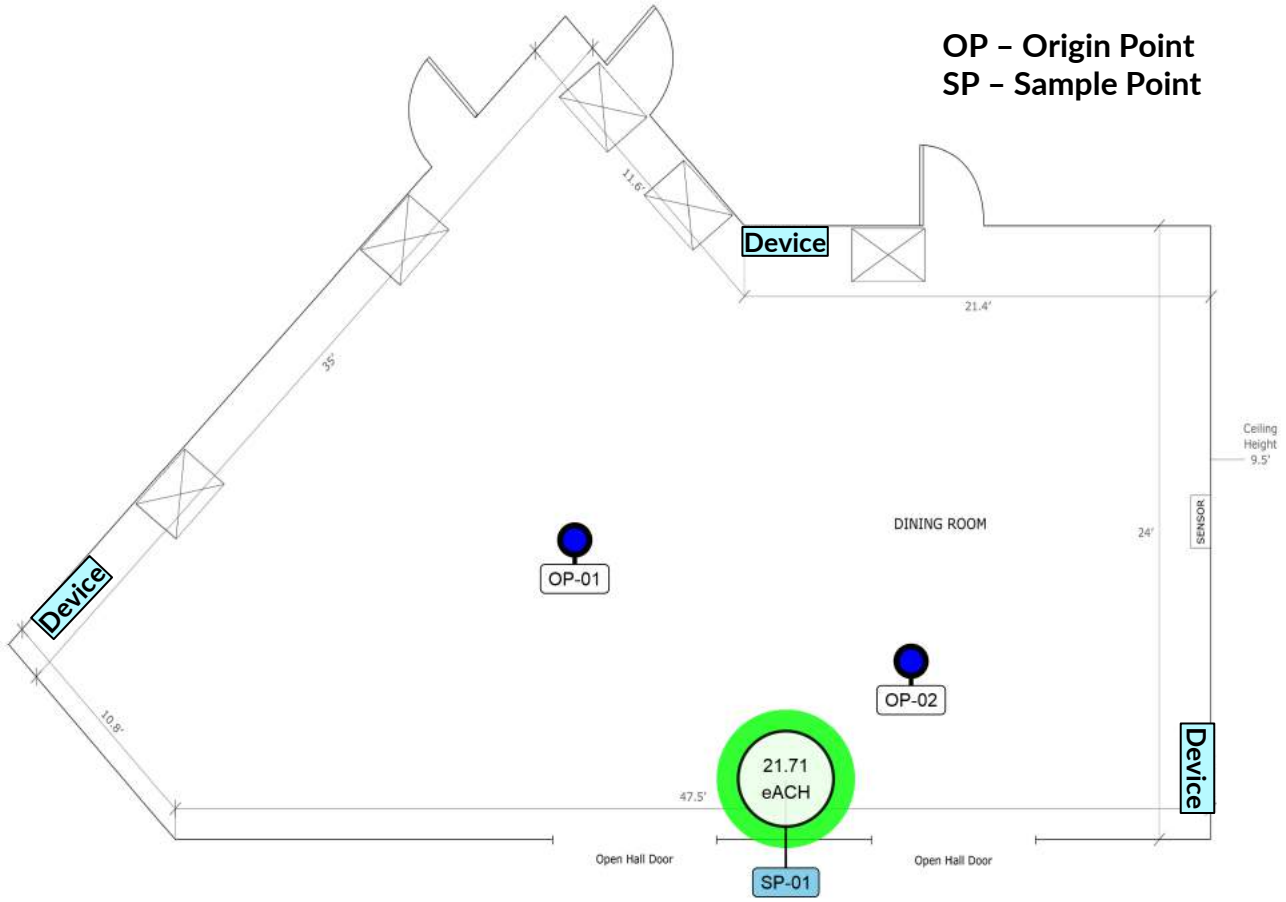
	Devices Off	Devices On	Benefit
SafeTraces	18.9 eACH	21.7 eACH	+2.8 eACH
MS2 Scaled*	18.9 eACH	22.8 eACH	+3.9 eACH

**MS2 scaling value multiplies SafeTraces measure eACH benefit by 1.38 correlation factor established in ARE Labs testing described on Slide 7*

Comments

- Three devices tested, with two placed near HVAC supply
- High eACH expected due to open wall connecting to a hall
- The room's baseline was significantly above CDC and UL health-based ventilation guidelines without supplementary air cleaning

Test Plan Layout
SafeTraces Devices On Result



Senior Living Restroom
Summary Results

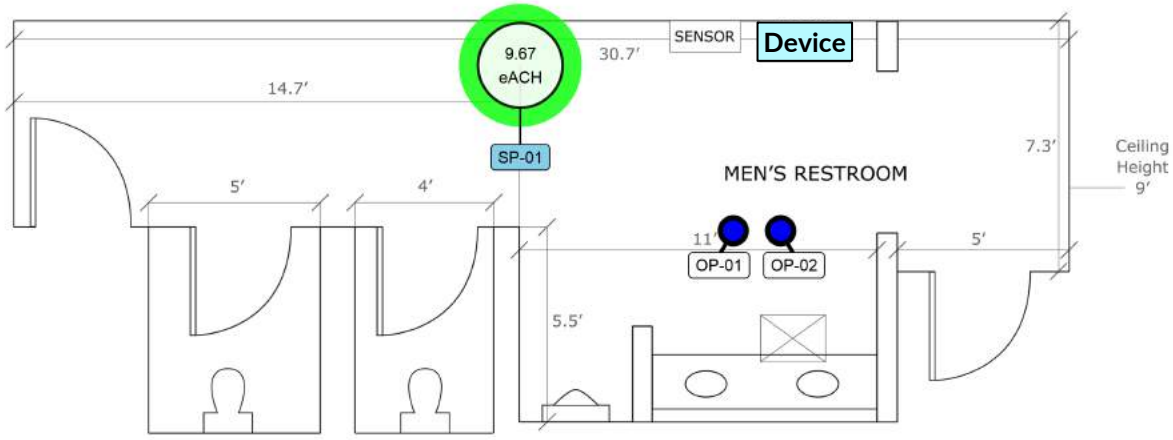
	Devices Off	Devices On	Benefit
SafeTraces	6.8 eACH	9.7 eACH	+2.9 eACH
MS2 Scaled*	6.8 eACH	10.8 eACH	+4.0 eACH

**MS2 scaling value multiplies SafeTraces measure eACH benefit by 1.38 correlation factor established in ARE Labs testing described on Slide 7*

Comments

- One device tested, placed near the center of the room and near the HVAC supply
- Room closed during testing
- Results demonstrate strong device performance along with the benefit of optimal positioning

Test Plan Layout
SafeTraces Device On Result



OP – Origin Point
SP – Sample Point

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Senior Living Office
Summary Results

	Devices Off	Devices On	Benefit
SafeTraces	8.2 eACH	8.3 eACH	+0.1 eACH
MS2 Scaled*	8.2 eACH	8.3 eACH	+0.1 eACH

**MS2 scaling value multiplies SafeTraces measure eACH benefit by 1.38 correlation factor established in ARE Labs testing described on Slide 7*

Comments

- One device tested, placed in a remote office corner
- Room closed during testing, but a fan and air purifier in an adjacent hallway was blowing in the direction of the air sampler
- Suboptimal device positioning directed by onsite staff reduced positive eACH benefits

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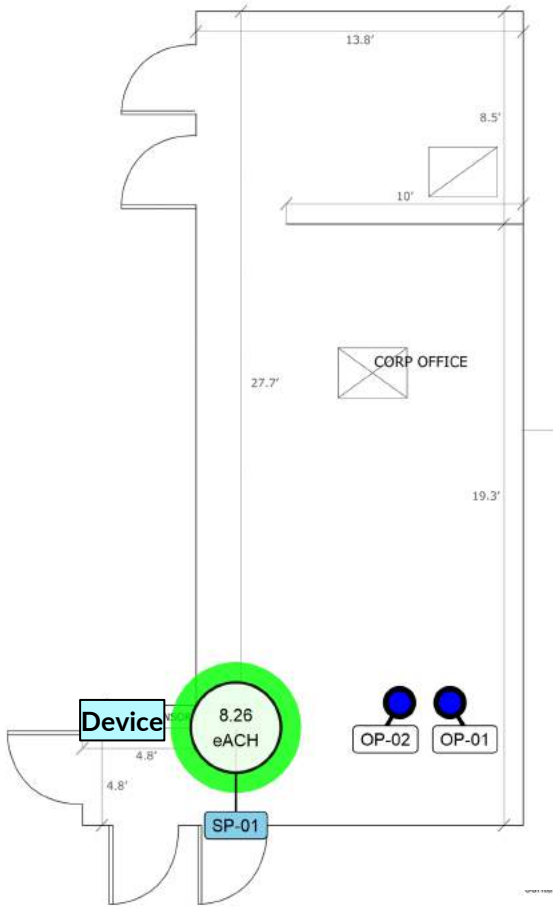
Test Plan Layout
SafeTraces Device On



OP – Origin Point
SP – Sample Point

Retail Store
Summary Results

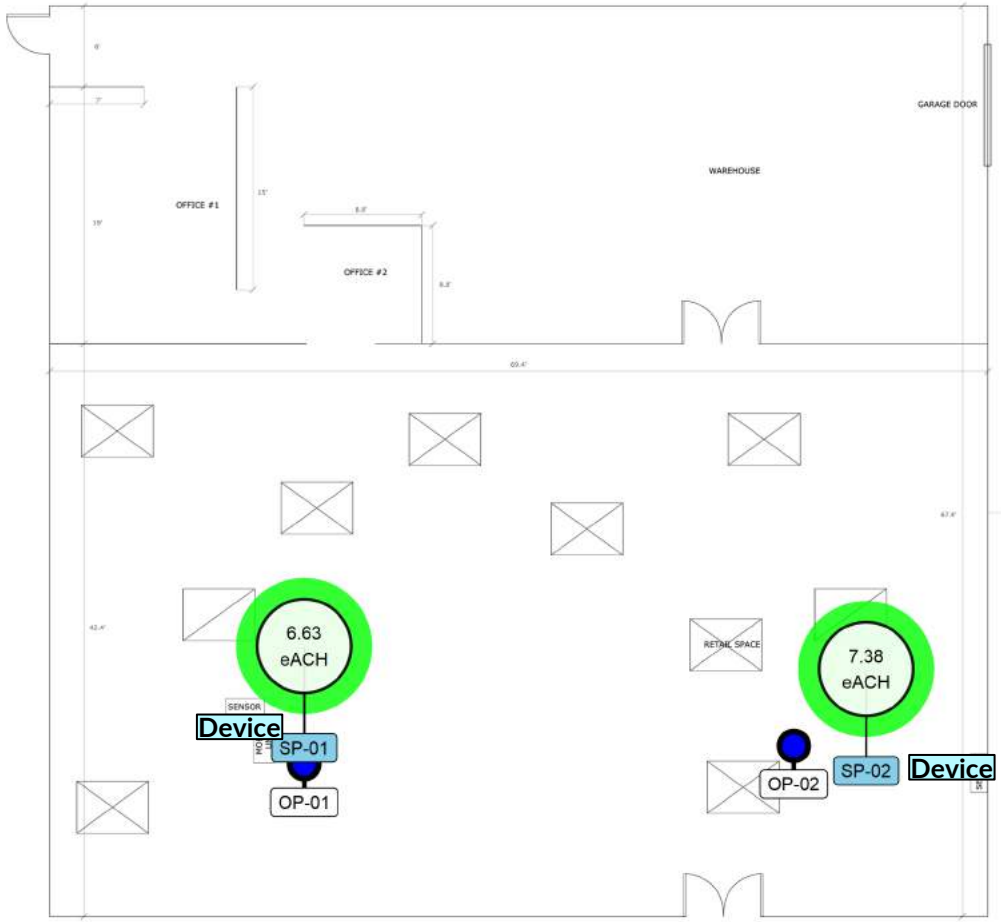
	Devices Off	Devices On	Benefit
SafeTraces #1	4.7 eACH	6.6 eACH	+1.9 eACH
MS2 Scaled #1*	4.7 eACH	7.3 eACH	+2.6 eACH
SafeTraces #2	5.1 eACH	7.4 eACH	+2.3 eACH
MS2 Scaled #2*	5.1 eACH	8.3 eACH	+3.2 eACH

**MS2 scaling value multiplies SafeTraces measure eACH benefit by 1.38 correlation factor established in ARE Labs testing described on Slide 7*

Comments

- Two devices tested, placed near HVAC supply and return
- Open wall connected test areas to back of the store; customers came in & out during testing
- Results demonstrate strong device performance along with the benefit of optimal positioning

Test Plan Layout
SafeTraces Devices On Result



OP – Origin Point
SP – Sample Point

Funeral Home Processing
Summary Results

	Devices Off	Devices On	Benefit
SafeTraces	7.0 eACH	10.5 eACH	+3.5 eACH
MS2 Scaled*	7.0 eACH	11.8 eACH	+4.8 eACH

**MS2 scaling value multiplies SafeTraces measure eACH benefit by 1.38 correlation factor established in ARE Labs testing described on Slide 7*

Comments

- One device tested, placed in L-shaped room corner to avoid obstructing operations
- Central HVAC return in the middle of a square surrounded by four vented supplies that directed air away from the central return, along with four other separate supplies in the room
- Sampler location near HVAC supplies and central air return of the room
- Results demonstrate strong device performance along with the benefit of optimal positioning

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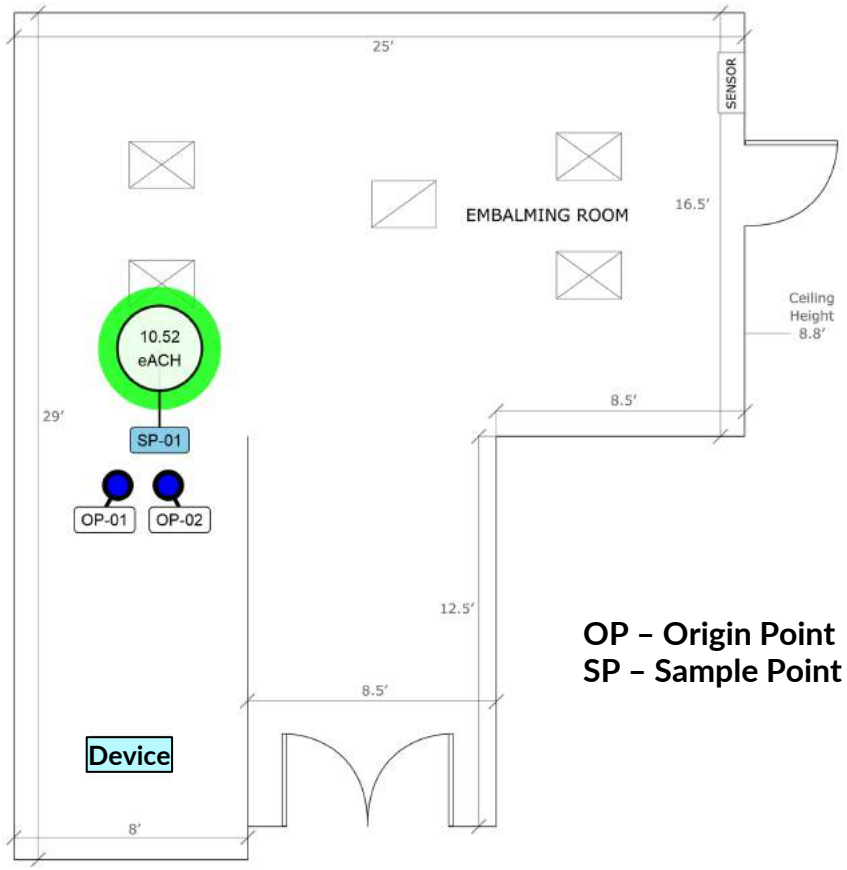
Test Plan Layout
SafeTraces Device On Results



OP – Origin Point
SP – Sample Point

Disclaimer

Based on public health guidance, transmission of SARS-CoV-2 through HVAC systems should be mitigated the risk of broader pathogen distribution and infection through facilities. We are developing the veriDART solution to identify high-risk transmission areas for individual facilities, assess filtration and ventilation, and help mitigate pathogen infection risk. It is important to note, however, that the scientific and industry literature is not yet unanimous in identifying the specific SARS-CoV-2 infection risks through large area aerosol transmission, the probability of survival of the SARS-CoV pathogens transmitted through HVAC systems, and the levels at which airborne SARS-CoV pathogens distributed through large spaces will trigger infections in humans. Consequently, there is no assurance at this time that the veriDART solution can reliably identify, reduce or eliminate infection of humans with pathogens. Our methodology is based on airborne pathogen mobility indicators, not actual viruses, and test results provide a snapshot of indicator mobility within a specific indoor space under specific conditions. We are continuing to test and improve our veriDART solution, and we will provide updates about the efficacy of pathogen detection and infection prevention as we continue to assess and improve the performance of the veriDART solution. We believe that our veriDART solution can be part of an effective strategy to minimize or eliminate the risk of airborne SARS-CoV-2 pathogen dispersion and infection. SafeTraces provides adjusted eACH values calculated from the measured % aerosol reduction, assuming a log-linear relationship between the starting and ending aerosol concentrations, including all effects from ventilation, filtration, dilution, and deposition of aerosols in tested areas.

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