



14 August 2020

The Rt Hon Boris Johnson MP, The Prime Minister
10 Downing St
London
SW1A 2AA

Dear Prime Minister,

In my letters to you dated 27th March 2020 and 16th April 2020 I explained the importance of recognising and addressing the health and economic threats that airborne transmission of the SARS-CoV-2 coronavirus poses, especially as people are most contagious when they are asymptomatic. Mitigation measures including regular hand/surface washing, mask wearing, social distancing and lockdowns have shown the R rate can be reduced but recent evidence shows that when the measures are relaxed and/or when people feel they can begin to return to “normality” the R rate begins to rise again. This is mainly because the threat of airborne transmission by contagious people who are asymptomatic is everpresent and evidently reimposes itself when they stop what they consider to be temporary mitigation behaviour. This is the unique reality of this pandemic and it will remain the dominant influencing factor until we can find a way to further reduce the ability for the virus to transmit in all indoor spaces without having to continually rely on the behaviours of building occupants and the population in general. Indeed, one of the problems with the current guidance is that people see the measures as temporary and are unlikely to wish to continue to wear masks and follow other mitigation behaviours indefinitely.

The purpose of this letter is to reiterate my earlier message that this objective can realistically be achieved if the government will consider introducing/making mandatory additional “air disinfection” measures which, when added to existing guidance/recommendations by Public Health England (PHE) and organisations such as CIBSE, ASHRAE, REVHA and BESA, is highly likely to greatly reduce transmission risk in all indoor spaces and keep it low. Another way of thinking about this suggestion is that it makes reduction of airborne transmission risk in indoor spaces a proactive and non intrusive process that building occupants cannot turn off which is one of the problems with the current guidance. Without this we will never get away from the need for intrusive and economically

damaging measures including lockdowns all the while this virus can be transmitted when people are asymptomatic.

Guidance to Increase HVAC Rates in Buildings / Use of Air Cleaner / Disinfection Devices

Current PHE guidance on infection control says COVID-19 is transmitted mainly through respiratory droplets when people breathe, speak, cough or sneeze which are either inhaled or transferred via contaminated surfaces. This echoes the message in my earlier letters. CIBSE guidance says larger droplets typically fall out of the air within a short distance of the source but smaller droplets can remain airborne for long periods and spread far further carried by internal air movements hence the suggestion to increase dilution ventilation especially in poorly ventilated indoor spaces and avoid AC recirculation if possible. In their April briefing note Coronavirus COVID-19 and HVAC Systems, CIBSE explains increased dilution ventilation reduces exposure time to any airborne viral aerosols and reduces the chance that infectious aerosols can settle on surfaces. They also state “In poorly ventilated spaces with a high occupancy and where it is difficult to increase ventilation rates it may be appropriate to consider using air cleaning and disinfection devices.” and go on to suggest “the most appropriate devices” are HEPA filtration units or those that use germicidal UV radiation and “any potential equipment will need to be properly tested, validated and quality assured and demonstrated to provide the specific irradiation properties it is designed to and nothing else.” and “Devices that emit ozone or other potentially hazardous by-products should not be used in occupied spaces.”

As an experienced HVAC professional who has been solving problems of indoor air quality for many years there are aspects of this guidance that I concur with such as the benefits of increased ventilation rates (although I disagree on how to get there as explained below). However, there are other aspects which are simply incorrect and poorly researched and I urge the government to consider my suggestions which are grounded in many years of successful IAQ problem solving experience.

Firstly, I agree that increasing dilution/displacement ventilation especially in poorly ventilated spaces can have a positive effect for the reasons given but certain caveats must be observed. The dilution/displacement process creates air movement which physically moves airborne particles that can cause harm. However, when it comes to viruses, the risk of transmission still remains because the virus remains active in the air or on surfaces and it will remain so until it has been physically moved beyond the reach of humans by the ventilation processes or removed from surfaces by a cleaning process. In other words the threat of inhalation/ingestion remains because the virus is physically

still there even though the likelihood may have been reduced by the increased ventilation rate. Further to this I would caution against a mitigation approach that relies on similar processes to those enshrined in the current ventilation Building Regulations (Part F) which are generally not followed in practice and have resulted in millions of domestic and commercial buildings underperforming from a ventilation perspective. The current Part F regulations are in dire need of improvement and as a stakeholder of the All Party Parliamentary Group for Healthy Homes & Buildings I can confirm a suitable blueprint for improvement exists in the form of the White Paper entitled “Building our Future: Laying the Foundations for Healthy Homes and Buildings” which if implemented would make the realisation of these objectives far more achievable. It proposes changes such as policed installations that include performance measurements and processes of continuous commissioning for both new builds and retrofits and I would further recommend real time monitoring of IAQ and microbials along the lines of the CIBSE TM/40 recommendations so that building occupants and managers can see and take actions as appropriate. Let me stress that these recommendations are not new to performance and quality oriented HVAC & IAQ industry participants like us whose solutions over the years have been meeting the objectives set out in the regulations but we are very definitely in the minority in the industry and this scenario is set to remain until regulatory change is enacted and enforced.

Secondly, the guidance relating to air cleaners and disinfection devices in relation to COVID-19 is in my opinion poorly researched and myopic and the suggestion that HEPA and UV-C air cleaners are “the most appropriate devices” when other technologies which are not passive by nature and are proven far more effective at drastically reducing real time viral transmission risk to virtually zero have not even been mentioned demonstrates this. CIBSE’s position in relation to HEPA & UV-C does appear to concur with various “expert” opinions in the Twitter-space over the past few months. Indeed, it is interesting to note the number of academics who have suddenly become experts in IAQ since this emergency began who promote HEPA & UV-C as the only solutions to the COVID-19 problem in addition to increased ventilation/air changes without any reference to the known issues and problems that HEPA filtration and UV-C strategies present especially in regard to viral transmission prevention. Please don’t get me wrong, HEPA filtration and UV-C can deliver benefits to HVAC/IAQ strategies (PM removal down to 0.3 microns, prevention of organic build up on in-duct filters for example), and both have been around since well before COVID-19 for managing IAQ issues but the right strategic approach must always be followed and it is fair to say that neither HEPA nor UV-C should be used as the primary instrument for viral transmission prevention for reasons including:

Passive v Active. HEPA and UV-C are examples of passive technologies which only treat air that passes through the unit and only capture air that is in close

proximity to the unit resulting in reprocessing the same air over and over again and never processing air that is further away. Also, there is no guarantee that airborne contaminants passing through the unit will be captured and/or removed by the unit in the first pass. These are known drawbacks of all passive technologies. It is impossible for any of them to offer real time simultaneous and continuous protection of every cubic cm of air and surfaces. Put literally this means they cannot immediately remove and/or destroy viral particles, they allow infectious particles to remain in the air for longer (hours if far away from the unit) and they offer no protection whatsoever for surface contaminations. Therefore for viral transmissions including COVID-19, passive systems will permanently allow a relatively high risk of transmission to remain after deployment.

HEPA Filter Grade. Many in the HVAC industry will agree that HEPA should not be used for the pure purpose of viral removal/transmission prevention because of its minimum grading - 0.3 microns or 300 nanometers. Put simply, smaller particles including viruses such as the SARS-CoV-2 coronavirus at 0.12 microns diameter, bacteria, and VOCs will pass straight through and back out into the indoor space. This is a very serious, well known and understood shortcoming of HEPA for managing viral transmission which many academics and “experts” have conveniently ignored since the pandemic started. Also products labeled as True or Absolute HEPA are manufactured and tested to meet the stated grading performance - 99.97% removal of particles down to 0.3 microns in diameter. Any HEPA product that is not labeled like this is unlikely to meet the performance specification and as experienced industry professionals we see a lot of them, especially since the pandemic started. In other words, HEPA manufacturing quality is critical to performance and is a known issue in the industry.

High Maintenance / Filters Need Frequent Replacement. HEPA filters start to clog up immediately. Their effect therefore immediately starts to lessen. HEPA filters also require regular cleaning (if cleaning is possible) and require frequent replacement. In our experience HEPA filters must be changed minimum every 3 months which is rarely if ever done in practice. As experienced IAQ professionals HEPA filter changing or any other post install process is rarely performed which means many properties are getting little or no continuing benefit from the unit. I have noticed some claims that HEPA filters become more efficient the dirtier they become. I can assure you such claims are pure nonsense.

Dust Collectors / Breeding Ground for Bacteria / Distribution of Mould Spores and Endotoxins. HEPA filters are known to become breeding grounds for micro organisms as their pores begin to clog up with captured material including viruses, bacterial endotoxins, fungus, mould and mildew spores, pet dander,

pollen, smoke etc. This means the HEPA filter itself becomes a source of infection within the indoor space in which it is deployed. As air passes through the unit captured or grown material is continually dislodged and blown back into the indoor space. As experienced IAQ professionals we have replaced many passive filtration products with our active units where owners have cited this as the reason why they want rid of the product. Each time they open it they are showered with dust and detritus from the unit which presents a significant and unacceptable health risk.

Energy Efficiency. HEPA filtration creates considerable pressure drop as the air passes through the filter membrane which requires a relatively large amount of energy. If you consider many HVAC systems contain filters then HEPA systems are essentially refiltering the same air on a continuous basis which is not the most energy efficient process, especially when one considers the backdrop of the 2050 Carbon Reduction targets where homes must optimize their energy consumption and not waste any. A more effective and energy efficient strategy for viral transmission prevention is to optimize the effectiveness of any existing filtration processes in the HVAC infrastructure (as our units do).

UV-C Efficacy. UV-C (254nm wavelength) is usually deployed inside HVAC ductwork very close to filters. UV-C destroys living tissue and is therefore highly dangerous so must be located out of sight and away of building occupants. Properly installed and located UV-C can be effective at destroying organic deposits but it has very significant operational limitations. The strength of UV-C decreases as you move further away from the light source and the drop in strength is inversely proportional to the square of the distance and once it gets past the scattering length it falls away exponentially. This is known and fully understood science and in our experience anything beyond 5 inches from the UV-C light source is not effective. Further, because of “dwell time” or the time needed to completely deactivate organic matter, UV-C is not effective on particles in a moving airstream which means any such particles not captured/trapped by in-duct filters will not be deactivated and will pass straight through and back out into the living space. Similarly, UV-C has no effect in shaded areas so any captured particles in such areas will not be deactivated. In our experience and in particular regard to viral transmission, UV-C is a “hit-and-miss” approach which risks viruses passing through the HVAC system just like HEPA and must not be relied upon for viral transmission prevention. Also as UV-C itself is entirely dependent on passive filtration all of the limitations described above also apply.

There are numerous online references to the issues and problems with HEPA and UV-C. May I suggest you read the following selected references all published before the COVID-19 pandemic which provide useful summaries especially as you and your colleagues consider the urgent issue of reopening schools.

Getting the HVAC strategy right for each and every building that is used as a school and/or for educational purposes is absolutely essential and I urge you and your colleagues not to allow your judgement to be clouded by “experts” with little or no experience of these matters. The strategy should build upon existing preventative guidance without impeding the function of the building or impacting on the occupants, except in positive ways. To be absolutely clear, HEPA and UV-C, if used as the primary defence against COVID-19 transmission present significant risks to the health, wellbeing and productivity of all schoolchildren, teachers and parents.

<https://www.boundshvac.com/blog/2019/june/limitations-of-hepa-air-filters/>
<https://enviroklenzairpurifiers.com/what-is-a-hepa-filter-purifier/>
<https://www.sciencedirect.com/topics/engineering/high-efficiency-particulate-air-filter>
<https://www.ncbi.nlm.nih.gov/books/NBK92445/>
https://www.researchgate.net/publication/235048517_Viral_Penetration_of_High_Efficiency_Part particulate_Air_HEPA_Filters_PREPRINT
<https://molekule.science/pros-cons-hepa-filter/>

Recent Media Examples where COVID-19 transmission has occurred despite mitigation measures being followed:

June 2020 Qatar Airways Doha-Athens flight. 12 passengers acquired COVID-19 during the flight of 5 hours. It was reported the airline’s aircraft have “the most advanced air filtration systems, equipped with industrial-size HEPA filters that remove 99.97 per cent of viral and bacterial contaminants from re-circulated air, providing the most effective protection against infection.” and yet these new infections still occurred. This demonstrates the futility of passive HEPA in an enclosed environment like an airliner cabin which contains elevated risk of viral transmission via airborne infectious aerosols and contaminated surfaces if the air is not being continuously disinfected.

You may be interested to learn there is currently an argument raging in the Twitter-sphere between various academic “experts” and an epidemiologist who suggested randomised trial data should be obtained for HEPA before it is rolled out and claimed safe for schools. The epidemiologist cited a peer reviewed example in an operating room with laminar airflow and HEPA which showed no protective effect and in fact was even associated with a significantly higher risk of severe SSI. Needless to say the “experts” continue to chastise him for disagreeing with them yet they have no actual real world industry experience. See <https://pubmed.ncbi.nlm.nih.gov/18948793/>.

June 2020 meatpacker Tönnies Fleisch in Rheda-Wiedenbrück, North Rhine Westphalia where 1,550 workers tested positive for COVID-19 despite all mitigation measures being followed.

August 2020 Greencore sandwich factory in Northampton. 292 positive cases despite having Public Health Northamptonshire stating they have “highly effective measures in place and they continue to work extremely hard to exceed the requirements needed to be COVID secure within the workplace.”

These examples, and numerous others like them occur because nowhere in the world is active air disinfection that is safe and effective and works on a continuous basis in every cubic cm of indoor air and surface space simultaneously being used in addition to current mitigation guidance.

Active Non Chemical Oxidation – The Most Effective Non Intrusive Solution For Preventing Viral Transmission

The safest and most effective strategy for minimising the risk of viral infection transmission including COVID-19 is one that deactivates/destroys live viruses the moment they are emitted onto the air or deposited onto surfaces and does so in a safe and unobtrusive manner and one that works all the time without input or control from the building occupants. By definition it is a process of real time air and surface disinfection that is safe and effective in every cubic cm of air and surface space simultaneously and continuously. Further if such a process can complement existing HVAC infrastructure and make its (filtration) components more effective without an energy efficiency penalty this offers added benefits. As I explained in my earlier letters, my company has been providing such solutions to our many HVAC/IAQ customers and I again urge your government colleagues to engage with us so we can help the government reduce COVID-19 transmission risk in any indoor space and get Britain back to work.

My company is the UK’s exclusive distributor of the products of US innovator RGF Environmental Inc. (www.rgf.com). RGF is a 35 year old manufacturer and holder of numerous patents in environmental technology covering 3 main vertical markets - air and water purification and food sanitisation. They have installed over 4 million air purification products in over 60 countries around the world and have seen unprecedented demand for their air purification products since the COVID-19 pandemic started. Their products comprise patented proprietary technology that actively disinfects all of the indoor air and surfaces simultaneously and continuously. Their technology is the most tested and the most proven of all technologies as proven by the “sneeze test” which destroyed 99% of all germs before they had travelled 3 feet from the source in real time. The technology has also been tested by compliance bodies including TUV SUD and Intertek and holds all appropriate CE markings. Further, various nationally

accredited laboratories and governments have performed their own tests over the years for safety and efficacy across all 3 main pollutant categories – microbials, particulates and gases/VOCs. In short, this technology is the benchmark against which all others are measured. RGF is also a recognised industry expert and advisor to various government bodies including ASHRAE.

Selected Recent RGF Tweets relating to installs across various verticals in the US (under hashtags Getting America Back to Work Again and Germ Warfare). These are by no means all of them but these are selected to give you some idea of the range of verticals covered including hotels, airports, schools, gyms, restaurants, dentists/medical facilities, nursing/care homes, businesses:

<https://twitter.com/rgfenvgroup/status/1293544580449804289> - Palms Hotel & Spa, Miami Beach

<https://twitter.com/rgfenvgroup/status/1291769519841726464> - Arnold Palmer Regional Airport, Pittsburgh. Part of \$1m HVAC improvement investment

<https://twitter.com/rgfenvgroup/status/1290658145111552005> - Sock It Studio, Baton Rouge, La

<https://twitter.com/rgfenvgroup/status/1288877247886233601> - Troup County School System & Lafayette Christian School, Georgia

<https://twitter.com/rgfenvgroup/status/1284228018605641729> - Gulf Stream School

<https://twitter.com/rgfenvgroup/status/1281227815434756097> - New Jersey Dentist

<https://twitter.com/rgfenvgroup/status/1287817965182881793> - The Galley, St Petersburg, Fl

<https://twitter.com/rgfenvgroup/status/1286766671928201217> - ATC Fitness (18 locations) Tennessee & Mississippi

<https://twitter.com/rgfenvgroup/status/1286735823724072962> - Taylor & Tyler HVAC Louisiana

<https://twitter.com/MarlowsTavern/status/1280896956655681536> - Marlow's Tavern

<https://twitter.com/rgfenvgroup/status/1273986738885713923> - Country Club NOLA

<https://twitter.com/rgfenvgroup/status/1271479586509987841> - Vernon Manor Nursing Home, Connecticut

I have also attached a copy of a Partial Commercial Client List in the US which contains numerous household names.

Commercial Air Customers		
Entertainment/Hospitality		
Miami Dolphins Tampa Bay Buccaneers Carnival Cruise Lines Norwegian Cruise Lines Sea World Disney Cruise Lines and Hotels Darden Restaurants	Marriott Hilton Ritz Carlton Waldorf Astoria Crown Plaza Hotel Subway Restaurants Chipolte Red Lobster	Finnish Ice Hockey Training Facility US Olympic Headquarters YMCA NY Golds Gym Excelsior Condominiums Lake Point Yacht Club Washington Casino
Schools and Universities		
University of Alabama Auburn University Lynn University Florida State Colleges Embry Riddle Flight School Edward Waters College	Marion County Schools Chicago School District Egg Harbor Township School Volusia County School District Saint Thomas University	University of Miami University of Florida Florida State College at Jacksonville Hillsborough Community College The Goddard School
Government		
Kennedy Space Center Eglin Air Force Base MacDill Air Force Base	FEMA Trailers US Army Corps of Engineers Internal Revenue Service	Brevard County CIA Offices FBI Offices
Technology/Service		
Google Microsoft	Siemens Headquarters Uber Headquarters	Gulfstream Aerospace
Medical Facilities		
Detroit Medical Center Southwest Texas Medical Lima Memorial Fresno Calif Medical Center Barnes Jewish Hospital Bascom Palmer Eye Institute Boston Children's Hospital Brigham and Women's Hospital Calvary Hospital Cleveland Clinic Duke University Hospital Emory University Hospital Fox Chase Cancer Center Hahnemann University Hospital Henry Ford Hospital Sloan Kettering Cancer Center	Southern Maryland Hospital Vanguard Trinity North Mississippi Health Services 5 Star Quality Care Inc. Jackson Memorial Hospital Jacobi Medical Center Johns Hopkins Hospital Kaiser Permanente Lenox Hill Hospital Long Island Jewish Medical Center New York Presbyterian New York University Hospital Northwest Memorial Hospital Pennsylvania Hospital Walter Reed Medical Center University of Colorado	Ronald McDonald Houses New Vista Society Resident Care Home Eden Gardens Nursing Home Baptist Hospital, Miami Massachusetts General Hospital Mayo Clinic Methodist Hospital Montefiori Medical Center Mt.Sinai Hospital National Jewish Health Texas Children's Hospital UCLA Medical Center University of Pennsylvania Hospital UT - MD Anderson Cancer Center Wills Eye Hospital
Food/Agriculture		
Syngenta	Nestle	Siracha (Huy Fong Foods)
Other Notable Projects		
Office Depot HQ Tsawwassen Animal Hospital	5-International Airports Highrise Building Complex with over 5 million ft ²	International Steel Mill

To summarise, we have the products and the expertise to create this unique active air disinfection capability that will drastically reduce COVID-19 transmission risk in all indoor spaces that is so needed by all of us. This will help build and galvanise permanent confidence that domestic and commercial indoor spaces can be made as safe as genuinely possible in the post COVID “new normal” world.

Please engage with us.

Yours sincerely
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