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ELEVATOR AIR FLOW & HEALTH

March 23, 2011

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In today's world, confusion, uncertainty and fear of Covid, air quality and the health conditions of places we wish (or need) to go runs more pertinent now more than ever. Between medical industry developments, governmental guidance and industry specific advise, we are filled each day with sometimes rushed information, or sometimes misinformation. Understanding the single most traveled mode of transportation (the elevator) serving to take over 85 billion trips per year in the US and Canada alone, is a paramount and integral step in the reopening of our places of interests, some of our places of work and in other cases, our homes. As CDC, WHO, EPA, ASHRAE and other authorities on the advisement of health, safety and combined effort of industry and regulatory industries working together to address the air borne threats of Covid, we learn of a single point of high focus of interest. IAQ or indoor air quality.

Indoor air quality has the potential of being a complete game changer, not only in the fight of Covid but, in the fight of ALL airborne infectious risks. The parallels between good health (both mentally and physically) and proper good IAQ have been proven in multiple studies by multiple industries, however, with now battling an air borne threat in Covid, the correlation between cleaning the air of infectious viral transmission has never been more imperative. In working to determine threat risks, treatment possibilities and identification of so called "hot zones", we focus our attention to the elevator and its billions of trips for people within a small, enclosed and poorly ventilated box to and from vertical destinations. In this article, we will address some unidentified products, systems and studies, collectively, that we have noted and will serve to advise on some questions of validity, inaccuracy and even dangerous situations.

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We have seen several papers, studies and presented information on elevators ranging from being compared to be worse than a public restroom to being safer than some outdoor activities. Based on our own research as well as research conducted by an independent laboratory on our behalf, we can conclude that though an elevator technically shouldn't be compared to a toilet for sanitary conditions however, the risks and poor air quality are far poorer than most areas we may frequent day to day. This, in fact, contradicting some reports we have seen in recent time. One report even going as far as to state that elevator air is safer, or at less risk of infection, than outdoor dining. Given the seriousness on information being received correctly by the general public, we expand on some observations below:

- Studies we've seen consider elevator ventilation using static information, discounting several contributory factors within an elevator which significantly effect the ventilation rates. We've noticed that ventilation rates are based on CFM information of a typical fan and of Code required natural ventilation slots however, shaftway conditions in air flow, travel of elevator and basic principles of fluid dynamics missed. Notations are as follows:

1. Natural ventilation accounts for only 3.5% of the net platform area. This (for a typical 3500 LBS car) equates to only a total of 1.33 cubic feet. With any flow models, this would restrict significantly the draw of any volume of air or fluid by restriction of the supply air flow to fill the area within the volume being emptied. This can be easily understood by a simple experiment of turning over a gallon of water in a bucket as compared to a milk container with a restricted spout. The decreased efficiency (or speed) of the volume of water leaving the milk container is in part greatly as there is no air being introduced in the container to fill the space left by the escaping water. A small hole would help however, still greatly reduce the flow. A larger hole, obviously increases the flow. The decreased intake of an elevator actually slows the process of removal of air significantly. For the same 3500 LBS cab (figuring 8 feet height), the volume inside is approximately 304 cubic feet. If we figure a typical fan at 350 CFM, drawing this volume, with a restriction of 1.33 cubic feet intake, we can (by rough calculation) see that (even if the 350 CFM fan quadruples the draw by force) would remove only approximately 5.32 cubic feet of air per minute (or 319.20 cubic feet per hour). This would mean that a typical scenario like this would take approximately 1 hour to remove the entire volume of air.

2. Air movement cycles due to shaftway stack effect should not be utilized in fluid dynamic consideration as the vast majority of the exchange of air is from shaftway to open floor, or to the converse. Shaftway pressures created by both pressure and temperature differences at different altitudes of a building, temperature differences from floor to floor and temperature / pressure differences in more extreme seasonal differences, are a common existence in all elevators. Taller buildings, more extremity in seasonal temperature changes all effecting the severity however, again, this exchange of air is from floor to floor, using the elevator shaftway as its path. Though a great amount of air can be felt moving, on the most extreme of days, very prominently at a landing walking into an elevator, very little of this air is transitioning through the cab enclosure (hence the restricted ventilation openings stated above). We've conducted several air speed tests and found that most air movement is transitioned in between the opening between the car enclosure and hallway opening doors, flowing out or into the shaftway, not the cab. As example, anyone recollecting the breeze intensely blowing from the open door at a lobby on a cold winter day, need only recollect that once they walk into the cab, just past the opening to the shaftway in between the doors, the breeze is no longer felt. Or, thinking back to how, though heard greatly, no air is felt moving when standing in the car when the doors open up at that same landing. Considering the lack of air movement through an almost all but enclosed structure, plays very little in to the contributory removal of air and possible infectious particles that may be suspended inside. As some may argue this however, we also ask to contemplate what purpose would removing any infectious air from the elevator be, if only transitioning the threat to an occupied floor and into the space immediately around incoming passengers?

3. As mentioned above in #1, the typical exhaust fan fails on another elevator specific issue. When going though air flow calculations and fluid dynamic modeling, the fan speed and draw would be considered a constant. The problem with this specific to elevators lies in that the shaftway air pressures from a moving car throughout the hoistway act to diminish, negate and sometimes even reverse the flow of air. Elevators traveling at even moderate speeds in an enclosed shaftway create a condition known as piston effect. This pressure of air enforced upon the car enclosure (and the open fan enclosure) will serve to create a substantial force to further render an elevator exhaust fan as ineffective or even counterproductive in the act of removing volumes of air and particles that may carry a virus.

4. As mentioned as well previously, when modeling the fluid dynamics there does appear to be a consideration to the turbulence created by passenger density within the moving car however, the alternating and unpredictable wavering of turbulence as passengers unload, or load on floors within travel. These turbulence would serve to not only resuspend possible viral carrying particles that are not being removed from the enclosure but, also draw some particles back into the car as passengers leave and enter (specifically being drawn into the void created by an unloading passenger and forced back inside by those entering, or a combination of both actions at the same time). These conditions again are very specific to an elevator with respect to the confinement of the enclosure and the close

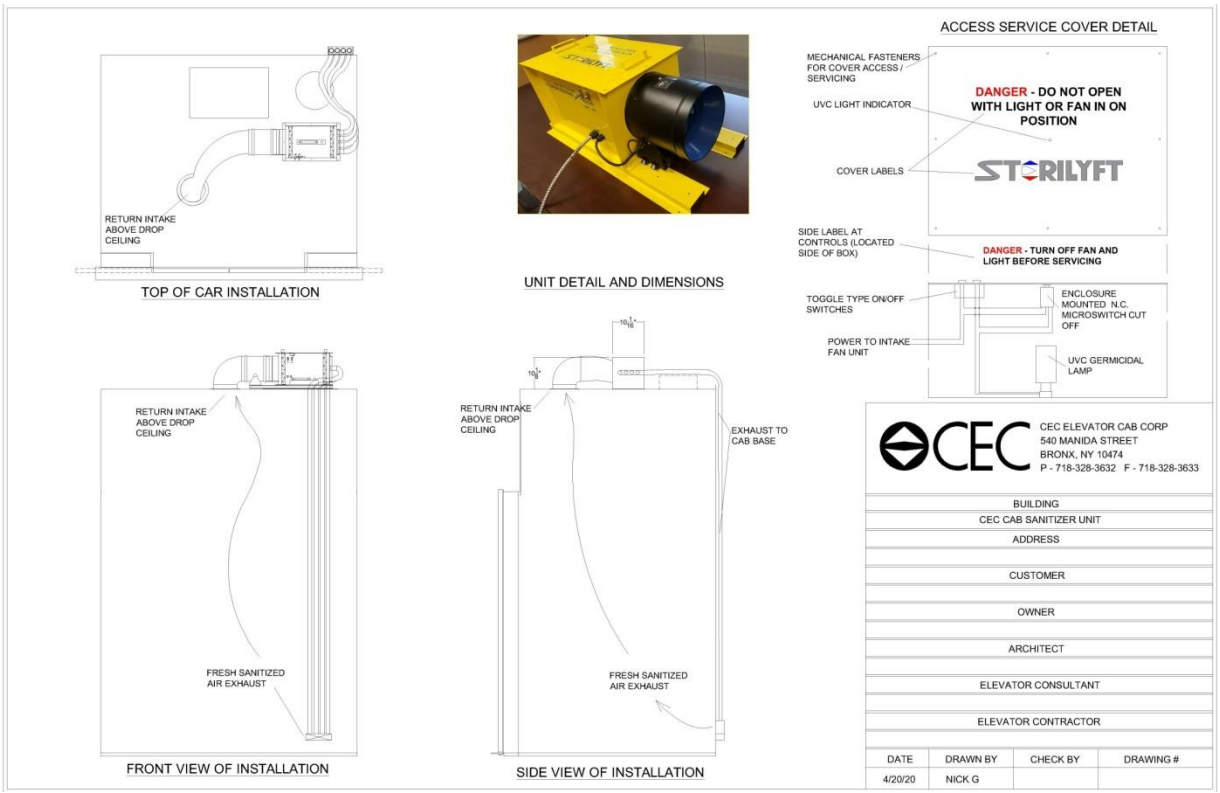
movement of passengers within. These conditions alone would serve to provide a much more advantageous position for risk reduction in any other setting, especially outdoor dining.

5. In some studies we've also noticed some discrepancies as volumes, or quantity, of possible infectious particles expelled by a human, One study appears to base particle removal on quantities of 525 particles for breathing and up to 1,950 or more particles expelled by a cough. We would challenge this low quantity as our research had found in a study published in the US National Library of Medicine, National Institute of Health had shown study of common influenza (as a communicable virus with transmission vehicle as cough, sneeze or droplet transmission) as to create anywhere from 900 to 302,000 particles when ill and 1,100 to 308,600 particles when in recovery. Surely, SARS CoV-2, as its primary vehicle for transmission is similar, would produce somewhere within this range as well. Given the shear difference in base line numbers of particles to be evacuated or dissipated, all calculations on risk assessment (coupled with the elevator specific issues above) would drastically change the conclusion in some of these studies, as well as redefine elevator exponentially in the categorization of risk factors as compared to other areas where social distancing, ventilation, influx of outdoor air and other factors are present as mitigation measures.

With respect to all above, we stress that we are not taking apart or diminishing any study or investigation efforts expended by anyone in this time of world wide crisis. We applaud any and all of those putting through efforts to not only better understand the world, environments and risks around us each day but, also in their efforts to collectively all work together to identify, plan and propose solutions to increase the health of our environment and the people all around us. We do however stress that information, in respect to health improvement systems, must be both well researched, accounting for any and all conditions that may be present, be compiled, discerned and reported with all facts, all conditions and all variables in tact. We also stress that research into mitigation systems be made with a failsafe level of safety in mind, as introducing any item, product or by-product into an enclosed occupied space can deem extremely dangerous both short term and long term by the methods chosen. As we had researched the complete processes and methods of most germicidal treatment techniques, by-products such as hydrogen

peroxide, ozone, hydroxyl radicals and other types of superoxides and radicals as oxidizers (or catalysts for cellular inactivation on an RNA/DNA level of an organism) will prove to be replacing a current threat of viral infection with a future threat of irreversible harm to unsuspected elevator passengers on a cellular level with results of illness and possibly development of certain cancers. Simply replacing a threat with a possible threat must certainly not be our objective or goal. A sound, safe and more profound solution must be our vision.

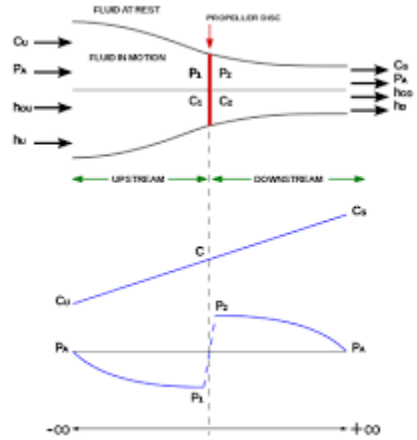
We respectfully assure all who wish to properly, safely and effectively provide for the healthiest and safest elevator conditions that we have researched and designed our system meticulously dedicated to its purpose and specifically designed for an elevator. Sterilyft is based on several paramount key features to address all of the above elevator specific issues.



a. To overcome the lack of adequate ventilation, Sterilyft is designed to be a balanced semi closed loop system acting separate of the elevator's current ventilation. Removing, cleaning and returning air to the enclosure not only rapidly increases the removal rate but, also provides for the positive influx of safe, clean air (in absence of outdoor air) to provide an equal volume of air as being removed to fill the cab with air treated of any infectious particles that may have been present prior to removal

b. Being a semi closed loop system, Sterilyft is completely sealed off from shaftway air, removing any risk of introduction of shaftway impurities or smoke and, is sealed away from

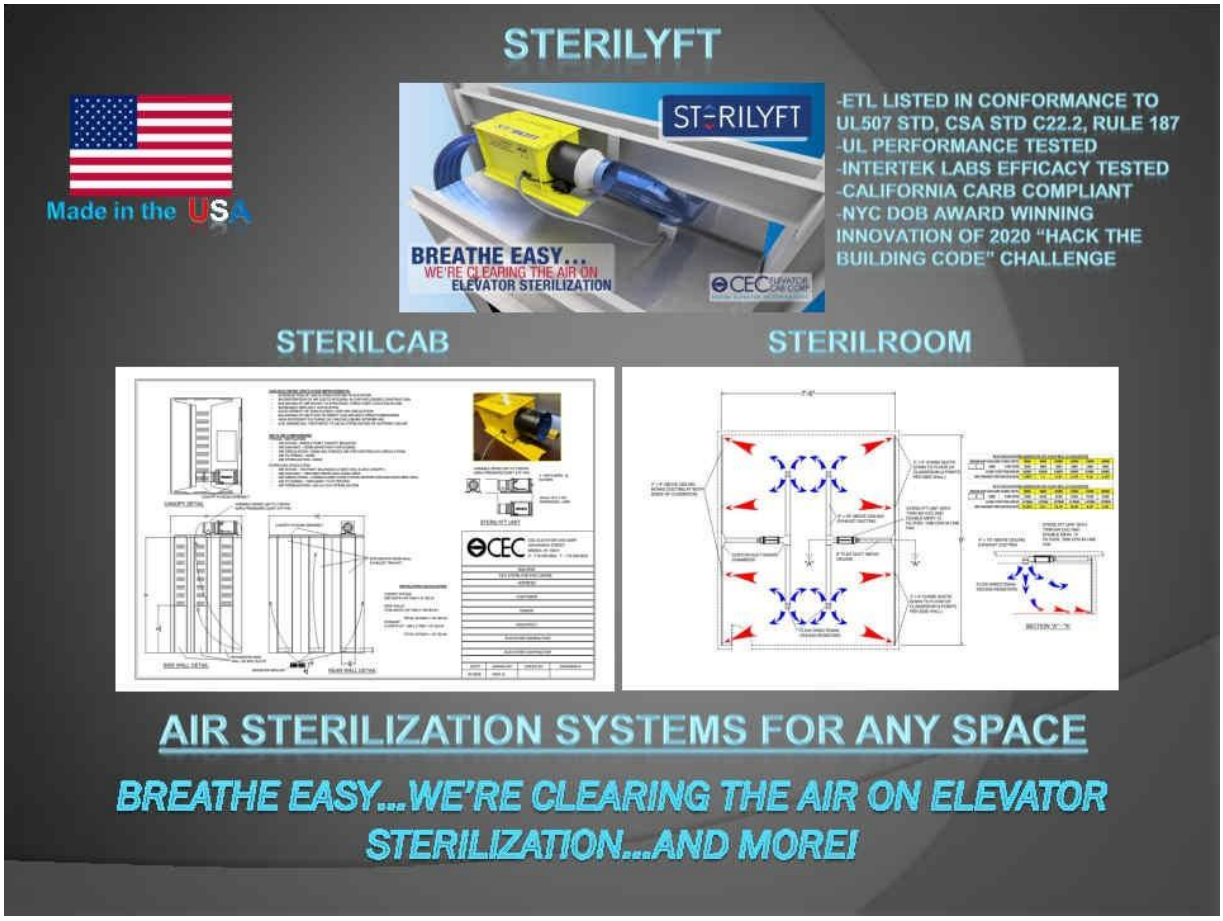
susceptible shaftway air pressure effects from either stack effect or piston effect. In addition, Sterilyft is designed to draw and feed the air volume within the enclosure itself, not relying or effecting upon door open door close cycles, This not only focuses solely on the target area in need of treatment but also aids in reducing or preventing risk propagation to other areas of the building by retaining (or removing prior to arrival) particles within the volume of air inside the cab.



c. Through Sterilyft's industry leading 710 CFM maximum speed, Sterilyft's fan and system design is intended to provide a flow of air from floor to ceiling within the elevator, helping to counteract any turbulence or static suspension of expelled particles within the volume of air inside the cab. This flow of air pushed by exhaust at the base and pulled by intake in the ceiling is intended to lift expelled particles as quickly as possible away from passengers, as well as to lift particles to the intake prior to mixing within any turbulence inside the car, remaining suspended at inhalable levels, or from being allowed to settle as fomites (or infectious particles that attach to surfaces such as walls, handrails or button panels).

d. With rapid removal of particles from within the volume of air, no other system is comparable to Sterilyft in performance. In a UL conducted one month study of two elevators in the same building in live occupied service, test results on particle removal yielded an astounding increase in PM removal (particulate matter) as compared to normal ventilation conditions (as was outlined in several studies we reviewed having Code required natural ventilation and a 250 CFM exhaust fan). Sterilyft proved to remove 95.5% more PM10 particles, 95.79% more PM2.5 particles, 97.46% more PM1 particles and 89.21% more particles less than .3 microns, over a one month average of periodic readings. This provides for an extreme reduction in risk just by the removal rate increase of possible viral carrying particles, further reduced in risk as Sterilyft has also been tested by Intertek Labs for efficacy rates of complete 99.99% inactivation of a

collection of viral, bacterial and mold subjects in under 30 minutes, and over 95% in just 2 minutes. This provides that Sterilyft is an industry leader in the complete removal and complete inactivation of viral or bacterial air borne threats that works both rapidly, continually and reliably. All while not subjecting passengers to any possible harmful effects or by-products of any kind being CARB certified by the California Air Resource Board.



We hope that the preceding proves helpful to all who may read and wish to offer our assistance, knowledge or services to any wishing to provide for the healthiest elevator conditions possible. Through our patent pending system, our certifications and testing as well as being awarded by the NYC Department of Buildings as one of the Innovations of the Year in their Hack the Code Challenge for 2020, we will strive to do our part in aiding our threatened world in the fight against Covid, and beyond. Our objective, our goal and our continued innovation into air quality / germicidal air treatment systems will continue to be to provide the safest and most effective solutions to all that are subject to the products we provide. For further information, or to contact us with any questions or requirements, please visit our product website at www.sterilyft.com, our main company website at www.cecelevator.com or, I may be reached at ngretsuk@cecelevator.com.