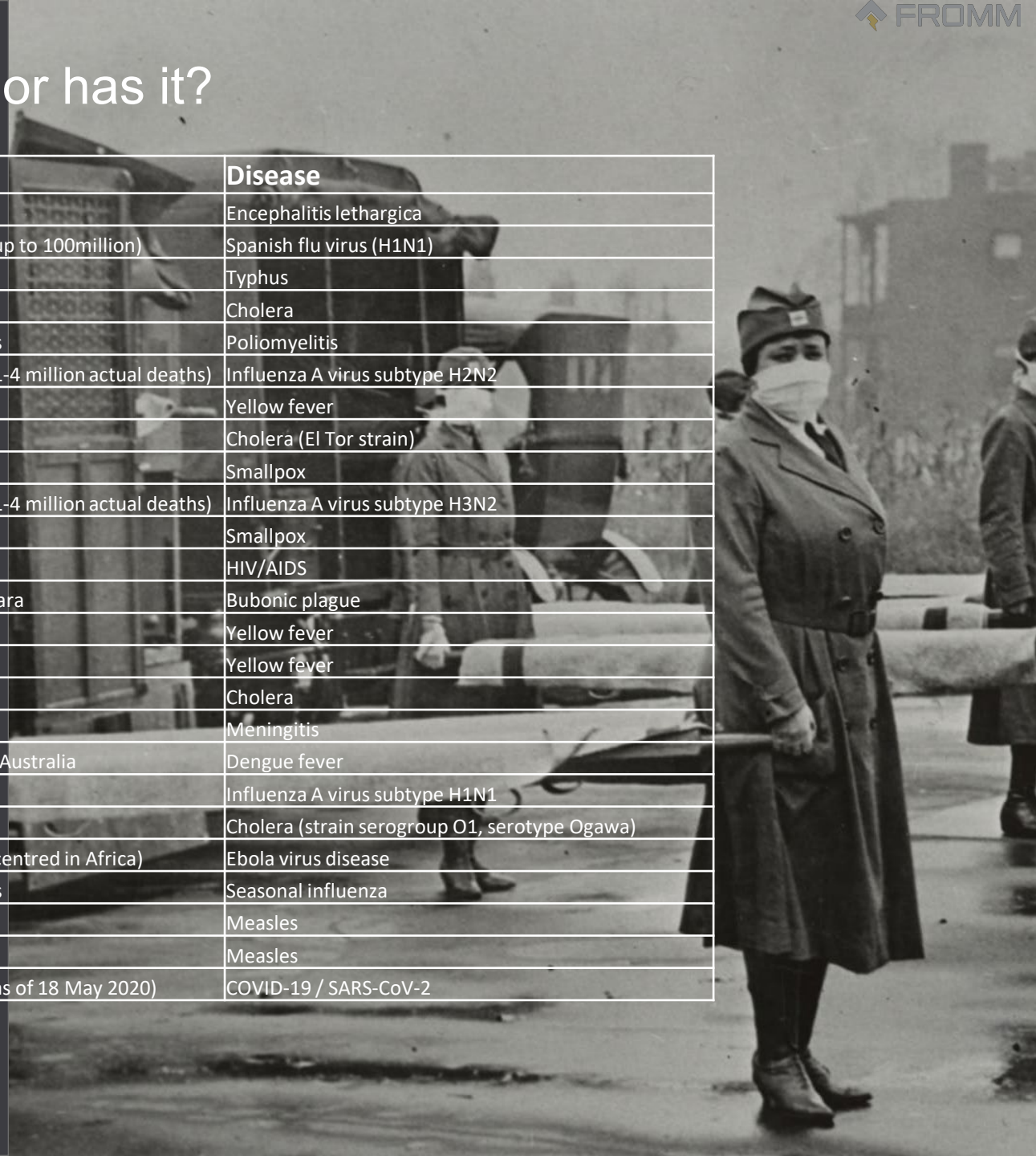
Signify

UV-C
Disinfection

FROMM

Our world has fundamentally changed……or has it?

Event	Date	Death Toll	Location	Disease
1915 Encephalitis lethargica pandemic	1915–1926	**1,500,000**	Worldwide	Encephalitis lethargica
1918 flu pandemic	1918–1920	**17,000,000**	Worldwide (up to 100million)	Spanish flu virus (H1N1)
1918–1922 Russia typhus epidemic	1918–1922	**2,500,000**	Russia	Typhus
1947 Egypt cholera epidemic	1947	**10,277**	Egypt	Cholera
Poliomyelitis Epidemic	1948	**8,005**	United States	Poliomyelitis
1957–1958 influenza pandemic	1957–1958	**1,000,000**	Worldwide (1-4 million actual deaths)	Influenza A virus subtype H2N2
1960–1962 Ethiopia yellow fever epidemic	1960–1962	**30,000**	Ethiopia	Yellow fever
Seventh cholera pandemic	1961–1975	**155,000**	Worldwide	Cholera (El Tor strain)
Smallpox Worldwide	1877–1977	**500,000,000**	Worldwide	Smallpox
Hong Kong flu	1968–1970	**1,000,000**	Worldwide (1-4 million actual deaths)	Influenza A virus subtype H3N2
1974 smallpox epidemic of India	1974	**15,000**	India	Smallpox
HIV/AIDS pandemic	1981–present	**43,800,000**	Worldwide	HIV/AIDS
1984 Western Sahara plague	1984	**64**	Western Sahara	Bubonic plague
1986 Oju yellow fever epidemic	1986	**5,600**	Oju, Nigeria	Yellow fever
1987 Mali yellow fever epidemic	1987	**145**	Mali	Yellow fever
1991 Bangladesh cholera epidemic	1991	**10,415**	Bangladesh	Cholera
1996 West Africa meningitus epidemic	1996	**10,000**	West Africa	Meningitis
Queensland 2009 dengue outbreak	2009	**503**	Queensland, Australia	Dengue fever
2009 swine flu pandemic	2009–2010	**575,400**	Worldwide	Influenza A virus subtype H1N1
2010s Haiti cholera outbreak	2010–2019	**10,075**	Haiti	Cholera (strain serogroup O1, serotype Ogawa)
Western African Ebola virus epidemic	2013–2016	**11,323**	Worldwide (centred in Africa)	Ebola virus disease
2017–18 United States flu season	2017–2018	**95,000**	United States	Seasonal influenza
2019–2020 New Zealand measles	2019–present	**2**	New Zealand	Measles
2019 Samoa measles outbreak	2019–present	**83**	Samoa	Measles
COVID-19 pandemic	2019–present	**4,279,366**	Worldwide (as of 18 May 2020)	COVID-19 / SARS-CoV-2



***Notable disease events above 10K deaths since 1915 + recent local events**

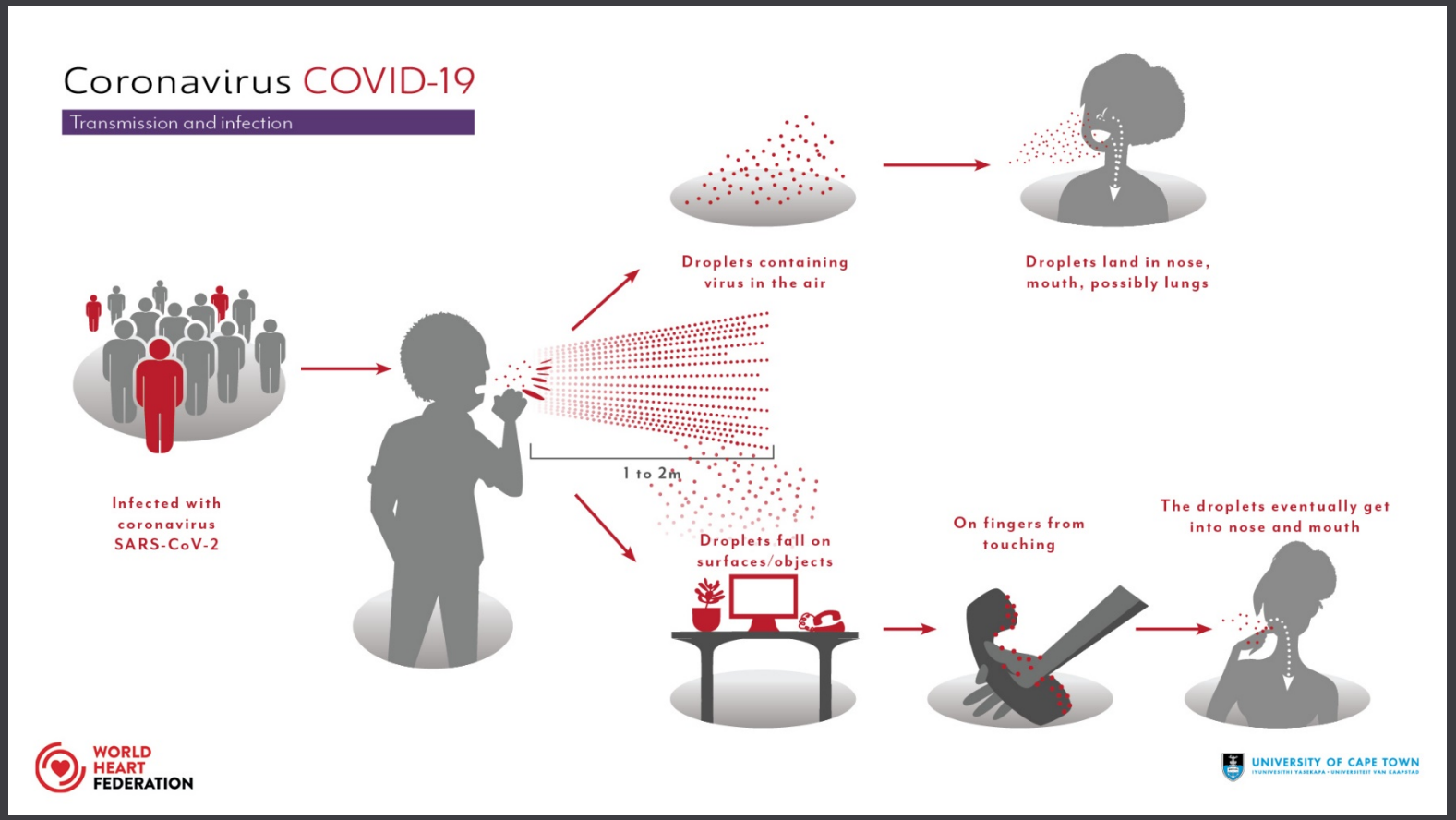
Signify

Why does air & surface disinfection matter?

Channels of transmission

The virus spreads mainly from person-to-person transmission in 3 basic modes:

- Direct air-borne transmission **between people**
- Indirect surface-borne transmission via **contaminated surfaces**
- Indirect air-borne transmission through **air flows**

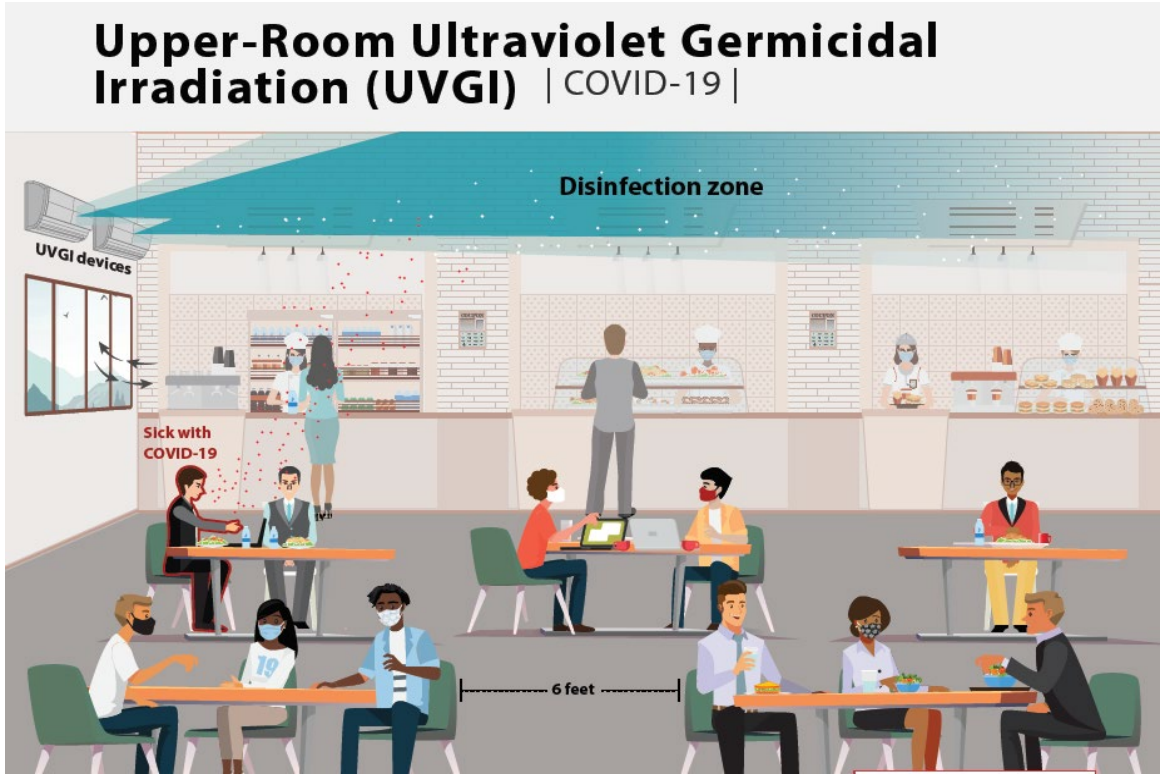


This is where UV-C can offer enhanced disinfection solutions

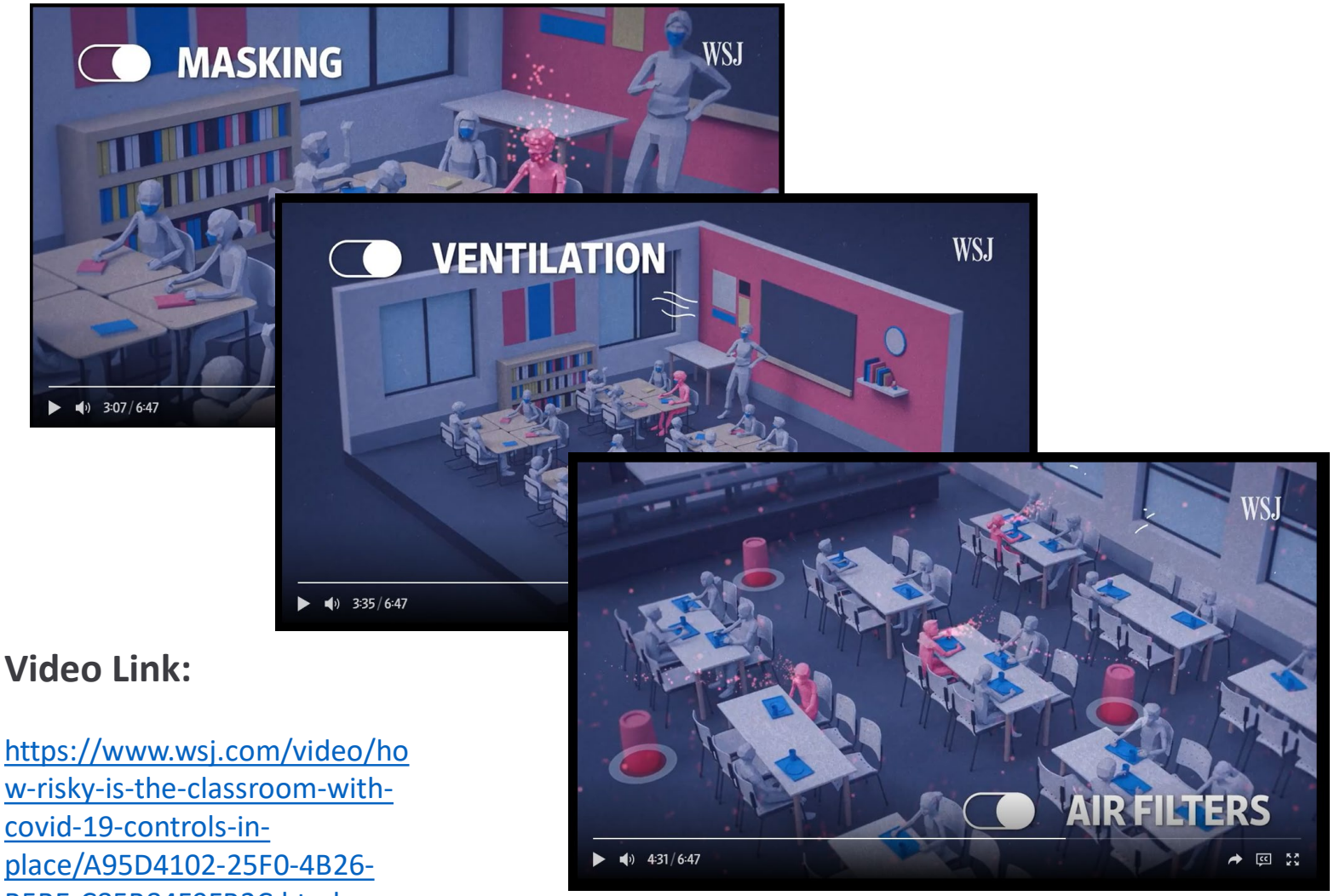
CDC Guidelines on Upper-Air UVC

Considerations for Use of Upper-Room UVGI

- The most important locations for UVGI are high-risk indoor settings. These include:
  - Areas with an increased likelihood of sick people (for example, school nurse's office, hospital waiting room).
  - Crowded spaces, particularly when the health status of occupants is unknown (for example, courtrooms, lobbies, homeless shelter sleeping areas).
  - Spaces where people must take off masks to eat or drink (for example, school/institutional cafeterias, restaurants, break rooms).
  - Areas where it is difficult to stay at least 6 feet apart from others.



Wall Street Journal Video



Video Link:

https://www.wsj.com/video/how-risky-is-the-classroom-with-covid-19-controls-in-place/A95D4102-25F0-4B26-B5BE-C85B84F9FB2C.html

3/18/2021 1:10PM

How Risky Is the Classroom With Covid-19 Controls in Place?

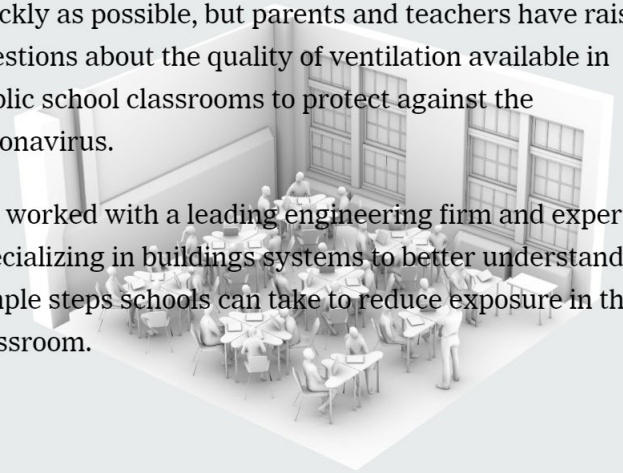
A year into the coronavirus pandemic, many schools are only partially open for fear they could fuel the spread of the virus. Experts explain what the actual risks are for spreading Covid-19 in schools and how proper controls can change that equation. Illustration: Preston Jessee for The Wall Street Journal

FROMM

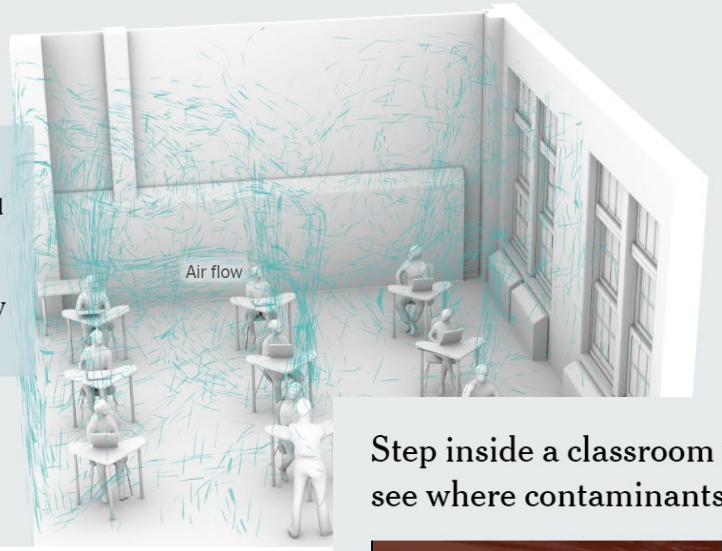
New York Times Video Simulation

The C.D.C. is urging communities to reopen schools as quickly as possible, but parents and teachers have raised questions about the quality of ventilation available in public school classrooms to protect against the coronavirus.

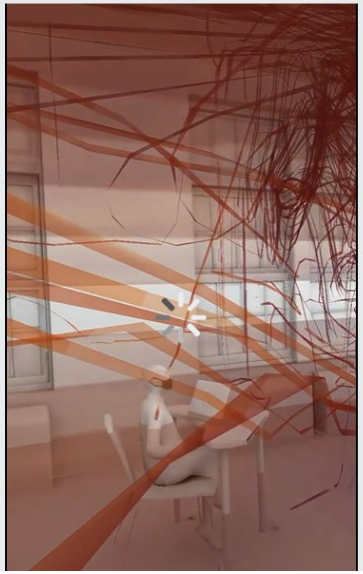
We worked with a leading engineering firm and experts specializing in buildings systems to better understand the simple steps schools can take to reduce exposure in the classroom.



The students are wearing masks, but their breath still circulates and mixes around the room. About 3 percent of the air each person in this room breathes was exhaled by other people.



Step inside a classroom with augmented reality to see where contaminants spread.



This augmented reality experience puts you inside an airflow simulation. See how ventilation changes how contaminants can spread indoors.

To experience this in your space, you will need the Instagram app.

To view on Instagram, open the camera on your device and point to the QR tag below.

Article Link:

https://www.nytimes.com/interactive/2021/02/26/science/reopen-schools-safety-ventilation.html?searchResultPosition=2

Key Takeaways/Observations:

- Simulations continue to show how contaminated air flows in the upper air regions of a space

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Why UV-C
vs.
other disinfection solutions

FROMM

New Research Article:

Air Disinfection for Airborne Infection Control with a Focus on COVID-19: Why Germicidal UV is Essential†

Edward A. Nardell*

Division of Global Health Equity, Brigham & Women's Hospital, **Harvard Medical School, Boston, MA**

Received 7 January 2021, accepted 16 March 2021, DOI: 10.1111/php.13421

*Corresponding author email: enardell@gmail.com (Edward A. Nardell)
†This article is part of a Special Issue dedicated to the topics of Germicidal Photobiology and Infection Control

Excerpt from article Abstract

- *"Only two established room-based technologies are available to supplement mechanical ventilation: **portable room air cleaners** and **upper room germicidal UV** air disinfection."*

- *"SARS-CoV-2 is highly susceptible to GUV, an 80-year-old technology that has been shown to safely, quietly, effectively and economically produce the equivalent of 10 to 20 or more air changes per hour under real life conditions."*

Excerpt from article summary

- *"Quantitatively, where applicable, no other technology approaches the equivalent air changes per hour that can be produced by upper room UV, silently, safely and cost-effectively."*

Signify

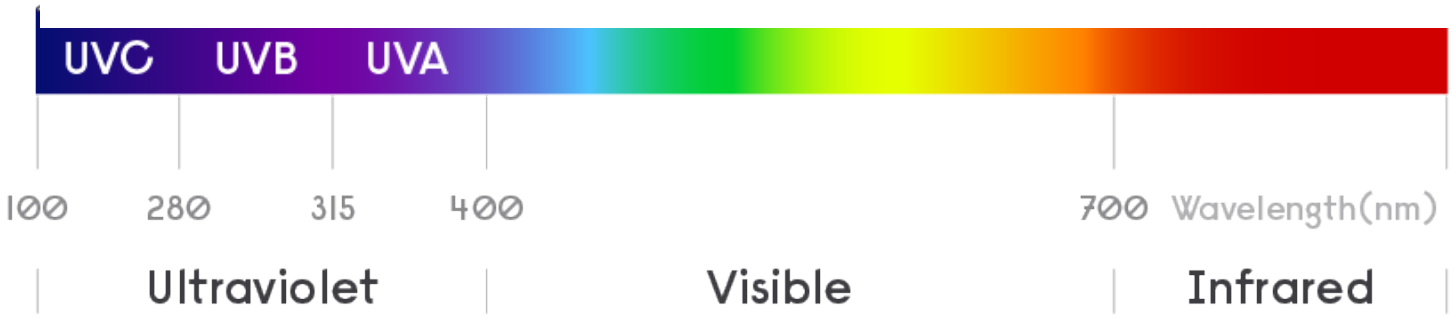
What is UV-C
&
how does it work?

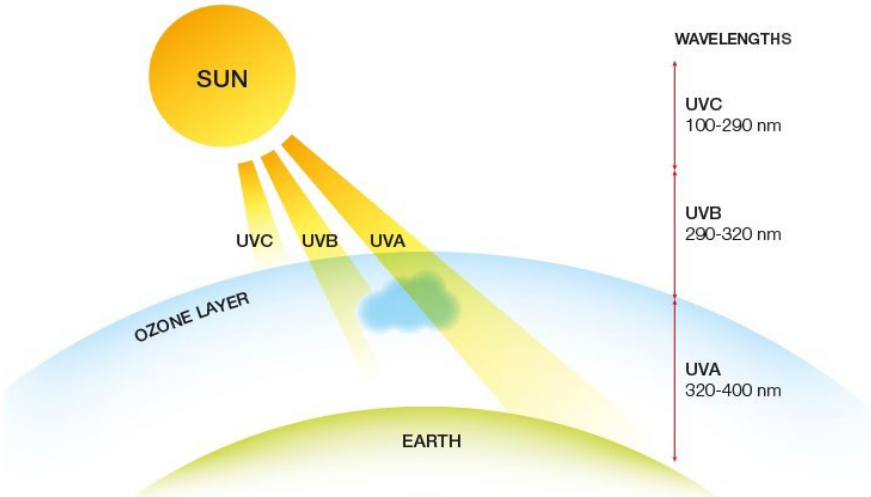
FROMM

What is UV-C?

UV stands for Ultraviolet. It is a wavelength of light that is invisible to human eyes. UV light can be subdivided into three categories:

UV-C 200 to 280 nm	UV-B 280 to 315 nm	UV-A 315 to 400 nm
For disinfection purposes and germicidal application	For medical use (i.e. phototherapy to treat skin conditions, including psoriasis)	For use with curing, suntanning, and insect traps





FROMM

Types of commercially available UV Light

(Far – UV)

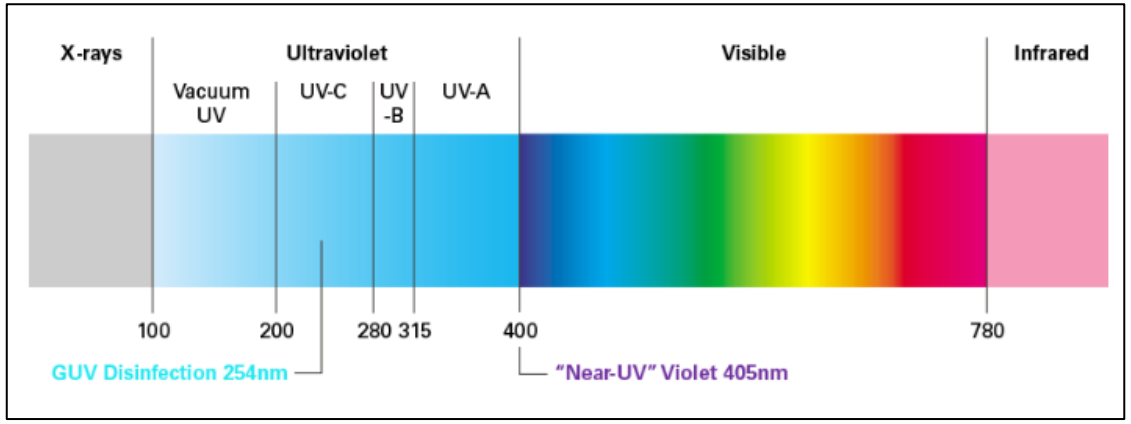
- 222nm
- Not visible light
- Kills bacteria
- Virus effect being tested
- Does not kill Mold, Fungi
- ***Exposure time is long***
- Lower exposure and ozone risks
- Technology Infancy
- *UL safety requirements same as 254nm*

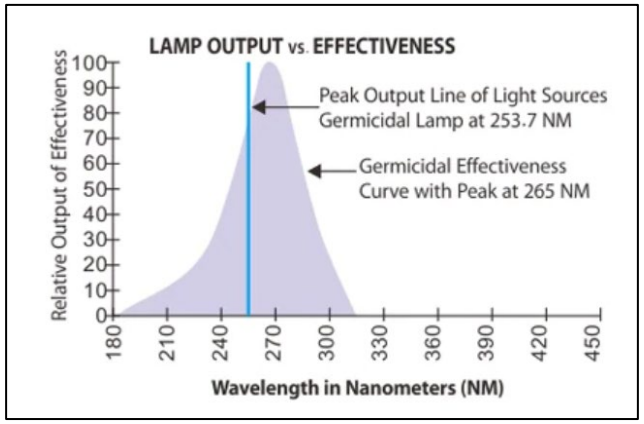
Germicidal UV-C (GUV)

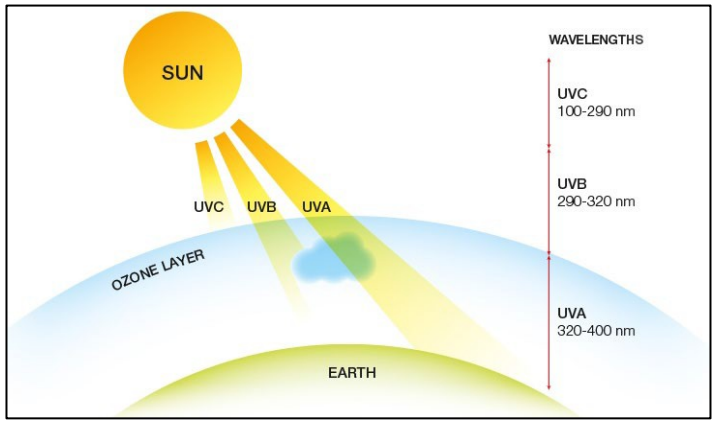
- 254nm
- Not visible light
- Kills bacteria & Inactivates viruses
- Kills mold and fungi
- Exposure time is short
- Highly effective
- Proven technology
- Exposure risk well documented

(Near – UV)

- 405 nm
- Visible light
- *Limited virus effect*
- Impacts on Mold and Fungi still being researched
- Slows bacteria growth
- *Requires long exposure time*







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- *UL safety req's updated, limited exposure*

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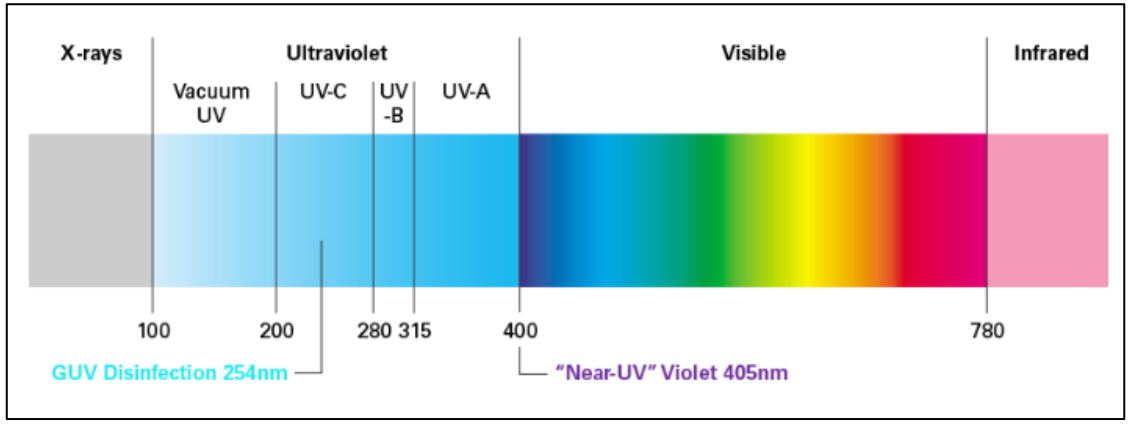

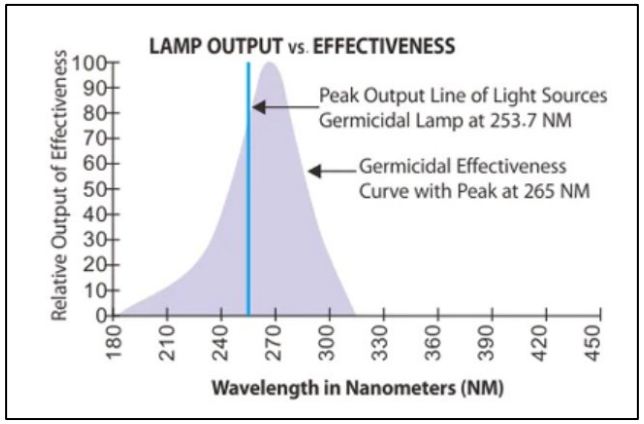

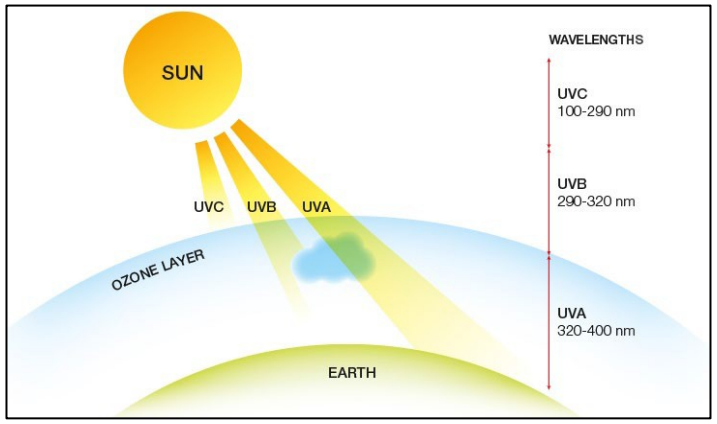

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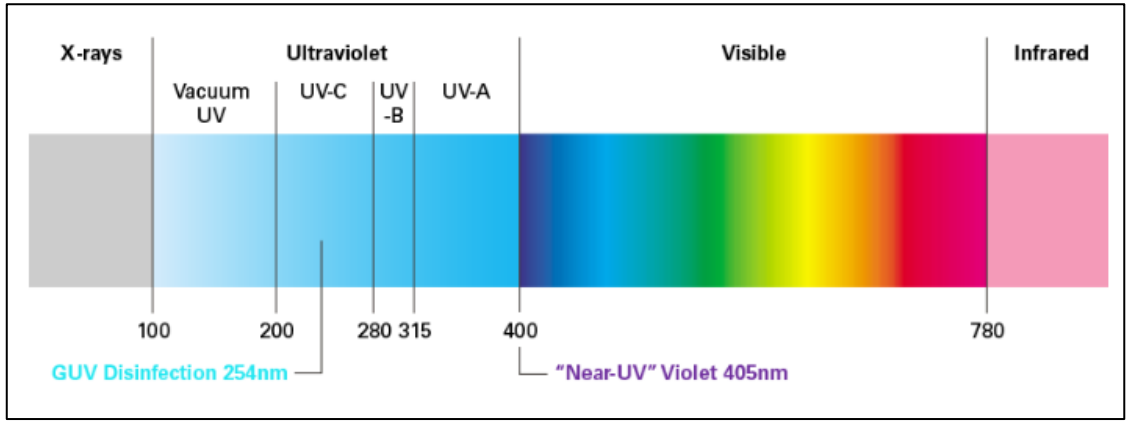
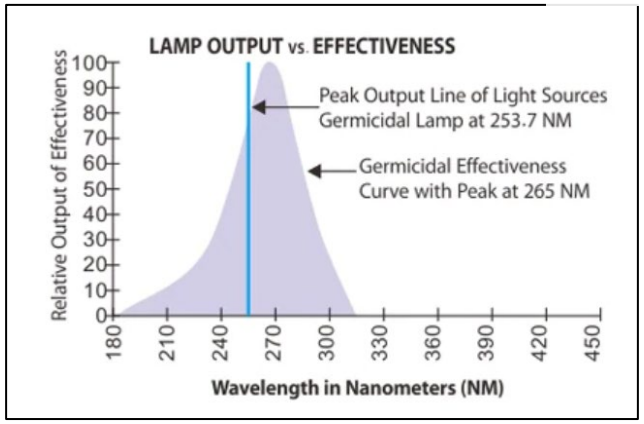
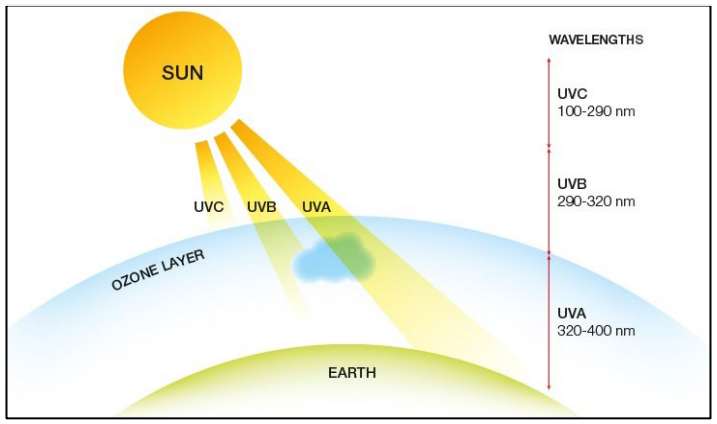


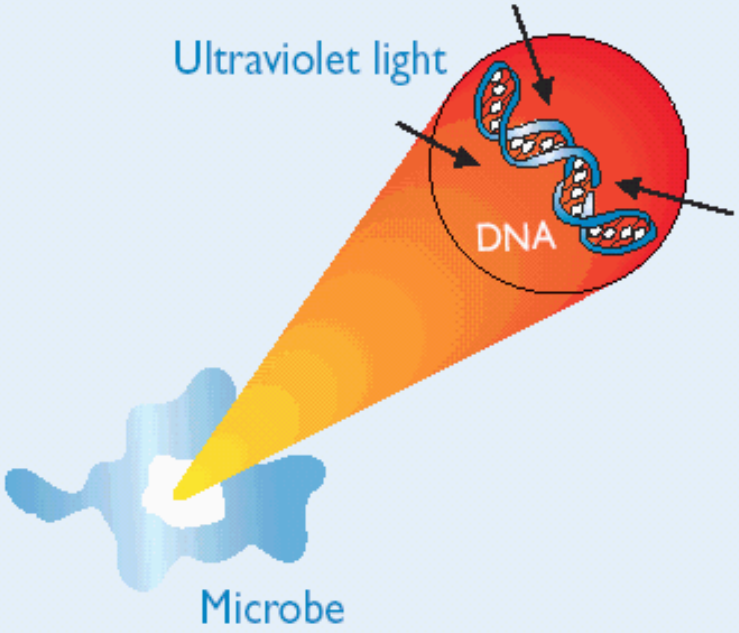




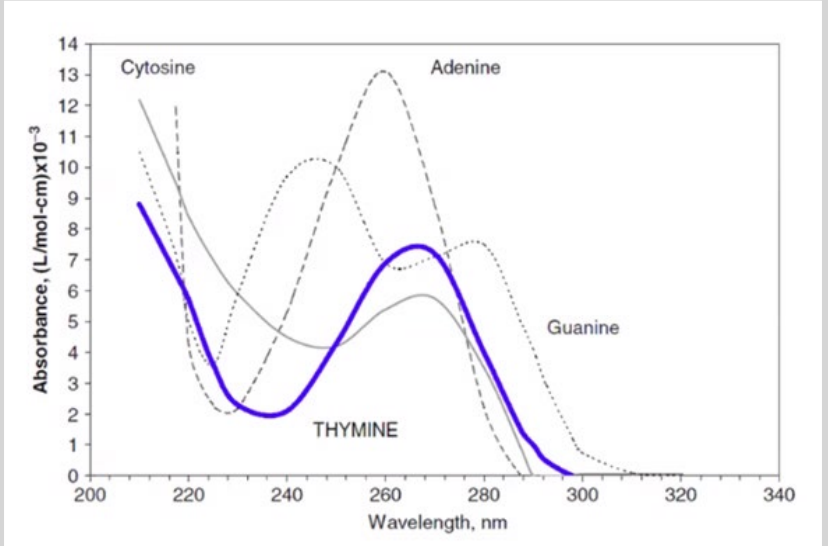
How does UV-C work?

- UV-C can breakdown the DNA and RNA of bacteria, viruses and spores – ***leaving them harmless.***
- To date, there are no known micro-organism that are resistant to UVC.[1]
- The peak output of traditional technology germicidal **UV-C products is (254nm)** which is close (80-85%) to the maximum effectiveness of **UV-C (260-265nm)**

Used extensively by scientists for over 40 years[2], UV-C is a known disinfectant for air, surfaces and water



Effectiveness of UV-C on DNA building blocks



[1] Fluence (UV Dose) Required to Achieve Incremental Log Inactivation of Bacteria, Protozoa, Viruses and Algae Revised, updated and expanded by Adel Haji Malayeri, Madjid Mohseni, Bill Cairns and James R. Bolton. With earlier contributions by Gabriel Chevrefils (2006) and Eric Caron (2006) With peer review by Benoit Barbeau, Harold Wright (1999) and Karl G. Linden

[2] EPA Report, "Building Retrofits for Increased Protection Against Airborne Chemical and Biological Releases" Pg. 56

Signify

Disinfection Products

UV-C Solutions
Surface Disinfection

Products

Air

UVC upper air Ceiling mount

UVC upper air wall mount

Surface

UVC Strips

UVC Highbays

Controls for Surface

Equipment

UV-C Chambers

Signify

Air Disinfection

Upper Air Luminaires

Testimonials

"We are aware that UV-C Wavelengths attack the microorganisms at molecular level, inactivating and destroying the contaminants. Therefore, this is part of our overall strategy. We have installed in our office upper-room disinfection luminaires, which are used because of the surrounding people working within the facility, installed at a height that prevents exposure to the UV-C light source."

- Stephen Burke, Construction Director, Forte Partners

EDEKA Clausen
Hamburg, Germany

- With the Coronavirus pandemic present, shopping brings some challenges. The last thing you would need, is to worry about your health and safety during shopping.
- The need for disinfection options - in particular for indoor air, but also for surfaces and equipment has increased significantly.
- A challenge that was faced by EDEKA Clausen supermarket in Hamburg to provide additional safety of customers and employees.
- EDEKA Clausen is the first supermarket in Germany to deliver an additional layer of protection with 31 Philips UV-C disinfection upper air luminaires installed to cover 1,315.70m2 large branch in Hamburg.
- As the upper air devices are equipped with shielding and optics to prevent exposure to UV-C radiation, employees can safely fill the shelves, and customers do their grocery shopping.

Coffee Beans – Korea

- With the Coronavirus pandemic present, outing brings its own challenges. The last thing you would need, is to worry about your health and safety during going out for wine and dine.
- The need for disinfection options - in particular for indoor air, but also for surfaces and equipment has increased significantly.
- A challenge that was faced by Coffee Beans Retail outlets in Korea to provide additional safety of customers and employees.
- Coffee Beans has 600 retail stores in Korea and plans to provide an additional layer of protection with Philips UV-C disinfection upper air luminaires installed in their first pilot store.
- As the upper air devices are equipped with shielding and optics to prevent exposure to UV-C radiation, employees can safely fill the shelves, and customers do enjoy their coffee with a piece of mind.

FROMM

Upper Air Disinfection

(Commercially available off-the-shelf, following installation safety guidelines & commissioning protocols)

Extended Duration

Close Proximity

Common Areas

ALKCO

Germicidal UV

2x2 Grid Ceiling Mount

ALKCO

Germicidal UV

Louvered Wall Mount

signify

FROMM

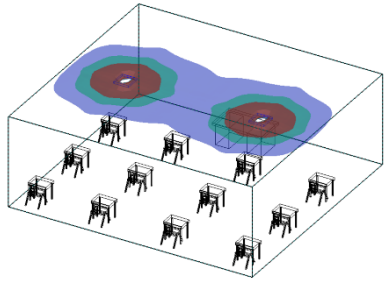
UV-C Solutions for
Upper Air Disinfection

Signify

2x2 Ceiling Mount

General Design Guidelines*

- Minimum 9' Ceiling Height
- Minimum 12' distance between fixtures
- Minimum 6' distance between fixture and wall
- Estimate of minimum 250sqft area of disinfection per fixture



2x2 Ceiling Mount

Product Specification:

- Available 2x2 Grid ceiling mount housing

-4 lamp 9 W PL-S Philips TUV
-White or black polyester powder coated steel housing

Video Duration: 1-min

UL CERTIFIED
SAFETY US·CA
SÛRETÉ US·CA
E517092

FROMM

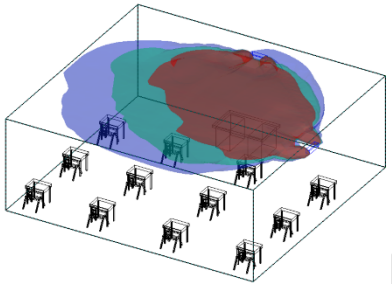
UV-C Solutions for Upper Air Disinfection

Signify

Louvered Wall Mount

General Design Guidelines*

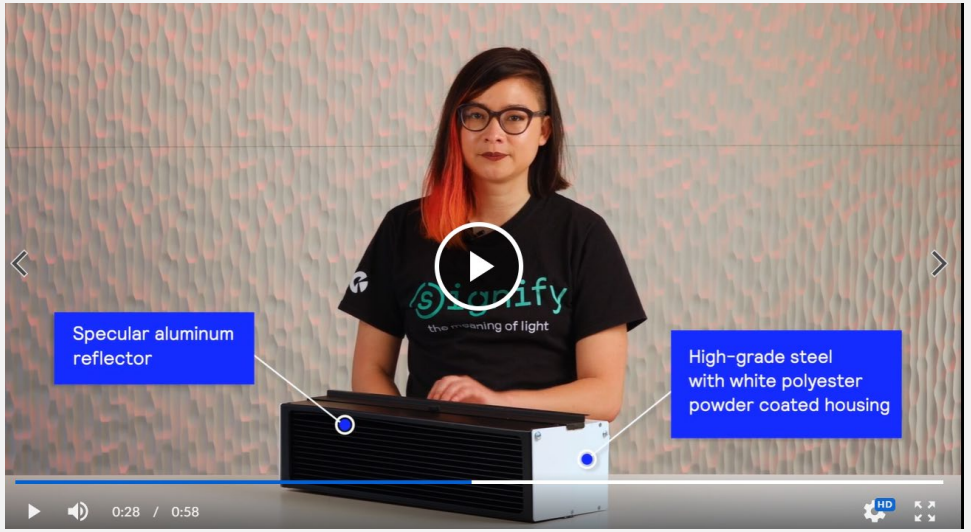
- Minimum 9’6” ceiling
- Minimum 8' 3" mounting height to bottom of fixture
- Minimum spacing between fixtures is 8'
- Recommended to not have obstructions or walls less than 20' in front of fixture
- Estimate of minimum 325sqft area of disinfection per fixture



Louvered Wall Mount

Product Specification:

- Available 22" white polyester powder coated housing (black optional)
- 1 lamp 20 W T5 Philips TUV
- Specular aluminum reflector
- Wall mounting plate provided



Video Duration: 1-min

FROMM

Upper Air Applications

Upper air disinfection for large areas and spaces where freestanding units are not viable

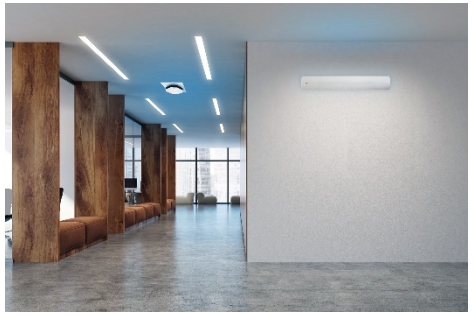
Restrooms

Classrooms

Athletic Facilities

Gymnasiums

Hallways



Cafeteria

Library

Break-out Rooms

signify

Signify

Surface Disinfection

Direct Luminaires

Spolem Stores
Ozorków, Poland

- To reduce the risk of spreading the virus, UV-C disinfection upper air devices were mounted on the ceilings. These continually emit UV-C radiation in the upper part of the store while still allowing customers to carry on shopping during their operation.
- To disinfect surfaces, UV-C battens were installed, which are automatically activated at night when no one is present. The whole installation was carried out the highest standards and UV-C radiation is measured to ensure maximum efficacy and safety
- UV-C disinfection devices reduce the risk of contamination to customers and employees of “Społem” stores and increase the safety and comfort of shopping. We believe the investment in Philips UV-C disinfection devices confirms the quality and the credibility of our brand - especially in such a difficult situation as the coronavirus pandemic. “Agnieszka Derlecka, President of “Społem” stores, Ozorków

FROMM

Direct Luminaires Surface Disinfection

(Controls & commissioning services required to meet UL guidelines)

Controls Required

ALKCO

Germicidal UV
High Bay

ALKCO

Germicidal UV
Strip

FROMM

Surfaces

Surface disinfection as part of a multi-step mitigation approach to reducing bacterial and viral transmissions

Restrooms	Athletic Facilities (lockeroom)	Gymnasiums	Break-out Rooms

Signify

Equipment

Shared Equipment
Disinfection Chambers

FROMM

Once BioShift® germicidal chamber – Shared Equipment Disinfection

Small chamber

- 254 nm UV-C
- 20W (4 UV-C lamps)
- 530 L x 495 W x 495 H mm
- 50 kg
- ideal for daily disinfection of pathogens on everyday items

Large chamber

- 254 nm UV-C
- 40W (18 UV-C lamps)
- 1119 L x 535 W x 1695 H mm
- 180 kg
- Ideal for facilities or entrances with a higher volume of people or devices

- Effective
- Easy-to-use
- Properly sealed
- Immediate
- Durable

Deactivates a wide range of pathogens in a recommended time of 5 minutes.

Application areas:

All indoor applications:

Faculty, Library, Athletic, and Laboratory Equipment

signify

Signify

Usage Guidelines

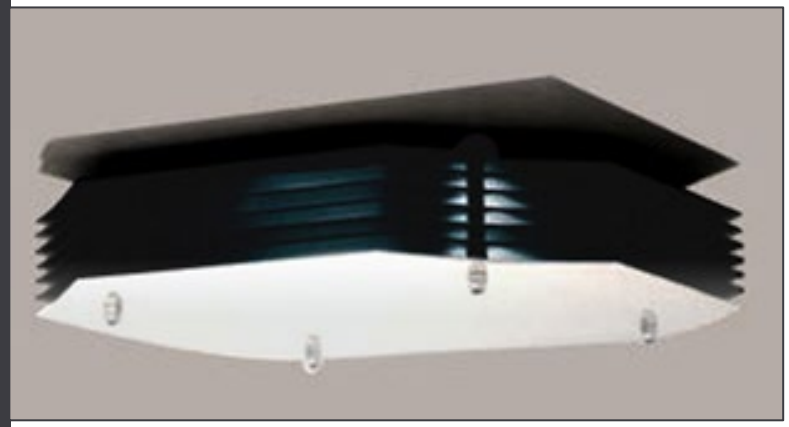
UL, Commissioning, & Controls

FROMM

UL Certification Compliance

Ensuring a safe application

Underwriters Laboratories has developed a set of standards solely for the purpose of establishing requirements for the safe and effective installation and operation of UV-C luminaires and solutions.



UL 1598 Safety Certified Germicidal UV system

Compliance on measurement technique to ensure safety

- ✓ Measurement in accordance with IEC 62471
- ✓ Defining the risk group as per IEC TR 62471-2
- ✓ Guidance on minimum mounting height
- ✓ Peak emission value irradiance measurement to assist installers with site planning.
- ✓ Requisite labeling and installation instructions.
- ✓ Guidance instructions on installation, operation, maintenance, and personal protective equipment for service personal in line with UL regulations
- ✓ Specify installer site planning responsibilities.

Testing requirement : The equipment shall be offset from its intended mounting surface angle by 1 degrees whenever such an offset is likely to produce a more severe test result

FROMM

Upper Air – Installation Commissioning Guide

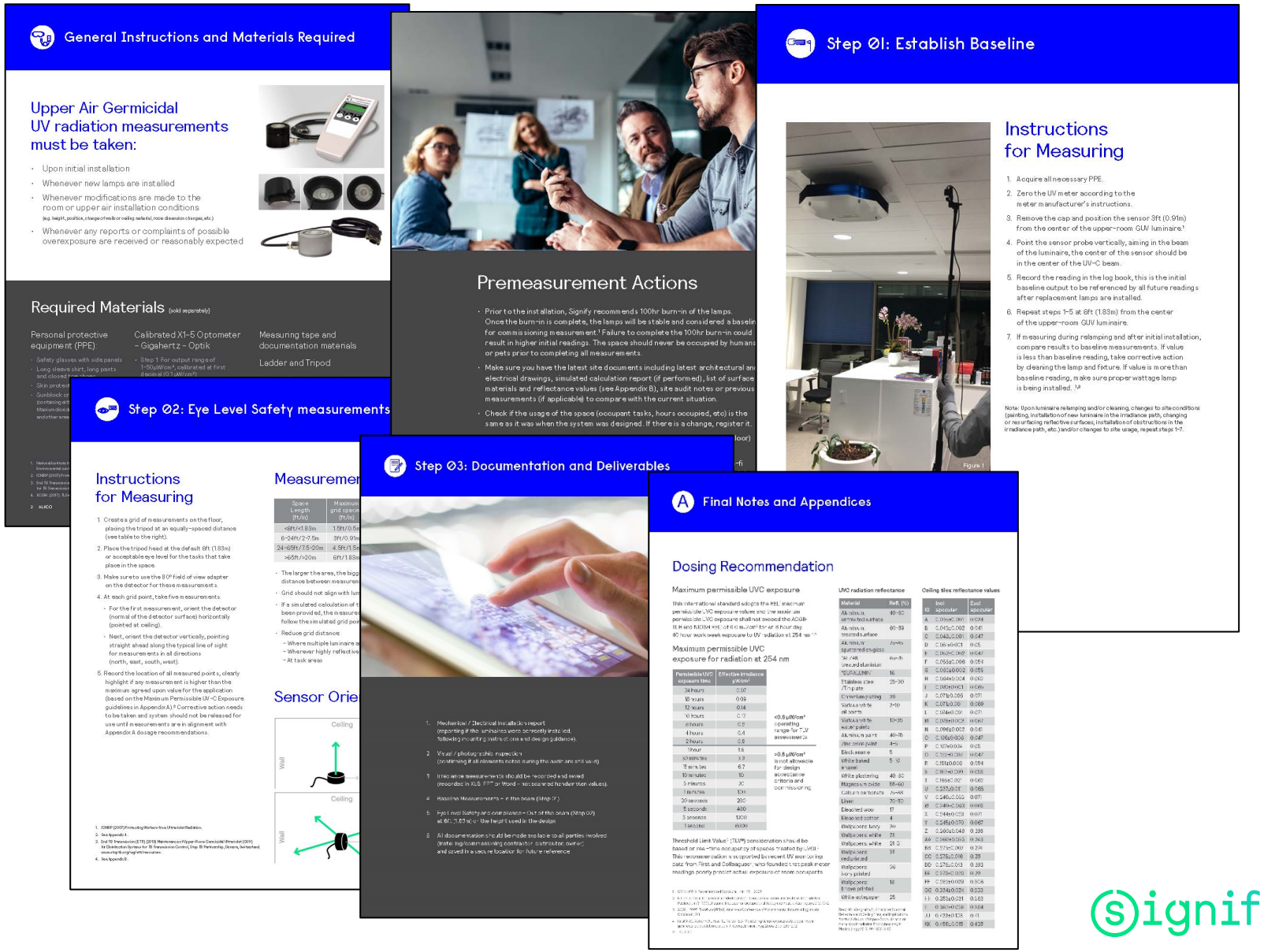
General Instructions and Materials Required

Step 01: Establish Baseline

Step 02: Eye Level Safetymeasurements

Step 03: Documentation and Deliverables

Final Notes and Appendices



Signify

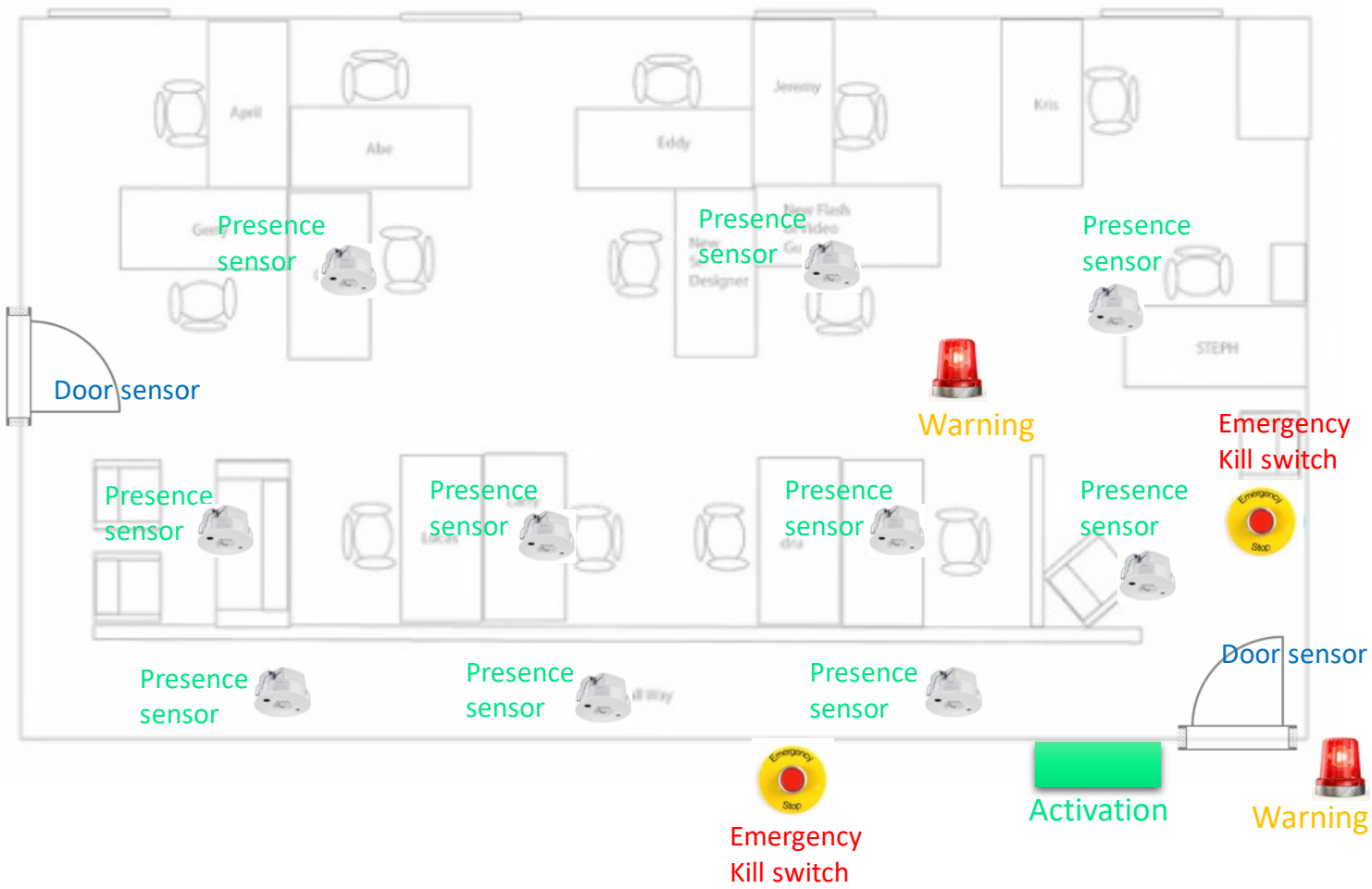
Direct UV-C Luminaire Controls to Ensure Occupant Safety

UV-C controls are fitted per room to prevent usage with people present

The responsibility to switch the UV-C lighting ON lies ***with an authorized operator.***

Key UV-C Control Components:

- Authorized Activation Panel
  - Luminaire on/off control
  - Protection checks
  - Status feedback
- Presence sensor: Independent mount
- Door sensor
- Emergency kill switch
- Activation warning (light or sound)




signify


FROMM