



PRS

Transforming Indoor Air Quality &
Energy Efficiency Worldwide



PRS CASE STUDY: LONDON OFFICE BUILDING

Testing from:
August 2023 to February 2024

Patents

Granted:

GB 2601361, GB 2614287, GB 2619499, GB 2633940

Applications:

US: App No: 18/254646, 18/723139, 18/870423

EU Pending: 23730188.2, 22840285.5

IND: App No: 202417055819

PUTTING PEOPLE, PLANET AND PERFORMANCE FIRST

In August 2023, PRS installed our Indoor Air Quality (IAQ) solution on the 2nd floor of a building in London. Our client uses 10 floors in the building, each of which is 32,000 sq. ft. in area, and we have been able to do comparative testing as part of our performance study. This study demonstrates that our Life Science Prop-tech solution fulfils the following: -

- ◆ Protects occupants now from airborne viruses, bacteria, and moulds
- ◆ Reduces energy costs by 10 to 40%
- ◆ Reduces the volume of polluted, often carcinogenic, external air entering the building
- ◆ Helps achieve ESG and Carbon Zero objectives
- ◆ Improves employee wellbeing and productivity
- ◆ Increases employee confidence in safely returning to the office
- ◆ Typically delivers a return of capital < 2 years, and a return on capital > 50%

PRS is delivering value to our client in this case for an effective cost of just £1.53 per employee, less than an average daily cup of coffee.



INTRODUCTION

Pathogen Reduction Solutions Limited (PRS or the Company) has developed a ground-breaking, joint UK/US- developed proprietary technology for safely and effectively inactivating airborne pathogens passing through indoor Heating Ventilation and Air Conditioning (HVAC) and other enclosed air handling systems. Harmful airborne pathogens in this case include bacteria, viruses, and mould.

The system employs high intensity ultraviolet light (UVC) for this purpose, a widely accepted application for sanitising generally static surfaces, but through proprietary design elements does so when the pathogen transit time is measured in a fraction of a second. PRS is practical as either a complimentary retrofit or as incorporated in new build as part of a state-of-the-art smart air handling system, in both cases for the effective life of the building and its air handling infrastructure.

Inspired by the pandemic, our technology was initially focused on providing clean, safe indoor air and building pathogen resiliency to save lives. PRS' technology, as now proven in large scale built and controlled lab environments, empowers owners, operators and tenants to realize this safe indoor air opportunity..

Large scale site testing demonstrates that PRS' single pass sanitisation reduces bacteria and mould exposures by 97 to 99% and 78 to 94%, respectively, relative to unprotected floors. With lethal viruses which require controlled environment lab testing (biosafety lab level 3; aka, BSL-3), PRS' single pass sanitisation reduces exposures of SARS-CoV-2, Influenza and Measles by 99.99% or higher.

The ability to safely recirculate more internal air using PRS provides a variety of other strong economic and stewardship benefits which this brief will expand upon, including:

- ◆ Reduced energy consumption by estimated 10-30% based upon empirical testing (an on-going study by Imperial College and Butterfly Sensors estimates up to 40% savings based upon a 70% air recirculation target);
- ◆ Reduced energy consumption to reduce a building's (or landlord/tenant's) carbon footprint and credibly document a path to carbon zero and compliance with government regulation like New York City's Local Law 97;
- ◆ Reduced reliance upon external air introduction in buildings to lower human exposure to common metropolitan area pollutants including noxious gases like NOx and particulates like wildfire-generated carbon black; and
- ◆ Reduced human exposure to harmful particulates like PM 2.5 by enabling more passes through the physical filtration element of a building's air handling system (working in tandem with PRS' air sanitization).

Optimising the balance and trade-offs between these elements – human and environmental safety and wellbeing and energy consumption – rather than simply monitoring Indoor Air Quality (IAQ) metrics and addressing individual dimensions of this challenge, is now practical and economically attractive.

INDOOR AIR QUALITY MANAGEMENT

Global Opportunity, Multiple Benefits

The rise in airborne threat awareness has intensified public and private sector scrutiny of indoor conditions, safety and environmental damage, and the near to medium term implications thereof for human health and wellbeing. The quality of the air we breathe – both indoors or outdoors – is centre stage, but the lines can blur around where the greatest exposure risks lie for pathogens, noxious gases and particulate pollutants. The convergence in interests, and the rationale for PRS' solution, is based upon the facts and thesis summarised below:

- ◆ Increased external air and air turnover were the guiding principles during the pandemic to manage contagion risk, but this approach introduces other prospective harms: increased exposure to external air pollutants and higher energy consumption.
- ◆ 50% of human exposure to external air pollutants occurs indoors due to “fresh” air introduction through indoor air handling, where the same average human spends an estimated 90% of their time, and pollutant concentration levels are often 2 to 5x higher than those outdoors.
- ◆ Of the globe's fossil fuel-generated carbon footprint, 13 to 15% is directly attributable to air handling systems in buildings – conditioning externally introduced “fresh” air by cooling, heating, dehumidifying, etc. to make it comfortable for human occupancy.
- ◆ Improving IAQ, while managing risk with external air exposure and reducing the energy consumed in continually conditioning external air, depends on smart IAQ systems capable of safely recirculating higher percentages of sanitised and filtered indoor air.
- ◆ PRS is a foundational enabler in this optimisation exercise: reducing pathogens, managing external air exposure, and improving energy efficiency – effectively fulfilling duty of care obligations while generating attractive economic returns.



APPLICATION RESULTS

Compelling PRS Performance

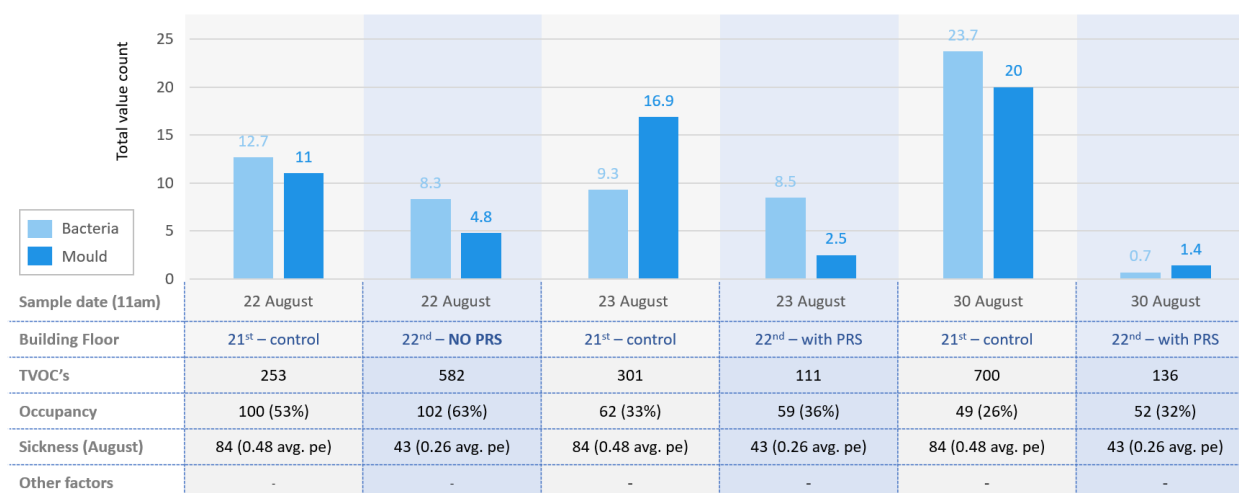
PRS has been engaged in collaborative discussions with our client for the better part of a year regarding IAQ and PRS’ innovative approach to air sanitization. To understand firsthand PRS’ application, our client agreed in 2023 to pilot PRS at their global headquarters in London.

Site monitoring is ongoing, but the test results are highly compelling as shown below in terms of both PRS’ efficacy in building resiliency against pathogens and our client’s opportunity to more effectively and efficiently manage IAQ. They initiated testing of PRS in August of 2023, installing PRS on the 2nd floor with the 1st floor serving as a control floor. Both 32,000 sq. ft. floors have similar physical configurations and near identical occupancy levels.

Testing in mid to late August of 2023 confirmed PRS’ effectiveness in pathogen reduction: PRS reduced bacteria and mould exposures on the 2nd floor by 97% and 93%, respectively, compared to levels measured on the control floor (see below excerpt from our client’s first internal briefing on the testing). In addition, Total Volatile Organic Chemicals (TVOCs) monitoring during this same period in August indicates 63% and 81% reductions, respectively, at the one day and one-week intervals with PRS operating on the 2nd floor.

VOCs are known to be harmful to human health, especially over long-term exposures, and are emitted as gasses from everyday products such as building materials, maintenance equipment and cleaning products; e.g., benzene and formaldehyde are known and suspected carcinogens, respectively. PRS’ management expected this TVOCs reduction but notes that it is subject to further testing in a controlled lab environment before PRS is prepared to make any formal claims about the magnitude of this secondary benefit.

INITIAL TESTING AUGUST 2023 - AVERAGE RESULTS PER FLOOR



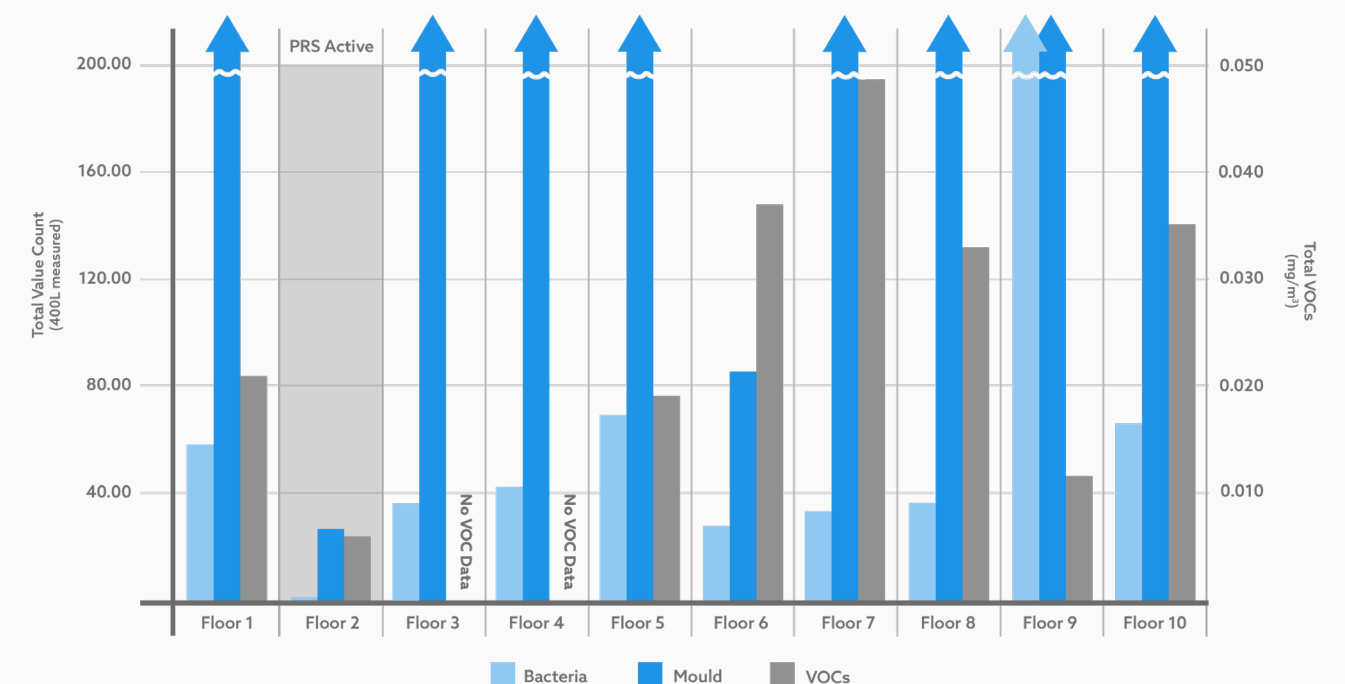
PRS Unit London Office Building



Another round of pathogen testing in early November 2023 produced even more compelling results. Occupant exposures experienced on the PRS-protected 2nd floor were 98.7% and 77.9% less than the average bacteria and mould exposures, respectively, as conservatively averaged across testing on nine other floors including the original 1st control floor (see below a summary by floor of concentrations in bacteria, mould and TVOCs).

In general, moulds require more energy to inactivate in a single pass than the targeted viruses and bacteria, so this differential between bacteria and mould exposures on the 2nd floor is scientifically supported. Viruses, given their materially smaller size (typically around 1/10 the size of bacteria), require a different monitoring method which PRS used during testing in the BSL-3 lab setting (spectrometry), but that is less practical on such a site.

NOVEMBER 1ST, 2023 RESULT - INDOOR AIR QUALITY SUMMARY



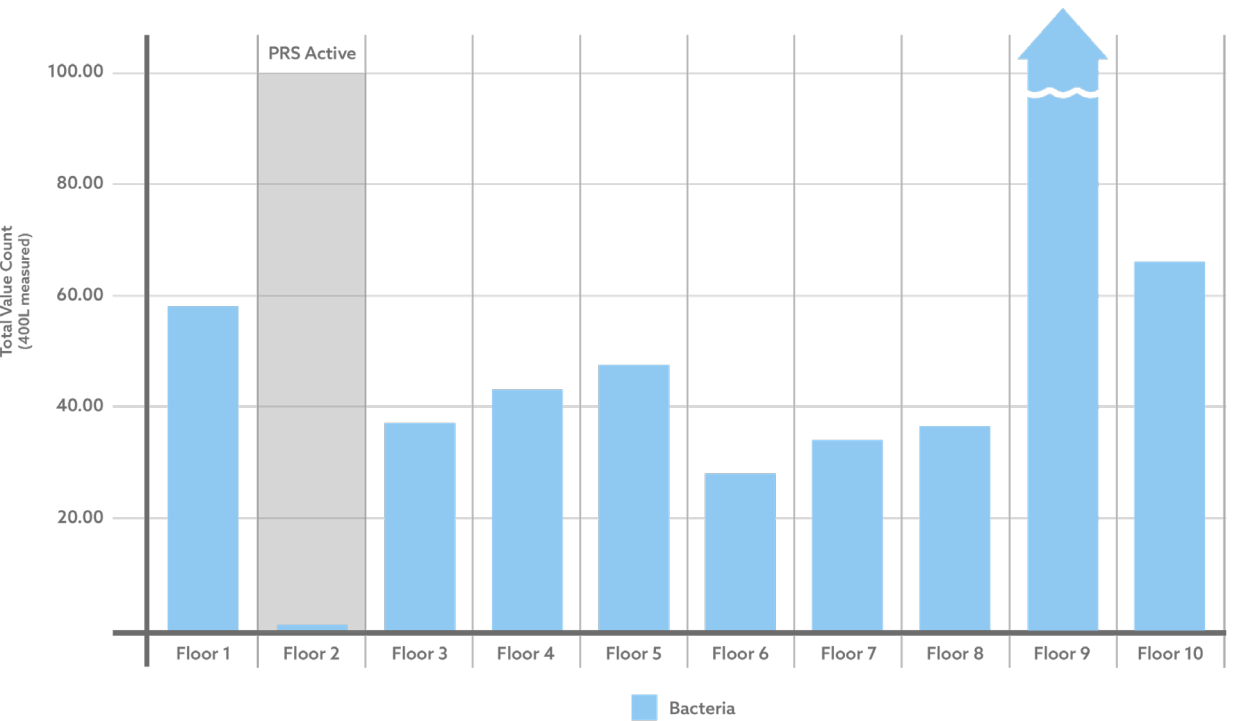


Improvements in occupant health and wellbeing lead to reduced absenteeism and higher productivity...

See Appendix for references

This graphic isolates relative bacteria counts as a proxy for PRS' impact on viruses as viruses generally require less energy to inactivate than either bacteria or moulds. The increased challenge in inactivating bacteria and moulds is because both are capable of forming spores, one of the most resistant organisms on earth, increasing bacteria and mould survival rates even under very harsh environmental conditions.

NOVEMBER 1ST, 2023 RESULT - BACTERIA ONLY



NB. Viruses are typically easier to inactivate or kill than bacteria and moulds
PRS' demonstrated efficacy with bacteria is the best proxy for efficacy with targeted viruses

Experience with this round of testing underscores PRS' role as a complement to an existing air handling system including physical filtration, and the opportunity over time to optimise the IAQ relative to energy consumption. The testing identified several high mould counts on other floors, in most cases downstream from physical filtration. There was one exceptionally high upstream mould count reading on the 2nd floor, but after the air passed through the PRS (i.e., downstream from the PRS), the 2nd floor occupants' mould exposure was reduced by over 94% vs. the 78% average reduction cited above.

According to the US Center for Disease Control and Prevention (CDC), mould exposure can cause many health effects from sore throat, coughing or wheezing, to more severe reactions for people with asthma or who are allergic and/or immune-compromised. Regardless of root cause(s) for these significant mould spikes, PRS is demonstrably reducing the risk of exposure.

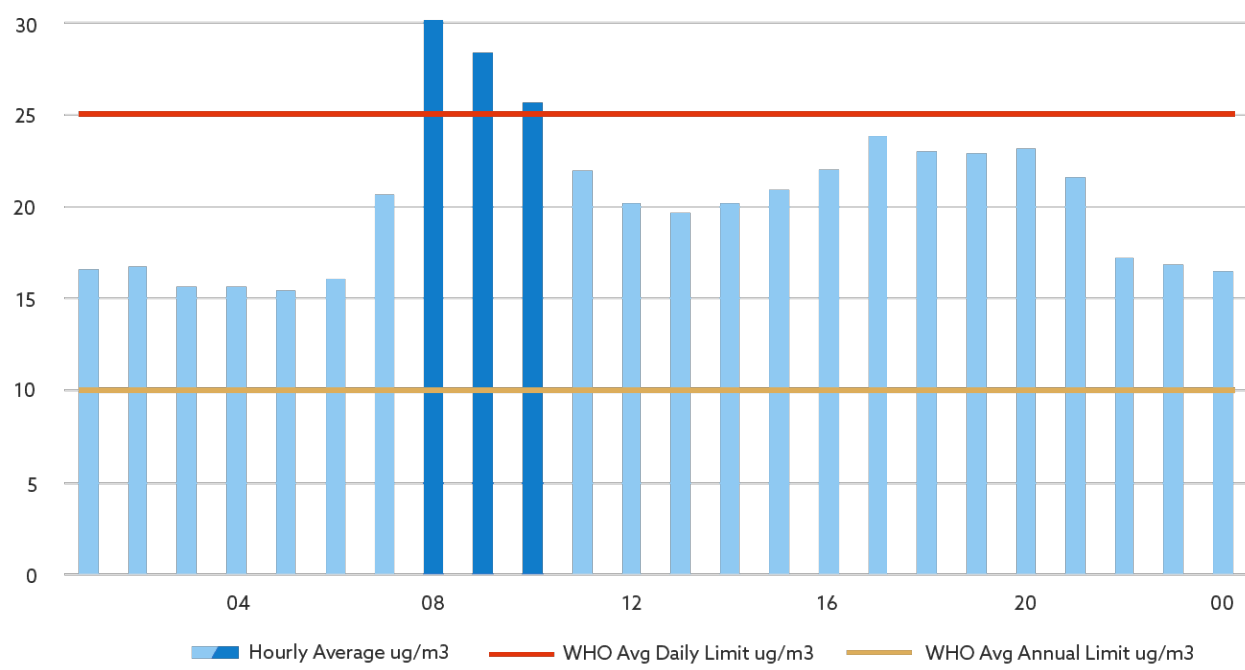
EXTERNAL AIR POLLUTANTS

Potential Exposure

While the results above feature PRS’ impact on interior air quality, in the context of the fact that roughly 50% of external air pollutants exposure occurs indoors where pollutant concentrations are often 2 to 5x higher, it is also important to monitor the external air quality (EAQ) as the “fresh” air that is being drawn into the building when not in recirculation.

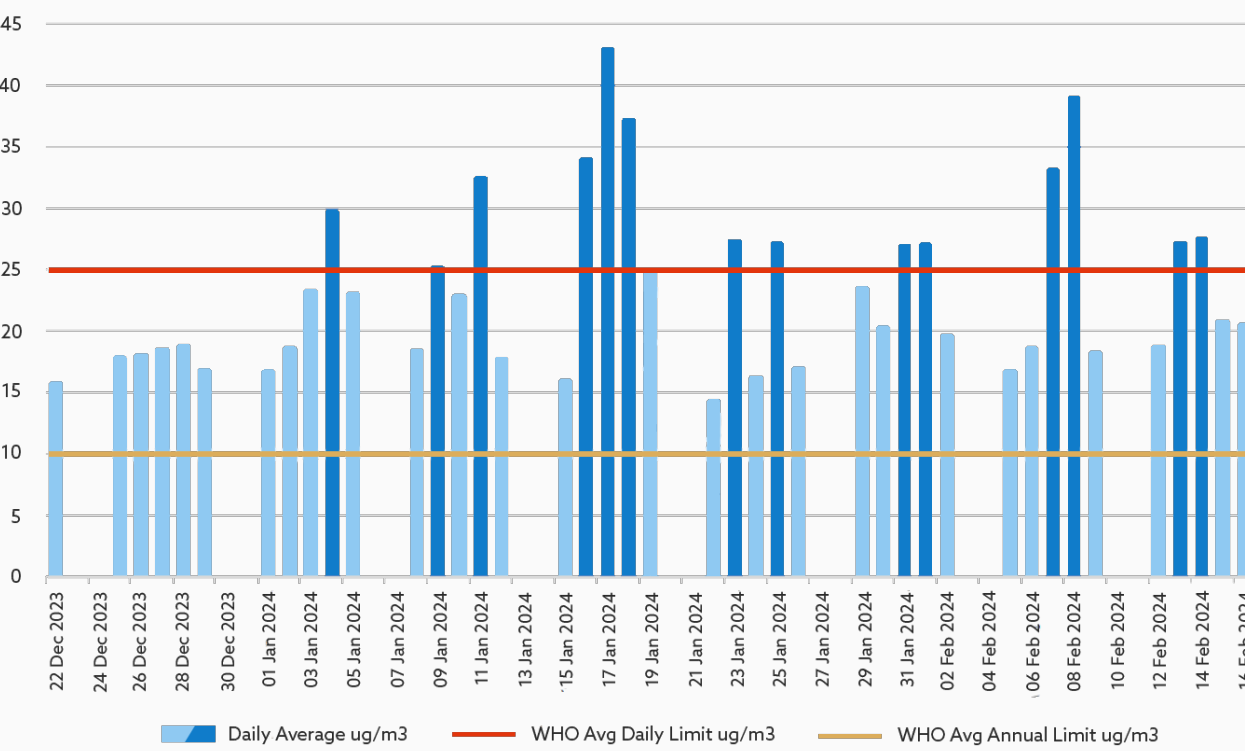
PRS has since December of 2023 been collecting external air quality (EAQ) data on the roof of the London office site. The graphs below focus on levels of NO₂, a known human carcinogen, with benchmarks provided by the World Health Organization (WHO) noting recommended safe exposure levels on a daily and annual basis.

ROOF SENSOR - NO2 HOURLY AVERAGE, WORKING DAYS 22/12/23 - 16/02/24



- While alarming, this data should also provide encouragement for two primary reasons:
1. PRS-enables safe air recirculation and can thereby, reduce these exposures, and
 2. This data type can inform the best times to draw in external air to minimize these exposures and drive incremental energy efficiency as outlined in PRS’ three phased energy savings continuum.

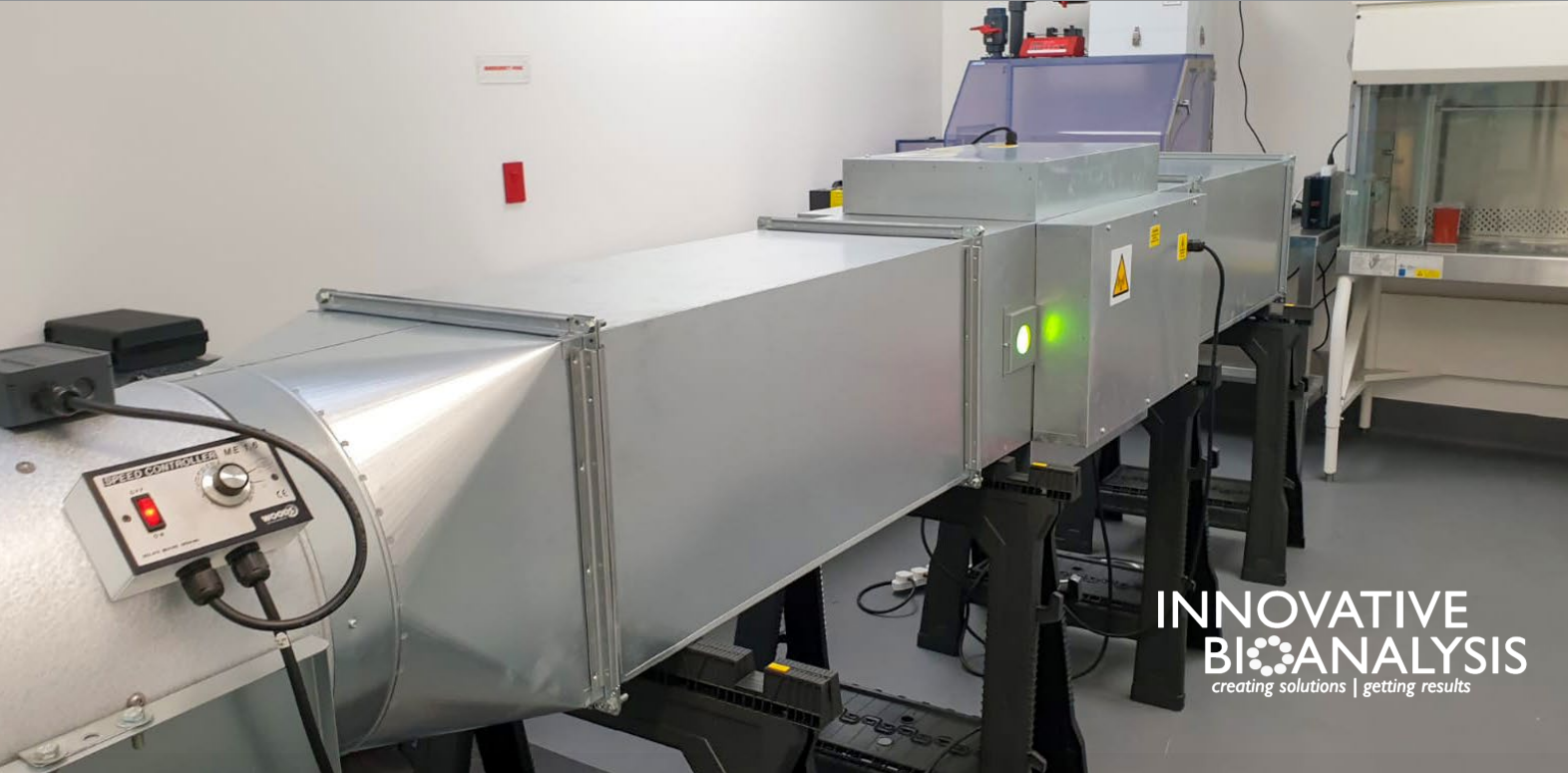
ROOF SENSOR - NO₂ DAILY AVERAGE (7.00 - 19.00), WORKING DAYS



Max 89 ug/m³ - 14 WHO breaches out of 41 days (34%)



AIR QUALITY DATA IS MONITORED BY A SERIES OF SENSORS LOCATED THROUGHOUT THE BUILDING. LEVELS OF BACTERIA, MOULDS AND VOCs ARE CALCULATED VIA PETRI DISH ANALYSIS BY AN ACCREDITED THIRD-PARTY LABORATORY.



PRS TECHNOLOGICAL INNOVATION

Proven Safe and Effective

PRS uses ultraviolet light at a 254nm wavelength in a uniquely designed optical cavity to ensure both intense irradiation of pathogens travelling within an air stream and efficient use of electrical power to generate the required energy flux density. Ultraviolet light's ability to inactivate pathogens is well documented and consequently, its application has been widespread for decades in surface sanitisation and water purification.

While most historical UVC applications have involved static surfaces (i.e., 2-D) or slower moving mediums (as in water purification), PRS' application is effective at inactivating airborne pathogens when the optical cavity transit time is measured in a fraction of a second by effectively irradiating the streaming pathogens in three dimensions (3-D).

Industry air handling standards groups such as the US American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) had historically documented that such a UVC application with such PRS- proven efficacy and form factors was neither practical nor possible.

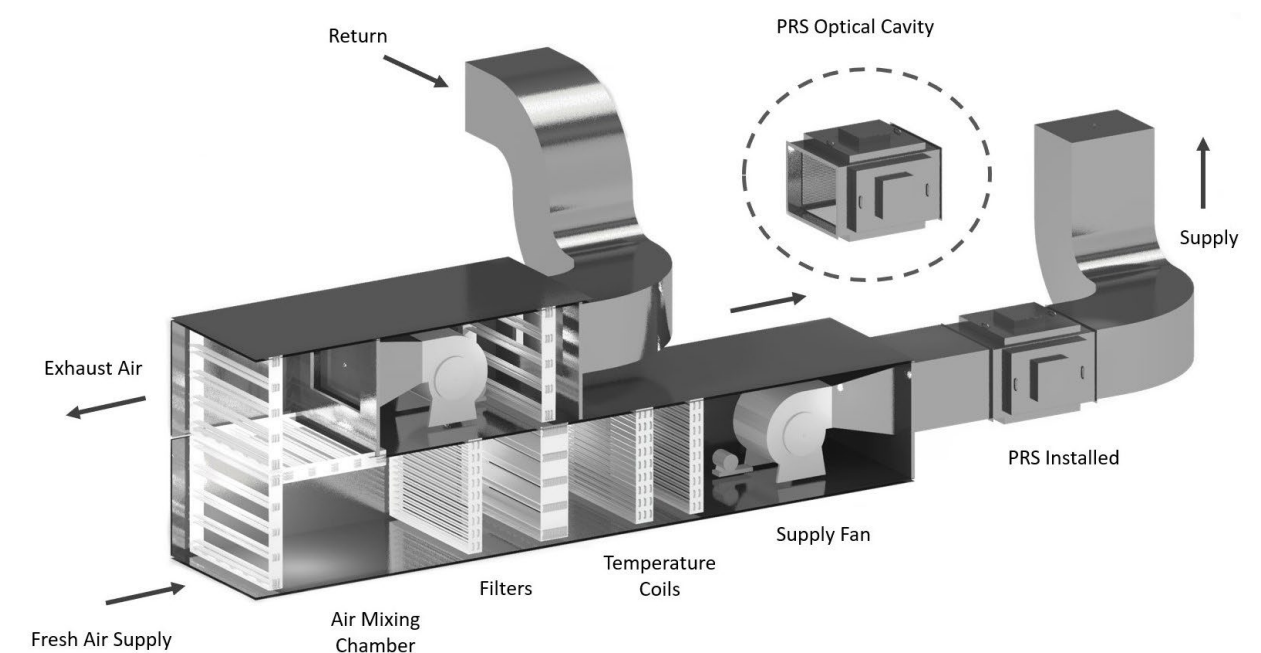
Rigorous Lab Testing

To date, our testing regime has included the following live pathogens:

1. **Viruses:**
 - a. SARS-CoV-2
 - b. Influenza A
 - c. Measles
2. **Moulds:**
 - a. Aspergillus Niger
3. **Bacteria:**
 - a. Micrococcus Luteus
 - b. Mycobacterium Parafortuitum

Copies of test results available in the Appendix

PRS CONFIGURATION INTO AIR HANDLING UNIT



PRS innovation has been formally recognised most recently by the United Kingdom's Intellectual Property Office with the grant of four patents (GB 2601361, GB 2614287, GB 2619499, GB 2633940). Patents covering other geographies are pending.

Extensive Efficacy Testing – Live Viruses, Bacteria and Mould

PRS management believes that the company has already undertaken more extensive third-party testing than any of its prospective IAQ management peers with lethal doses of live viruses as well as industry standards group-designated bacteria and one mould. PRS has undertaken this biological testing at a fully certified Biosafety Level-3 lab. Live viruses tested include Measles, Influenza A and SARS-CoV-2. Live bacteria testing included Mycobacterium Parafortuitum and Micrococcus Luteus, primarily because these bacteria were specified as test protocol pathogens by ASHRAE and University of Liverpool, respectively. Aspergillus Niger (aka, black mould) was the subject of the Company's mould testing.

PRS' design standard was based upon inactivating or killing measles at a 99.99% rate, thereby designing in conservatism with respect to SARS-CoV-2 killing efficacy – as measles is roughly 2x as hard to kill as SARS-CoV-2. This conservatism ensures that PRS inactivates all variants of SARS-CoV-2 along with many other harmful pathogens. During testing by the University of Liverpool, the designated technology testing agent for the UK's National Health System (NHS), the PRS system surpassed their benchmark air sanitisation standard by approximately 10x.

Extensive Safety Testing

PRS has undertaken and completed extensive testing on all electrical system safety and on UVC lighting safety. Nemko, an international testing and certification company ensuring since 1933 compliance with standards around the world, fully tested and certified the Company's electrical systems with SISTEMA safety sign-off, to a residential level (higher standard of safety than a commercial standard).

LUX TSI laboratory fully tested PRS' UVC lighting, proving it completely safe for people and plant infrastructure. In addition, PRS has many built-in safety features designed to protect against any human UVC light exposure and to protect surrounding HVAC and plant infrastructure and equipment and PRS' lighting fixtures are certified for zero ozone emissions under UL 2998.



PRS systems have qualified for the IWBI “Works with WELL” license



Technical Accreditations

Electrical Safety

Electrical system is designed and certified to EN-60204-1, 2014/30/EU, EN 13849-1, ISO 14120 with SISTEMA product safety sign off, and is CE certified.

Nemko testing and certification confirmed compliance to the following specifications:

- EN 60335-2-65:2003 +A1:2008 +A11:2012
- EN 60335 1:2012 +A11:2014 +A13:2017 +A1:2019 +A14:2019 +A2:2019
- EN 62233: 2008

Ballasts and Lamps are certified IEC 62471, IEC 61347-2-3, NL 41271, EN 62471-2008, NL 731120, CE, UL Listed 704G, RoHS compliant.

UVC Safety

Tested and certified to EN 62471-2008 at LUX TSI laboratory.

Personnel Safety: External to unit exempt. Testing proves that there is no risk to personnel working adjacent to ductwork.

Within Ducting: Proprietary Containment Device restricts radiation to Risk Group 2. No detrimental effect to existing building infrastructure.

Manufacturing

Manufacturing, Installation, and maintenance services certified to: ISO 9001, ISO 14001, ISO 45001 and DW/144.



OUR VALUE PROPOSITION

Informed Optimisation Across Multiple Dimensions

The PRS IAQ solution not only enhances overall wellbeing but also presents compelling economic advantages throughout diverse operational arenas. It contributes to environmental sustainability through energy savings while safeguarding occupants from airborne pathogens and external pollutants.

In addition to the clear health improvements associated with cleaner air, buildings utilising PRS experience considerable financial benefits, including reduced operating costs, increased occupant productivity, and the potential for carbon tax offsets.

Tenants and landlords alike will derive significant value from PRS performance, whether they are focused on cutting-edge IAQ management or maximising rental yields and property valuations.



ENERGY & CARBON PERFORMANCE

Reduced Energy Use and Improved Environmental Sustainability

- ◆ Through safely increased air recirculation, reduced energy consumption and costs associated with heating, cooling, dehumidifying, etc. external air
- ◆ Lower carbon footprint due to energy efficiency; potential carbon tax offsets and neutralisation support



HUMAN HEALTH & PRODUCTIVITY

Ensured Pathogen Resiliency and Reduced Pollution Exposure

- ◆ Reducing airborne pathogen transmission risks today while strengthening resilience against future infectious threats
- ◆ Reduced exposure to outdoor pollutants including NO₂, SO₂ and particulate matter through intelligent ventilation management
- ◆ Workforce wellbeing benefits including reduced absenteeism, improved cognitive performance and lower healthcare costs



ASSET VALUE PRESERVATION

Ensured Safe and Regulatory Resilient Workplaces

- ◆ Realising the right side of the valuation spread – avoiding brown discounting and capturing green premiums
- ◆ Ensuring compliance with existing/pending legislation and industry guidelines on carbon neutralisation and more transparent, data-driven evidence of healthy spaces

PRS' APPLICATION

Generating Attractive Economic Returns

While PRS is continuing to monitor actual energy savings on site, a 15% energy savings along with very modest improvements related to human health and productivity, generates a return of capital in < 18 months and a return on capital > 70%. Note that a 15% energy savings assumption is less than half the midpoint of our estimated range of savings for Phase 1 alone and well below the estimated result generated in the on-going collaborative study between Imperial College London and Butterfly Air.

For billable employees, any productivity increase or opportunity cost reduction in the form of reduced absenteeism is easily quantified in tandem with historical human resource data.

Other unquantified improvements for which there is increasing, corroborative third-party data will only improve these return expectations; e.g., reduction in health care costs tied to reduced claim numbers and/or claim severity.

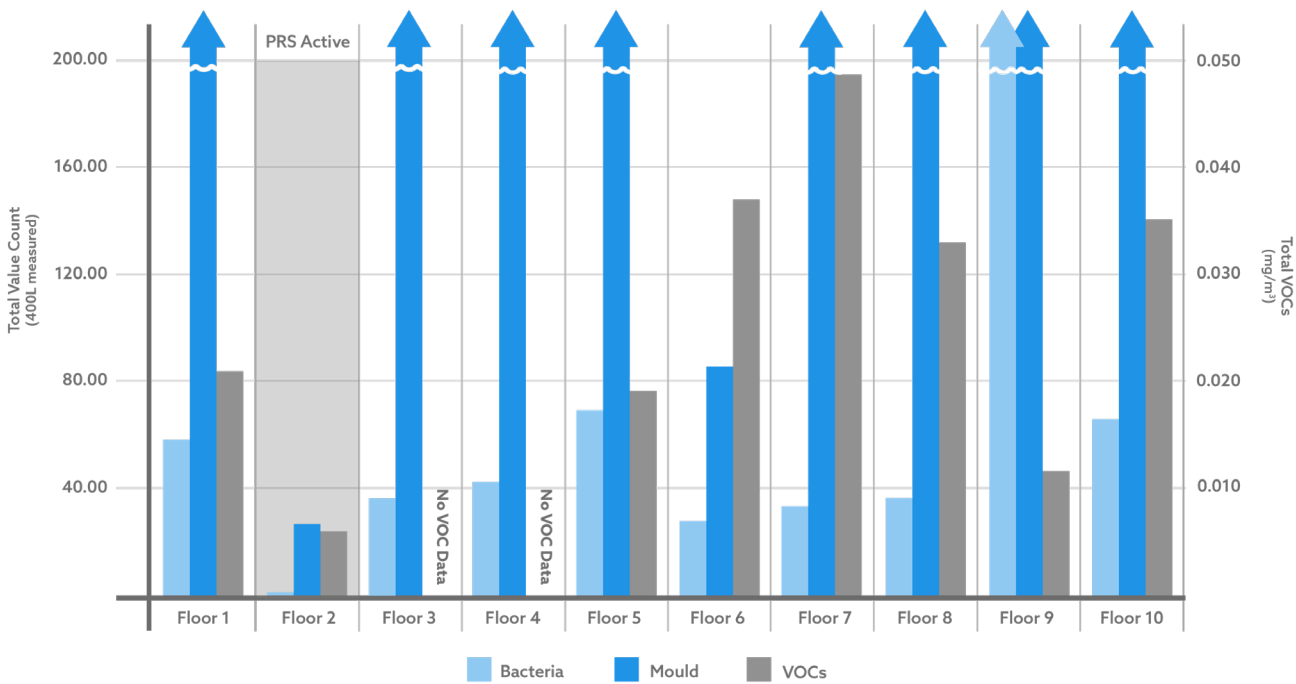
Year	2024	2025	2026	2027	2028
Period	0	1	2	3	4
Cash Outlays					
Initial Capital Expenditure	-£ 1,560,000				
Operating Lease Payments (monthly in advance)	£	- £	- £	- £	-
Maintenance Fees (annually in advance)	-£ 156,000	-£ 156,000	-£ 156,000	-£ 156,000	£
Consumables Replacement					
Other					
Total Cash Outlays	-£ 1,716,000	-£ 156,000	-£ 156,000	-£ 156,000	£
Cash Infusions and/or Savings					
<i>Reduced Operating Expenses:</i>					
- Energy	£	320,119	£ 320,119	£ 320,119	£ 320,119
- Other					
<i>Enhanced Occupant Wellbeing:</i>					
- Productivity Gains	£ 1,153,489	£ 1,153,489	£ 1,153,489	£ 1,153,489	
- Reduced Absenteesim	£ 64,083	£ 64,083	£ 64,083	£ 64,083	
Proven ESG Accountability					
Improved Risk Management					
Facility Mangement Efficiency					
PRS Kit Salvage Value					
Total Cash Infusions and/or Savings	£ 1,537,691	£ 1,537,691	£ 1,537,691	£ 1,537,691	
Return of Initial Capital Outlay					
Total Net Cash Flow	-£ 1,716,000	£ 1,381,691	£ 1,381,691	£ 1,381,691	£ 1,537,691
Implied Return on Capital					
Implied Return of Capital (excl Maint Fee)	72.10%	13.55	(months)		

CONCLUSION

PRS has already undertaken more extensive, successful efficacy and safety testing, with lethal doses of live target viruses and with other pathogens, than we have seen credibly reported by any other air handling and sanitisation product providers. PRS units have also been engaged for over a year in several commercial and private locations in the US and UK with equally favourable results. Given the science behind PRS’ innovative application of UVC and the extensive third-party testing, Company management was confident in PRS results moving to even larger scale commercial applications, but recognised the broader market’s need for documented performance in a large scale, “real world” or non lab-based case.

The Company is deeply appreciative of the opportunity to collaborate with our client on this pilot at their world headquarters, and respectful of our client’s progressive stance on understanding first-hand PRS’ application and the IAQ implications for their employees and clients. The PRS advantage, as graphically presented again below, could not be clearer from an effective pathogen management and IAQ improvement opportunity. In the context of globally heightened human and environmental health concerns, *“Who wouldn’t want the protection afforded in the light grey column representing the 2nd floor?”*

NOVEMBER 1ST, 2023 RESULT - INDOOR AIR QUALITY SUMMARY



Keeping employees and clients safe and confident in the health of their work environment is an essential endeavour, but there is much more at stake when considering the investment in and application of PRS. Safely increasing the recirculation of indoor air reduces energy demand to yield operating cost savings and lower carbon emissions. In addition, safely increasing the recirculation of air provides more flexibility in managing indoor exposure to external pollutants in major metropolitan and/or industrial areas where EAQ is consistently or frequently poor.

PRS is a foundational enabler in this optimisation exercise: killing pathogens, improving energy efficiency, and managing external air exposure – effectively fulfilling duty of care obligations for humans and the environment while generating attractive economic returns.

PRS Application - Realising Opportunities while Managing Liabilities

OFFENSIVE RATIONALE - REALISING OPPORTUNITIES	DEFENSIVE RATIONALE - MANAGING LIABILITIES
Improving IAQ for the health and wellbeing of your occupants with likely benefits including increased productivity and reduced absenteeism, among others Safely recirculating air to reduce energy consumption – reducing operating costs and improving environmental sustainability Improving flexibility to more safely manage and reduce external air pollutant exposure for occupants while indoors, where pollutant concentrations are often higher Distinguishing indoor space through 3rd party certification such as that provided by IWBI, to attract higher occupancy and enhance building utilisation/value Optimising air handling system for balance between IAQ efficacy and energy consumption relative to physical filtration, external environmental conditions, etc.	Demonstrating a clear duty of care to occupants by providing a safer workplace with a market-leading standard of IAQ Reducing probable health care claims associated with a required increase of in-office hours by many business sectors, relative to a predominantly remote working norm Systematically taking action – now that efficacy and practicality of an IAQ solution like PRS is established – to elevate E and S profiles amidst heightened ESG scrutiny Mapping with well documented, empirical evidence the required EPC certification and upgrade path to net zero carbon by 2050 Reducing opportunity costs tied to higher absenteeism levels, particularly in seasonal regions; e.g., mould spikes in the fall, influenza and SARS-CoV-2 spikes in late autumn/winter

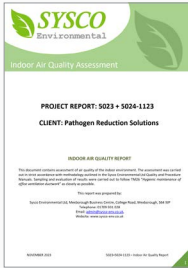
APPENDIX

Reference Documents

Sysco - Client Test Results



Sysco - Report Oct 2023



Sysco - Report Nov 2023



Sysco - Report Dec 2023

} Available on request,
upon completion of NDA

PRS Information



PRS - Technical Info

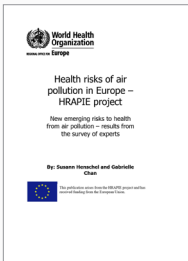


PRS - Detailed FAQs

Government & NGO Info



UK Ventilation Reg F



WHO - Air Pollution Risks



EEA - Air Quality in Europe



NERA - Infection Resilient Environments

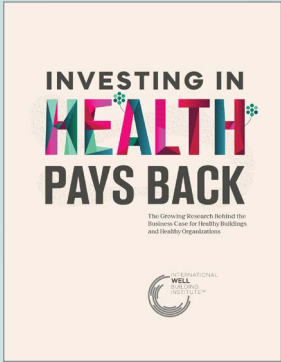


Environmental Research: PM2.5 and CO2

Building Wellbeing Reports



Stok - High Performance Buildings



IWBI - Investing in Health Pays Back



IWBI - Impact of WELL Certification

ESG Reports



Morgan Stanley - ESG Report 2022



RICS - The Impact of ESG



Marsh McLennan - ESG Report 2022

"PRS provides sustained economic and environmental benefits, significantly reducing energy costs and carbon footprints, while creating a healthier and more productive environment for all..."

- PRS Team



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