SPC SANUVOX

Ultraviolet air & object purifiers

Applications & Solutions

A resource for solving IAQ issues with Sanuvox UV Systems

- Hospital Air Steriliser
- Odours & Bio-chemical Contamination
- Waste Rooms / Noxious Smoke
- Smoking Rooms & Tobacco Smoke
- Changing Rooms & Lavatory Odours
- Shelter / Kennel / Veterinarian Air Sterilisation
- Cold Rooms & Ethylene Reduction
- Fruit & Vegetable surface Sterilisation
- Coil Cleaning to improve efficiency

About SPC Sanuvox

THE INDUSTRY LEADER IN ULTRAVIOLET AIR & OBJECT STERILISATION

Sanuvox is a global leader in ultraviolet air & object sterilisation providing the most advanced cost-effective in-duct & stand-alone UV air, coil & object sterilisation systems available. Proprietary Sanuvox UV systems are designed to maximise exposure time delivering the ultraviolet energy required to produce exceptionally high airborne & surface disinfection rates.

VARIOUS APPLICATIONS

Sanuvox in-duct, stand-alone & surface sterilisation systems are used worldwide in residential, commercial, institutional, food processing, manufacturing, medical and military installations.

Sanuvox UV technologies are used to:

- *Dramatically improve indoor air quality*
- *Destroy thousands of airborne contaminants such as viruses, bacteria, mould, chemicals, VOCs and odours*
- *Improve energy efficiency & reduce maintenance costs by maintaining a clean evaporator coil free from mould & other microbial growth*
- *Reduce absenteeism and building related illnesses*
- *Sterilise up to 99.9999% of airbourne bio-contaminants in a single pass*
- *Reduce Hospital Acquired Infections (HAIs) through air & surface sterilisation*
- *Surface sterilisation of products and packaging for the food & produce industries*
- *Incorporate UV fixtures into the food, meat, fish & produce production line to bask products and surfaces prior to packaging maintaining a sterile product ready for distribution and consumption*
- *Protect occupants form Biological Warfare Agents*

TESTED & PUBLISHED RESULTS

Sanuvox UV systems have been tested by government agencies, laboratories and universities. These include RTI, US Environmental Protection Agency and National Homeland Security, Penn State University and McGill University. A two year Sanuvox Double Blind Study has been published in the peer reviewed Lancet Medical Journal.

Sanuvox Engineered Solutions

The Sanuvox Design Applications Team is proud to offer this UV Resource Applications Book.The goal of this "go-to resource" is to provide solutions to common & unique applications where the latest UV technology can be exceptionally effective in alleviating many of the day-to-day issues you continually encounter

Although this resource touches on many diverse applications,Sanuvox Systems are used in thousands of facilities to address hundreds of different & unique problems. Please visit www.spcoils.co.uk for an expanded online version of this resource that will showcase many more solutions.

TRY ME:
Use your smart device to scan the QR code. Each page's QR code is unique to that UV product & when scanned will open the SPC website product page on your smart device.

This QR Code will take you to the UV home page on our website.

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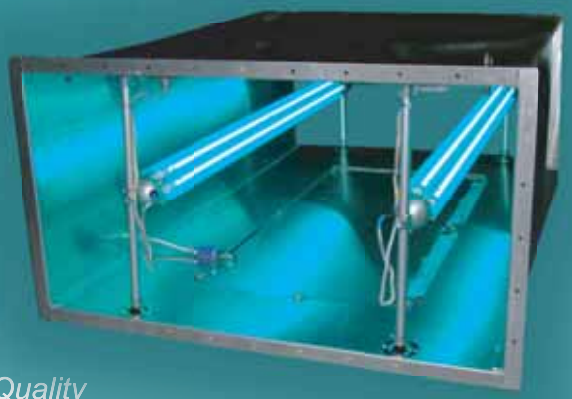
Hospital Air Sterilisation

Studies show that Hospital Acquired Infections (HAI) cost the healthcare industry millions of pounds every year. Viral & bacterial contamination both airbourne & surface may very well be the leading cause of nosocomial infections.

The Sanuvox Bio-Wall is the most effective in-duct air sterilisation system available. The proprietary design allows for the UV assembly to be positioned parallel to the airstream guaranteeing the longest dwell-time possible.



UV Bio-Wall In-Duct Air Treatment System

Features

- *Reduce airborne infection rates, building related illnesses workplace absenteeism while dramatically improving Indoor Air Quality*
- *Continuously treats the entire duct*
- *Destroys up to 99.9999% of bio-chemical contaminants*
- *Compliments filtration*
- *Sanuvox provide detailed real-time kill rates & sizing calculations*

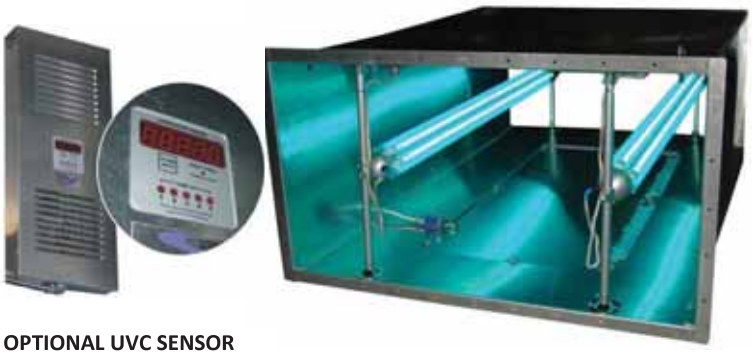
UV AIR STERILISATION

OBJECTIVE: Eliminate up to 99.9999% of airborne bio-contaminants including viruses and bacteria that circulate through the ventilation system without increasing the pressure drop that results from high efficiency filtration.

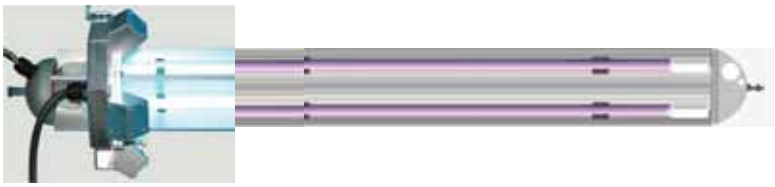
EQUIPMENT: UV Bio-Wall UVC systems installed in the ventilation duct parallel to the airflow, allowing sufficient contact time required for airborne sterilisation. The UVC intensity of each lamp can be measured in "real-time" with an optional UVC sensor, ensuring the required inactivation intensity will be delivered to the contaminant.

OPERATION: To create the sterilisation chamber in the existing duct (up to 5 feet deep per unit), the walls are covered with an aluminum reflective material. The proprietary sterilisation sizing calculations take into account: air velocity, dimensions of the duct, the lethal UV dose needed to sterilise the micro-organism for the desired inactivation rate. The sizing calculations will determine the number and length of UV Bio-Wall(s) required. The optional UVC sensor will guarantee that the UVC emitted from the lamp will exceed the amount of UVC that is required at all times.

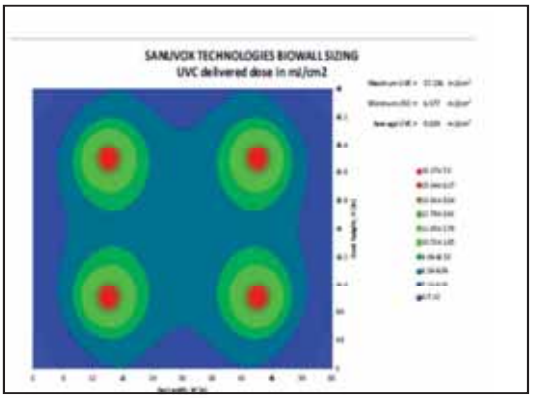
SIZED INSTALLATION



OPTIONAL UVC SENSOR



STERILISATION SIZING CALCULATIONS



UVC GERMICIDAL PRINCIPLE: The 254nm UVC germicidal wavelength has been used for decades for sterilisation and its effect on micro-organisms is well documented. UVGI inactivates micro-organisms by damaging their DNA structure making them incapable of reproducing. The germicidal efficiency can deliver virtually a 100% disinfection rate. The system The system can achieve exceptionally high disinfection rates as a result of the UV Bio-Wall being mounted parallel to the airflow and the desired intensity is sized for each particular application.

BENEFITS

- Low pressure drop, high efficiency sterilisation
- Electronics-connected to a PLC and/or BMS
- Low cost compared to a HEPA filter installation with the additional fan pressure requirement due to increased static pressure.
- Lower maintenance and longer service intervals compared to a HEPA filtration installation

MARKETS

- Hospitals
- Offices towers
- Private clinics, Veterinarians, etc.
- Schools, Universities, College, etc.
- Fertility Centers
- Commercial Buildings

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Make-up Air: Odours & Bio-Contaminates

It is not uncommon for outside contaminants including odours and allergens to find their way into a building. Restaurant odours, manufacturing off-gassing, diesel fumes from idling trucks even jet fuel from helipads can be pulled into the make-up air and distributed throughout the HVAC system and building.

The Sanuvox Technologies' line of in-duct UV air treatment systems are the ideal solution for these often troublesome issues. Sanuvox offers exceptionally cost effective systems that can address IAQ issues that filters and absorption media cannot.

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***UV Bio-Wall QUATTRO** *Shown here*
***UV Bio-Wall In-Duct Air Treatment System** **Available*

Features

- *Sanuvox proprietary systems eradicate biological contaminants such as mould, bacteria, viruses, germs & allergens*
- *Reduces chemicals, VOCs & biological odours*
- *Installed PARALLEL to the air-stream results in greater 'Dwell Time' between the air & the UV Lamps*

EXTERIOR ODOURS

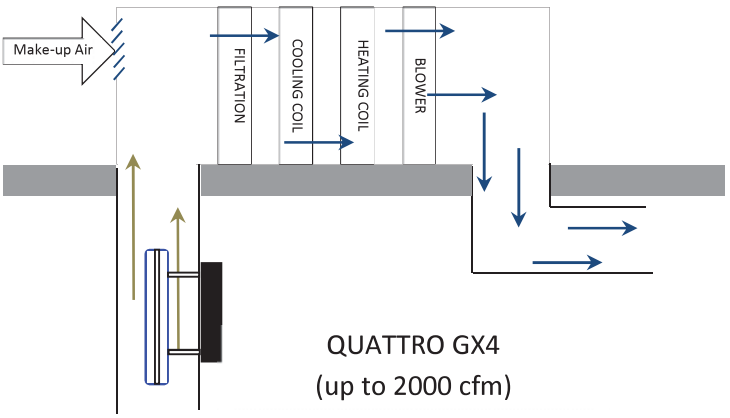
OBJECTIVE: Substantially reduce odours introduced into the workspace, offices, schools, hospitals, etc. due to the supply of contaminated "fresh" air from outside. For example: odours from restaurants, factories, diesel engines, sewage, etc. that are drawn into the building by the HVAC fresh air intake.

EQUIPMENT: Duct mounted units installed in the return or supply side of the HVAC system parallel to the airflow and supplied with multiple Germicidal UVC lamps, each with a section of Oxidising UVV that can be adjusted (covered or removed) depending on the concentration of odours

OPERATION: The UV lamps treat the recirculating air in two ways:

1. The oxidising UVV section of the lamp reduces the chemical components in the air through photo-oxidation. Select units are designed to be "dosed" on site, such as the QUATTRO GX4.
2. The germicidal UVC section destroys airborne biological contaminants (viruses, bacteria, mould).

Typical installation on the HVAC return side



QUATTRO GX4
(up to 2000 cfm)

GENERAL: PROCESS ON BIOLOGICAL AND CHEMICAL CONTAMINANTS

1-ACTIVATION PHASE $O^2 + O^* \rightarrow O^* + O^*$

Ultraviolet photon energy (170-220nm) is emitted from a high-intensity source to break-down oxygen molecules into activated monoatomic oxygen. The rate of production or effectiveness of this process depends on the wavelength and intensity of its source.

2-REACTION PHASE: $O^* + P \rightarrow PO$

The activated oxygen atoms (O*) are then mixed in the airstream; the process will react with any compound containing carbon, hydrogen or sulphur, reducing them by successive oxidation to odourless and harmless by-products. If airborne contaminants are outnumbered by the activated oxygen atoms, then there will be formation of residual ozone (O^3) which will occur following the oxidation of normal oxygen molecules (0^2).

3- NEUTRALISATION PHASE: (also GERMICIDAL) $O^3 + UV(C) \rightarrow O^2 + O^*$: $O + O \rightarrow O^2$

CHEMICAL DECOMPOSITION:

- Formaldehyde $CH_2O + O^* \rightarrow CO_2 + H_2O$
- Ammonia $NH_3 + O^* \rightarrow N_2 + H_2O$
- Styrene $C_8H_8 + O^* \rightarrow CO_2 + H_2O$
- Mercaptans $H_2S + O^* \rightarrow SO_2 + H_2O$

BENEFITS

- Odours in the workplace are substantially reduced
- Low maintenance
- Lamp replacement 1-2 years
- Improved indoor air quality (IAQ)

MARKETS

- Buildings near Airports & Helipads
- Buildings with adjoining
  - Warehouse (diesel)
  - Printing shop, restaurants, etc.
  - Mechanical workshop
- Crematorium

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Waste Rooms / Noxious Areas

Facilities & apartments often suffer from odours migrating from the rubbish room to other parts of the building. It is not uncommon for rubbish room odours to be pulled from the holding area and distributed up the lift shaft or into the HVAC system.

The SPC S300FX equipped with a Remote Oxidation Control will automatically tailor the amount of oxidation for each application destroying bio-chemical contaminants that are so troublesome for rubbish rooms.

S300FX w/ Remote Oxidation Control System

Features

- *Reduce odours & chemicals*
- *Destroy biological contaminants & biological odours*
- *Stand-Alone / Wall-Mount / Duct-Mount*
- *Optional remote Oxidation Control System (OCS) monitors residual ozone levels and controls the secondary Booster Oxidation Lamp (UVV) to maintain ozone levels at .025 ppm*

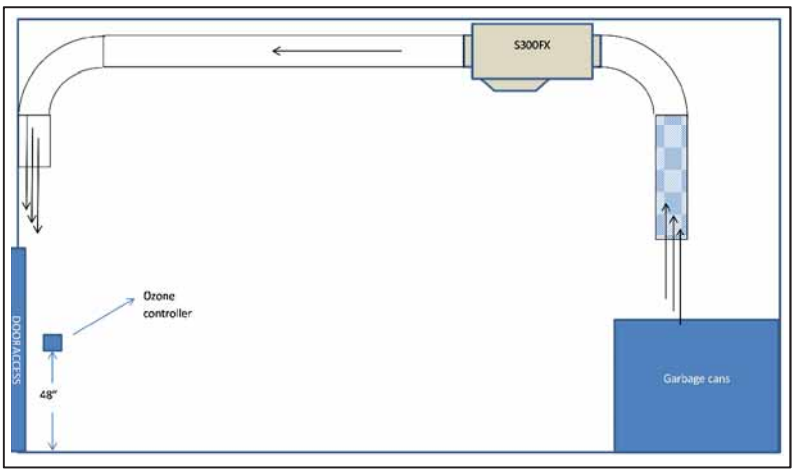
WASTE ROOMS

OBJECTIVE: Re-circulate the air in a waste / rubbish room to reduce odours and bacteria while maintaining and monitoring the oxidation process.

EQUIPMENT: Stand-alone UV air purifier that incorporates fan producing either 300 or 1000 cfm filters to capture particulates, one dual zone UVC/UVV lamp & one oxidising UVV lamp, the latter controlled by an ozone detector set to a maximum ozone concentration level of 0.025 ppm.

OPERATION: Untreated air is drawn into the unit from the top of the rubbish cans or containers and treated by the UV germicidal and oxidising lamps. The treated air is exhausted above the entrance to the room, creating a curtain of clean air, insulating the room. The ozone controller samples the air every 70 seconds and will shut off the oxidising lamp should the ozone concentration level exceed 0.025 ppm.

TYPICAL INSTALLATION
S300FX-GX & SUBKITOZDS300



SIZING: Approximately 6 to 8 air changes per hour are required.

- A **P900X-SP** unit with an all UVV lamp will be required for an 800 cu ft room (10' X 10' X 8'). Since there is no ozone controller, the UVV lamp will be manually covered with foil for an acceptable ozone concentration.
- An **S300FX-GX** unit (300 cfm) will be required for a 2400 cu ft room (15' X 20' X 10'). This relates to 6 air changes per hour. Factory installed accessory (**SUBKITOZDS300**) is also required.
- An **S1000FX-GX** unit (1000 cfm) will be required for a 9600 cu ft room (24' X 40' X 10'). This relates to 6.25 air changes per hour. Factory installed accessory (**SUBKITOZDS1000**) is also required.

MAXIMUM OZONE CONCENTRATION LEVELS

Agencies/ Concentration exposure limit	1 hour	8 hours	24 hours	1 year
City of Montreal	0.082 ppm	0.038 ppm	0.025 ppm	0.015 ppm
Environment Canada		0.065 ppm	0.025 ppm	
Health Canada	0.120 ppm			
EPA (USA)	0.120 ppm	0.080 ppm		
OSHA	0.300 ppm (15 min)	0.100 ppm		
WHO		0.050 ppm		
ACGIH		0.050 to 0.100 ppm		
NIOSH (IDLH 5 ppm)	0.100 ppm			

BENEFITS

- Substantially reduces odours
- Low maintenance
  - Lamp replacement 1-2 years
  - Periodic filter replacement
  - Controller Recalibration not required for 3 years
- Low cost compared to refrigeration (for odours or control)

MARKETS

- Apartments with rubbish
- Public buildings with restaurants
- Hotels and meeting rooms
- Sports centers or amusement parks

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Smoking Rooms & Tobacco Smoke

Designated smoking areas although typically separated from working and living areas often cause problems with air that may very well circulate in and out of the designated areas. The smoking area itself may be overwhelmed with cigarette smoke causing smokers to seek alternative areas to smoke.

Sanuvox technologies offers two UV / Filter stand alone / ducted models that are effective at removing tobacco smoke from the air and reducing odours as well as nicotine and smoke, which are so problematic in these applications.

S300FX-GX UV / Filter System (200/300 CFM) **Available*
S1000FX-GX UV / Filter System (1000 CFM) ***Shown here*

Features

- *Unlike conventional technology, Sanuvox systems do not use costly carbon for absorption, or rely solely on filters which easily become coated with tar & nicotine*
- *The UV process changes the molecular structure of the tobacco smoke into a fine power which is then easily captured on the filter media*
- *It is recommended that the UV systems are sized to provide a re-circulation rate of 6-8 air changes per hour*

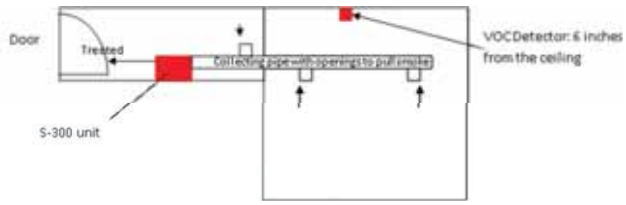
SMOKING ROOMS

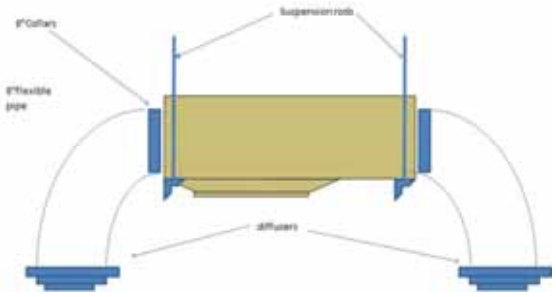
OBJECTIVE: To re-circulate the air in a room where there are varying numbers of smokers, reducing odours, nicotine and smoke. Equipment producing 6-8 air changes per hour is required.

EQUIPMENT: Stand-alone 300 or 1000 cfm air purifiers that will include germicidal and oxidising ultraviolet lamps, pre-filters and main filter to capture the nicotine and smoke. An optional VOC (Volatile Organic Compound) detector can be used with optional multiple lamps when the number of occupants increases.

OPERATION: Sanuvox dual Zone UV lamp will reduce odours, nicotine and smoke in the air in the room through recirculation. With the optional UVV lamp(s) and VOC detector, if the smoke level increases (more smokers), the VOC detector will trigger the additional oxidising lamp(s), then shut them off when the level decreases. The cycle is repeated, lowering the odour, nicotine and smoke levels, until the maximum reduction is reached.

TYPICAL INSTALLATION





GENERAL

Cigarette smoke is composed mainly of:

- White ash
- Nicotine molecules
- Chemical by-products

Ash will be trapped by the pre-filters.

Nicotine will be transformed into yellow powder that will be captured by the pre-filters and the main filter.

The chemical by-products will be oxidised by the UV process: high frequency UVV energy activates the organic molecules and accelerates the chemical reaction, resulting in the air being oxidised.

Odours are oxidised by the process of photolysis that initiates the breaking of chemical bonds by the action of the ultraviolet light. The oxidation process will reduce odours and chemical contaminants by changing the complex molecular contaminants into CO_2 and H_2O

SIZING: Approximately 6 to 8 air changes per hour are required. This reduces the amount of fresh air required by two thirds.

- An S300FX-GX unit (300 cfm) will be sufficient for a 1920 cu ft room (12' X 20' X 8') – 9.3 changes per hour- Optional factory installed accessories (SUBKITVOCS300)
- An S1000FX-GX (1000 cfm) will be sufficient for a 9600 cu ft room (20' X 40' X 10') – 7.5 changes per hour - Optional factory installed accessories (SUBKITVOCS1000)

BENEFITS

- Reduced Odours and Smoke (for Odour control)
- No tar buildup in the unit - UV irradiation crystallizes the nicotine molecules
- Low maintenance
- Lamp replacement 1-2 years
- Periodic filter replacement

MARKETS

- Care homes
- Private homes
- Poker rooms / Casinos
- Bingo halls
- Cigar bar
- Smoking Rooms

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Changing Rooms & Lavatory Odours

Changing Room odours are the result of perspiration which is excreted by the sweat glands in our skin. Sweat itself is not the source of the odour, but rather the off-gassing of the bacteria which feed on sweat. The source of this unpleasant off-gassing can be found on occupants, clothes, towels and equipment as well as other soft materials.

Sanuvox technologies' S300FX-GX UV / HEPASystem is the ideal solution to reduce & eliminate unpleasant odours such as changing room and lavatory odours. The proprietary Sanuvox process will sterilise and oxidise bacteria, viruses, chemicals and odours dramatically improving the air quality in these sensitive applications.

S300FX-GX UV / HEPA System

Features

- *Pre-filter & HEPA filter captures particles down to 0.3 microns in size*
- *Sanuvox proprietary system eradicates biological contaminants such as mould, bacteria, viruses, germs & allergens*
- *Reduce chemical & biological odours*
- *Can be used as a stand-alone, wall-mount or HVAC duct-mount system*
- *Two speed 200/300 CFM system*

CHANGING ROOMS

OBJECTIVE: Reduce odours resulting from perspiration and sweat in changing rooms by killing bacteria and decreasing VOC chemical concentrations to achieve better air quality.

EQUIPMENT:
Stand-alone: Model P900 equipped with a blower of 80 cfm; Model S300 with a blower of 300 cfm or Model S1000 with a blower of 1000 cfm. Filters (except P900) to capture particulates, and a dual zone UVC/UVV "adjustable" lamp are standard. The S300 unit can be used as a stand-alone system with optional intake and exhaust louvres or ducted using an 8-inch flexible duct with optional collars.

OPERATION: Untreated air is drawn into the inlet of the unit, purified with the germicidal/oxidation UV lamp, filtered and then exhausted. Recirculating the air in the room continuously reduces bacteria and odours, improving overall air quality.

WALL INSTALLATION: S300FX-GX with MSCLOU1

SIZING:
Approximately 6 to 8 air changes per hour are required.

- A **P900-GX SP** unit (80 cfm) with a dual zone UVC/UVV lamp will be required for a 1 200 cu ft room (15' X 10' X 8')
- An **S300FX-GX** unit (300 cfm) with a dual zone UVC/UVV lamp will be required for a 4,500 cu ft room, (25' X 20' X 10'). Collars (MSCCOL1) can be ordered to duct the unit using an 8 inch diameter duct, or an intake and exhaust louver grill(s) (MSCLOU1) can be ordered if the unit will be used as a stand-alone system.
- An **S1000FX-GX** unit (1000 cfm) with a dual zone UVC/UVV lamp will be required for a 15,000 cu ft. room, (50' X 20' X 15'). The system uses 2 x 8 inch inlets and 2 x 8 inch exhaust outlets (collars).

Units should be positioned near the center of the room to be as effective as possible. Excluding the P900GX unit, all other units can be installed in the plenum above the ceiling or in an adjoining room and ducted with an 8 inch round duct.

FEATURES:
All Sanuvox air treatment systems are equipped with a dual zone "J" UVC/UVV lamp. All Dual Zone lamps have a maximum oxidising UVV section in order to minimize residual ozone. In situations where odours are more concentrated, it is possible to fit the units (except unit P900-GX) with special lamps incorporating a larger section of oxidation, with the installer making the final odour adjustments on the job site.

For more details on any of these units or their operation, please contact your SPC representative.

ADVANTAGES

- Greatly reduced odours
- Low maintenance
  - Lamp replacement every 1-2 years
  - Periodic filter replacement
- Improved indoor air quality (IAQ)

MARKETS

- Sports (Hockey, Football, etc.) team dressing room, fitness centres, etc.
- Laundry rooms
- Dirty laundry storage
- Basement odours, mould odours, heating oil odours

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Shelter / Kennel / Veterinarian Air Sterilisation

Illness among animals, especially dogs can be significantly higher when so many are boarded within close proximity or kept within the same room/ building. Airborne illness can easily be transmitted from one animal to another. They may very well cause issues all of their own when they migrate to other areas affecting staff and visitors.

Sanuvox technologies' UV systems are the ideal solution for destroying airborne viruses and bacteria as well as reducing the concentration of unpleasant odours.

***S300FX-GX UV / HEPA System** *Shown here*

***UV Bio-Wall QUATTRO** **Available*

***Bio Grid 600** **Available*

Features

- *Sanuvox proprietary system eradicates biological contaminants such as bacteria, viruses, germs & allergens*
- *Destroys chemicals & biological odours*
- *Multiple application UV systems can be used for both stand-alone and duct-mount installations*

ANIMAL KENNEL, SHELTER

OBJECTIVE: Substantially reduce odours such as ammonia produced by animals in kennels, shelters, pet stores and veterinarian clinics and sterilise the air to reduce the risk of airborne viral & bacterial infection between animals.

EQUIPMENT:

1. **Stand-alone**: Model P900 equipped with an 80 cfm blower; Model S300 with a S300 cfm blower or Model S1000 with a 1000 cfm blower. S300 & S1000 are equipped with filters to capture particulates, (pet hair etc.). A dual zone UVC/UVV lamp is standard. An "adjustable" oxidising lamp is available.
2. **In-Duct** QUATTRO GX4 unit installed parallel to the airflow includes four UVC/UVV lamps, each with a one-inch section of oxidising UVV. Two of the lamp's oxidising sections are masked with removable foil, allowing for increased oxidation if necessary.

TYPICAL INSTALLATIONS

OPERATION: Each unit treats the air through recirculation in two ways:

1. The Germicidal UVC lamp portion destroys airborne biological contaminants (viruses, mould, bacteria.)
2. The Oxidising UVV lamp portion reduces airborne chemical contaminants & VOCs through photo-oxidation.

GENERAL: PROCESS ON BIOLOGICAL AND CHEMICAL CONTAMINANTS

1-ACTIVATION PHASE $O^2 + O^* \rightarrow O^* + O^*$

Ultraviolet photon energy (170-220nm) is emitted from a high-intensity source to break down oxygen molecules into activated monoatomic oxygen. The rate of production or effectiveness of this process depends on the wavelength and intensity of its source.

2-REACTION PHASE: $O^* + P \rightarrow PO$

The activated oxygen atoms (O*) are then mixed in the airstream; the process will react with any compound containing carbon, hydrogen or sulphur, reducing them by successive oxidation to odourless and harmless by-products. If airborne contaminants are outnumbered by the activated oxygen atoms, there will be formation of residual ozone (O^3) which will occur following the oxidation of normal oxygen molecules (0^2).

3- NEUTRALISATION PHASE: (also GERMICIDAL) $O^3 + UV(C) \rightarrow O^2 + O^*$: $O + O \rightarrow O^2$

CHEMICAL REACTION

- Ammonia $NH_3 + O^* \rightarrow N_2 + H_2O$

BENEFITS

- Indoor odours greatly reduced
- Reduce cross-contamination between animals
- Improved air quality
- Low maintenance

MARKETS

- Kennels, pet boarding and animal shelters
- Laboratories
- Veterinarian Centers
- Zoos and pet stores

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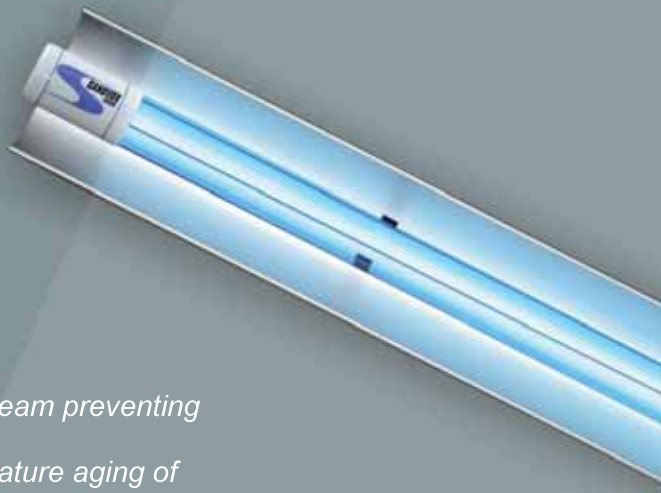
Cold Room Air Sterilisation & Ethylene Reduction

Mould and bacteria can severely impact the quality of meat, chicken, fish, fruit & vegetables that may be stored or prepared in warehouses and cold rooms. Ethylene off-gassing cause fruit and vegetables to prematurely ripen & age, dramatically shortening shelf-life.

Sanuvox UV CoilClean IL systems are installed facing the cooling coil and designed to bask the coil and air with ultraviolet energy, destroying micro-organisms including bacteria, mould and viruses while oxidising & reducing ethylene off-gassing.



Sanuvox UV CoilClean IL Multi-split

Features

- *Patented Sanuvox process sterilises the cooling coil and airstream preventing and destroying bacteria, mould & viruses*
- *Destroy ethylene off-gassing which is a leading cause of premature aging of fruits & vegetables*
- *Easily retrofitted into pre-existing systems*
- *Available in lengths from 12" to 60"*

COLD ROOMS

OBJECTIVE: Destroy airborne bio-chemical contaminants such as bacteria, viruses & mould that may affect the storage and preparation of fish, chicken and meat. Reduce ethylene off gassing which causes produce to ripen faster thereby extending shelf-life.

EQUIPMENT: Sanuvox IL Multi-spilt units installed facing the cooling coils in the fan coil uni.
Each IL unit includes a UVC / UVV lamp mounted in an anodised aluminum parabolic reflector. The ballast box incorporates LED'S for providing lamp status & replacement (2 yrs.) and can be remotely monitored.

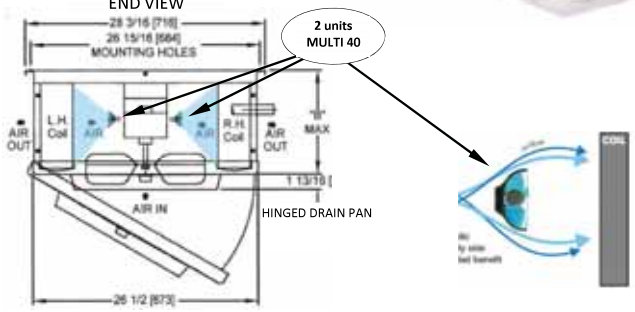
OPERATION: The fan coil unit recirculates the air, where:

1. The UVC germicidal section of the UV lamp destroys airborne biological contaminants (viruses, mould, bacteria and spores)
2. The UVV oxidising section of the UV lamp reduces ethylene, slowing down the ripening process of vegetables and fruits.

Coils remain clean and more energy efficient.

TYPICAL INSTALLATION

END VIEW



SLOWING DOWN THE CONTAMINATION SPREAD WITH UVC

Produce will degrade due to the rotting process. Rotting is caused by parasitic fungi and mould. Food deterioration begins with the breakdown of the cellular tissue by enzymatic action that allows the growth of microbes. Germicidal UV (UVC) is extremely effective at preventing the reproduction of bio-contaminants. UVC destroys airbourne fungi,moulds and their spores, limiting the contamination spread from one fruit to another. Meat, fish & chicken are especially vulnerable to airborne bio-contamination. UVC sterilises the air destroying contaminants as they circulate within the cold room.

RETARDING THE RIPENING PROCESS WITH UVV

Photo-oxidation with UVV can be used to reduce chemicals that trigger the ripening of fruits and vegetables. The life stages of a plant are influenced by plant hormones. An organic compound involved with ripening is ethylene, a gas created by plants from the amino acid, methionine.
Ethylene increases the intracellular levels of certain enzymes in fruit and fresh-cut products, which include:

- Amylase, which hydrolyses starch to produce simple sugars, and
- Pectinase, which hydrolyses pectin, a substance that keeps fruit hard.

UVV oxidises and thus neutralises the ethylene molecules released by the ripening process, slowing down the spread of ripening to the surrounding produce.
This oxidation process breaks down ethylene into carbon dioxide and water vapour.

Ethylene C_2H_4 $C_2H_4 + O^* \rightarrow CO_2 + H_2O$

BENEFITS

- Extended shelf life for vegetables and fruit
- Sterilise airbourne bacteria, viruses & mould
- Cleaner cooling coils - more energy efficient
- Low maintenance -
  - Lamp replacement every 2 years
  - 5 years ballast warranty

MARKETS

- Cold storage rooms, groceries
- Meat, fish & chicken storage & preparation facilities
- Fruit and vegetable retailers
- Fruit and vegetable warehousing
- Fruit and vegetable transportation

SPC SANUVOX

Fruit & Vegetable Surface Sterilisation

Surface contamination of fruit & vegetables is a problem for growers, distributors and retailers. Mould and bacteria can have severe effects causing produce to spoil.

FoodSafe UV Sterilisers are exceptionally safe & versatile disinfection systems for surface, packaging & conveyor applications designed to bask meat, fish & poultry, fruit & vegetables, baked goods and packaging with UVC germicidal light. The UV system is extremely effective at destroying surface contamination while extending product shelf-life. Only a few seconds of exposure can achieve up to a 99.999% destruction of common biological contaminants that are problematic in the food industry.

FoodSafe IL UV Surface Sterilisation

Features

- *Incorporate UV fixtures into the production line (i.e. over conveyer belts) to bask the products and surfaces prior to packaging maintaining a sterile product ready for distribution and consumption*
- *Surface sterilisation of meat, fish & poultry, fruits & vegetables, baked goods and packaging*
- *Easily incorporates into pre-existing sorting, manufacturing and packaging equipment*
- *All FoodSafe IL UV Lamp systems are TEFLON® coated to insure that no UV Lamp contents will escape in the event of Lamp breakage*

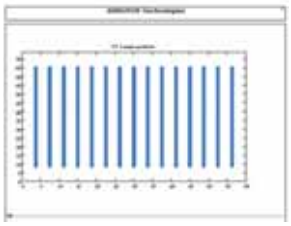
PRODUCE DISINFECTION

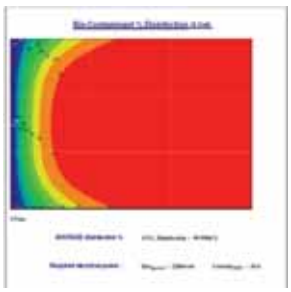
OBJECTIVE: Prevent & destroy microbial contamination such as bacteria and fungi that occur naturally on fruit and vegetable surfaces and are responsible for premature decay. The process will leave no residue as is found using chlorine or irradiation treatments with gamma rays. At the producer level, sterilisation of fruits and vegetables could reduce the use of pesticides.

EQUIPMENT: FoodSafe IL units in various widths, equipped with parabolic reflectors and Teflon coated lamps will be positioned equidistant across the conveyor parallel to the conveyor, Computerised sizing programs taking into account the speed of the conveyer and the contaminant(s) to be treated will determine the size of the lamps.

OPERATION: The end user will determine the location and design of the lamp assembly enclosure that will attach to the conveyor guaranteeing there is no direct UV exposure to employees. Fruits and/or vegetables will be exposed for a predetermined period of time to UV radiation as they move through the enclosure on the conveyor. This predetermined time will be sufficient to sterilise the fruit and/or vegetable pathogens and slow down the ripening process.

TYPICAL INSTALLATION





Pictured here a Sanuvox UV installation for surface sterilization of Bell peppers

RESEARCH ON STRAWBERRIES

Researchers from the Department of Food, Science and Nutrition (Laval University, Quebec, Canada) demonstrated that exposing strawberries to Ultraviolet Radiation prolongs their shelf life. Freshly picked strawberries exposed to Germicidal Ultraviolet Irradiation (UV-C) have retained their freshness for 14 to 15 days, while untreated freshly picked strawberries were “almost done” on the tenth day.

The conclusions from this research have been published in the Food refrigeration science journal which slows the growth of micro-organisms and fruit ripening, allows a limited but effective mean regarding conservation of strawberries.

"Exposure to UV-C is a very interesting approach to facilitate the marketing and distribution of fresh fruits and vegetables", says researcher Joseph Arul. This treatment slows the ripening of strawberries: they remain firm longer, their respiratory rate is lower, their colour is more attractive and the taste is not altered "It is believed that exposure to UV-C would kill some mould on the surface of the fruit or, more likely, the treatment would stimulate the defense mechanisms of the produce, suggests the researcher.

Arul's team has already demonstrated the benefits of UV-C exposure for the conservation of carrots, broccoli, tomatoes and blueberries.

Arul does not anticipate negative reactions from consumers, unlike gamma irradiated food, or more recently, genetically modified organisms. "The technique is more acceptable to a consumer. In low doses, UV is beneficial. It is a light source and I do not think people have problems with that."

BENEFITS

- Complete sterilisation without pesticides
- No residue, no visual change of vegetables
- Increased shelf life
  Low maintenance - lamp replacement every 2 years
- Teflon covered lamps - in case of breakage, broken glass & contents remain inside the Teflon sleeve

MARKETS

- Vegetable Growers
- Fruit and vegetable importers
- Hydroponic producers
- Value-added packagers

SPC SANUVOX

Coil Cleaning: Mould & Bio-Film / Improve Efficiency

Because of environmental factors, evaporator coils are the ideal breeding ground for bio-contaminants & the source of many issues that affect a building's Indoor Air Quality. Bio-contaminants such as mould & bio-film insulate the coil fins restricting airflow and reducing the ability to transfer heat. The insulation of the coil fins causes the system to work harder resulting in a loss of equipment efficiency. The "blow-off" of mould and odours causes these contaminants to be released into the building.

The Sanuvox UV CoilClean IL is specially designed to direct virtually 100% of the UVC germicidal energy onto the coil preventing mould & bio-film from growing on the coil and surrounding areas.

UV CoilClean IL

Features

- *The patented UV CoilClean IL incorporates a High-Intensity UVC germicidal Lamp and an Anodized Aluminum Parabolic Reflector to direct the UV light onto the coil*
- *Available in sizes from 12" - 60" lengths. Any number of units can work together to treat any size evaporator coil*
- *Each UV CoilClean IL includes: Ballast box with LED Status Display (monitors system performance), dry contact for building automation integration, UV Lamp Moisture Boot and mounting hardware*

EVAPORATOR COIL

OBJECTIVE: To destroy mould & bio-film on the evaporator coil and surrounding areas and to limit the spread of pollutants distributed by the HVAC systems. Maintain peak system efficiency, lower energy costs & reduce conventional coil cleaning as well as eliminating biological "blow-off" & odours that can be introduced into the building or facility as a result of a fouled coil.

EQUIPMENT: Sanuvox IL Coilclean Object Purifiers for HVAC coils utilize patented technology to focus the maximum UV energy on any surface. The patented anodised aluminum parabolic reflector serves two purposes:

1. Directs the maximum amount of UV energy produced by the lamp onto the coil surface, requiring less or shorter lamps and fixtures
2. Protects the UV lamp from fouling

INSTALLATION BENEFITS

Before

After

OPERATION: Prolonged exposure to UV radiation will keep the air conditioning coil clean and free of bio-contaminants, including viruses, fungi, bacteria & bio-film that may grow on the coil. Maintaining a coil free of microbial growth will maximise the efficiency of coil heat transfer and reduce the hours of operation of the compressors, resulting in lower energy costs.

STERILISATION SIZING CALCULATION:

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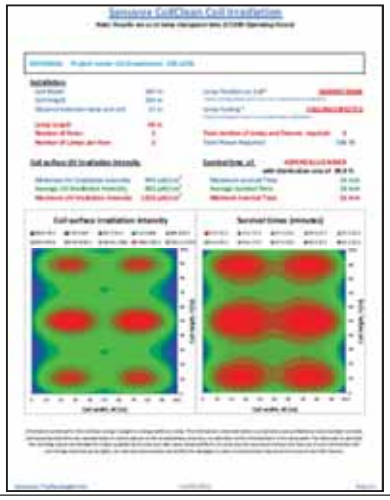

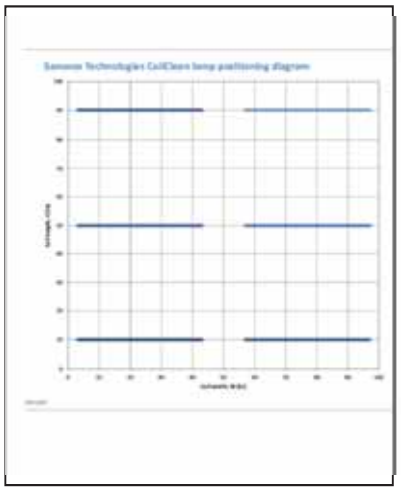

UVC GERMICIDAL PRINCIPLE: - The 254nm UVC wavelength is well documented for its germicidal properties. The effects of ultraviolet radiation on biological contaminants have also been included in the latest ASHRAE Handbooks. Generally, this relationship is similar to the absorption curve of nucleic acid (DNA), the basis of all living organisms. The germicidal destruction rate for any specified bio-contaminant can be greater than 99.9% as the maximum UV intensity produced by the UV lamp is directed onto the coil and each application is sized according to its requirements.

BENEFITS

- Improved energy efficiency
- Low maintenance- requires lamp replacement after 17,000 hours or 2 years of operation
- Improved air quality
- Remote monitoring electronics

MARKETS

- Commercial buildings, High Rise
- Facilities such as Schools & Universities
- Medical Facilities
- Restaurants & Hospitality

Model Range

	Model	Type	In-Duct / Duct Mount	Stand-Alone	Bio-Sterilisation	Chemical / Odour Reduction	Other
	**QUATTRO**	Air-Treatment	●		●	●	• 4 x 18" UV Lamps • Auto. Operation • Plug & Play • Adjustable legs for different duct sizes
	**UV BIO-WALL**	Air-Treatment	●		●	●	• Avail. in sizes up to 60" • Remote control box • Sizing & Kill Rate Report provided at no-charge
	**C2000EX**	Exhaust Air-Treatment	●		●	●	• Available in various sizes • For chemical / odour exhaust applications
	**IL SERIES** - CoilClean - FoodSafe	Coil / Produce / Object Sterilisation			●	●	• Maintains a clean coil • Sterilises food & produce • Sizing & Kill Rate Report • Telfon sleeve lamps for food applications
	**S300FX**	UV Air-Treatment / HEPA Filtration	●	●	●	●	• Two speed 200/300 CFM • UV & HEPA Filtration • Various applications
	**Bio Grid 600**	Ceiling-Tile Mounted Air Treatment		●	●	●	• Self-contained ceiling tile mounted design • Ideal for offices, break-rooms and restaurants
	**S1000FX**	UV Air Treatment / Filtration	●	●	●	●	• Clean Room Option offers a HEPA & additional UVC Lamp
	**P900GX**	Portable Air-Treatment		●	●	●	• Portable UV system ideal for offices and break-rooms
	**PENTA**	Mobile Room Steriliser		●	●		• Surface sterilisation for hospitals / medical applications • 360° Safety Infrared Motion Detector • Proven effectiveness
	**INTERCEPTOR**	12V Vehicle / Cabin Air-Treatment		●	●	●	• Designed for ambulances & other emergency response vehicles • **Boats** • Maintain fresh produce in transit

Global provider of UV solutions

Sanuvox Technologies is a global provider of UV solutions that vary from biological sterilisation to chemical & odour control. Below you will find examples of Sanuvox users from various industries and countries that benefit from Sanuvox UV systems.

3i Corporation
911 Emergency Response Center
ALCAN
Alfred Dallaire Mausoleum
Algoma Retirement Center
Allendale Retirement Center
Alliance Assurance
Ambulance Service
American Fidelity Company
Anatole Hotel Dallas
Andrews Air Force Base
Bank of America
Bar S Foods
Bay/Adelaide Center
Bayer Labs
Baystate Medical-Mary Lane Hospital
Beijing University - China
Bikram Yoga Studios
Boca Raton Medical Center
Bombardier
Bradenton Towers
Bradford Middle School
British Printing Press - Kuwait
Brookfield Properties
Brookhaven Sewer Project
C.L.S.C.
Caisse de Depot
Camp Pendleton Marine Corps Base
Canada Post
Canadian Air Force
Canadian Army - Calgary, Alberta
Canadian Embassy - Mumbai, India
Canton Hospital
Capistrano School District
Carnegie Research, Stanford University
CBRE
Cecil Facer Medical Center
Cell Signaling
Excellence in Bio-Research - Thailand
Charter Springs Hospital
Chateau Poochie
Chesapeake Energy
Chickasaw Nation Medical Center
Children's Hospital Boston
Children's Hospital Texas
Chulalongorn Hospital
Circles Of Care
City Hall - Upland, California
City of Brownsville, Texas
City of Gainesville, Florida
City of Montreal
City of Orlando, Florida
City of Pharr, Texas
City of Quebec
City of Rancho Viejo, Texas
Civil Courts - New Orleans
Clayton County
Cleveland Clinic - Abu Dhabi
Cleveland VA Medical Center
Club Mardi Gras
Conoco-Phillips
Cornell University
Costco Stores
Covenant House
Coweta County School
Cunningham Elementary
Cupertino City Hall
Curtis Draper
Daniel Foods
Dante Restaurant
DC Superior Courthouse
Defence Acquisition University
Del Monte Foods
Department of Transportation
Desjardins Bank
Doha International Airport, Doha-Qatar
East Texas Medical Center
Eastern University
El Conquistador Resort -Puerto Rico
Emerson Hospital
Ephrata Hospital
Evangel Assembly Church
Experion Credit Agency
FAA Training Center
Fairview Shopping Complex
FBI Indianapolis
First Choice Pharmacy
Florida Navel Hospital
Fort Drum United States Army
Fort Gordon United States Army
FOX NEWS New York City
Florida State University
Gaston Memorial Hospital
Geisinger Medical Center
Gilmer Courthouse
Goglanian Bakery
Guelph County Public Health
Gulfport Juvenile Detention Facility
Hamilton General Hospital
Harrison School District
Hartford General Hospital
Hattie Latham Children's Hospital
Health Central
Healthcare for the Homeless
Heinz Packaging
Hershey Chocolate
Hickam United States Air Force Base
Hines Property Management
Holiday Inn - Muscat - Oman
Holly Cross University
Houma Elementary School
Huntersville Presbyterian Hospital
Huntington Hospital
Il Fornio Bakery
Indiana State University
Industrial Alliance Insurance
Institute for Specialized Medicine
IVF Clinic
J Edgar Hoover FBI Headquarters
Jack Astor
Jackson County Memorial Hospital
James Gibson Library
James Tighe-Gilmer Courthouse
Japan Tobacco (JTI)
Keesler Hospital Air Force Base
Kentucky State Penitentiary
Knights of Columbus
Kuwait Hospital
LA Mission Hospital
Lancaster General Hospital
LAX Fire Station
Lucky Truck Stop Casino
Marble Medical
Marina View Tower – Singapore
Massachusetts General Hospital
Maxwell Meighen Homeless shelter
MD Anderson Hospital
Medanta - The Medicity, India
Meridian Bio-Science
Metro East Detention Centre
MGM Tower
Miami 1111 Building
Miami Dade College
Ministry of Human Resources
Miramar Library
Mission Regional Hospital
Montreal Jewish hospital
Moore Regional Hospital
Moose Lodge
Motor City - Dubai
NAS Jacksonville Youth Center
National Art gallery Ottawa
National Library
National Medical Centre - Pakistan
Nature Fresh Farms
NAV Canada
Norfolk Southern Railroad Building
NORTEL
North East Medical Center
Oak Ridge
Oak Tree Run Bakery
Oakville Daycare Center
OLG Brantford
Orlando Health
Orlando Regional Medical Center
Palm Desert Police Department
Paramount Pictures
Peck Federal building
Penn State Outreach Building
PHF Research Complex
Pike County School
Place Dupuis
Polaris Sea Vessel
Portola Packaging
Power Stream Cleaning Services
Pratt & Whitney
Princess Noura University, Saudi Arabia
Providence Medical Center
Providence St Mary's on the Lake
Purdue Pharmaceutical
Radius Restaurant
Rama Hospital
Region of York Public Health
Research Park Plaza Building
Ricoh
Royal IT Center - Thailand
Salon
Salvation Army Homelss Shelter
San Diego Sports & Surgery Center
Santa Fe Community College
Scotia Center
Seafarers Union Building
Shell Oil
Shire Pharmaceutical
Siriraj Hospital - Bangkok
Sojourn House
South Florida Water Management
Southeast Bldg Solution
Southern Methodist University (SMU)
St. Anthony Bone & Joint Hospital
St. Paul's Retirement Facility
St. Simons shelter
St. David's Hospital
St. Rose Hospital
Stamford CT Police Station
Sushi Shop
Swiss Army - Switzerland
Tampa Port Authority
Taylor Hospital
The Gran Melia Resort Hawaii
The Hockey Hall of Fame
The Toronto Stock Exchange (TSE)
Times Customer Service
Toronto Public Health
Transco Tower
Travis Commercial Building
Trinity Baptist College
Uncle Wally's Bakery
United Nations - Tajikistan
United States Dept. of Transportation
University of Houston
University of New Hampshire (UNH)
University of North Carolina
University of Tampa
University of Texas at Austin
University of Toronto
VA Hospital
Verizon Corporate Office Building
VIA Rail Canada
Victoryland Casino
Virginia Department for the Blind
Walnut Creek Elementary School
Walter Reed Army Medical Center (DC)
Washington National Zoo
Wellington Dufferin Guelph Public Health
Wellspan Surgical & Rehab Center
West Boylston Prison
West Capella Sea Vessel
Westminster Services
Westminster Suncoast
White Oaks Plantation
Wilson Memorial Hospital
Winchester Hospital
Yale School of Medicine

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Bringing light to the issues

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SPC Sanuvox video

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