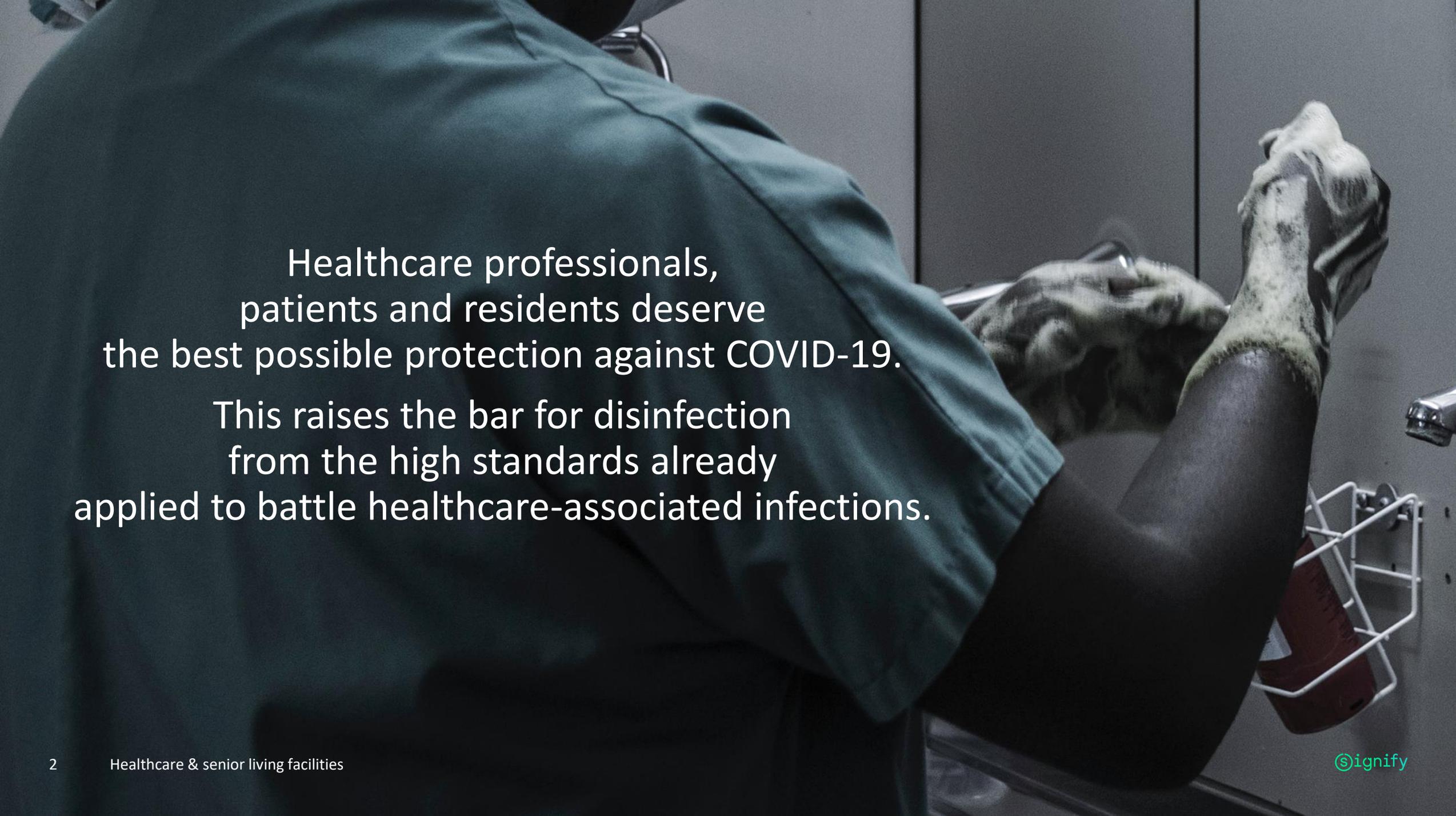




Enhancing safety and confidence with UV-C disinfection

Healthcare and senior living facilities | June 2020

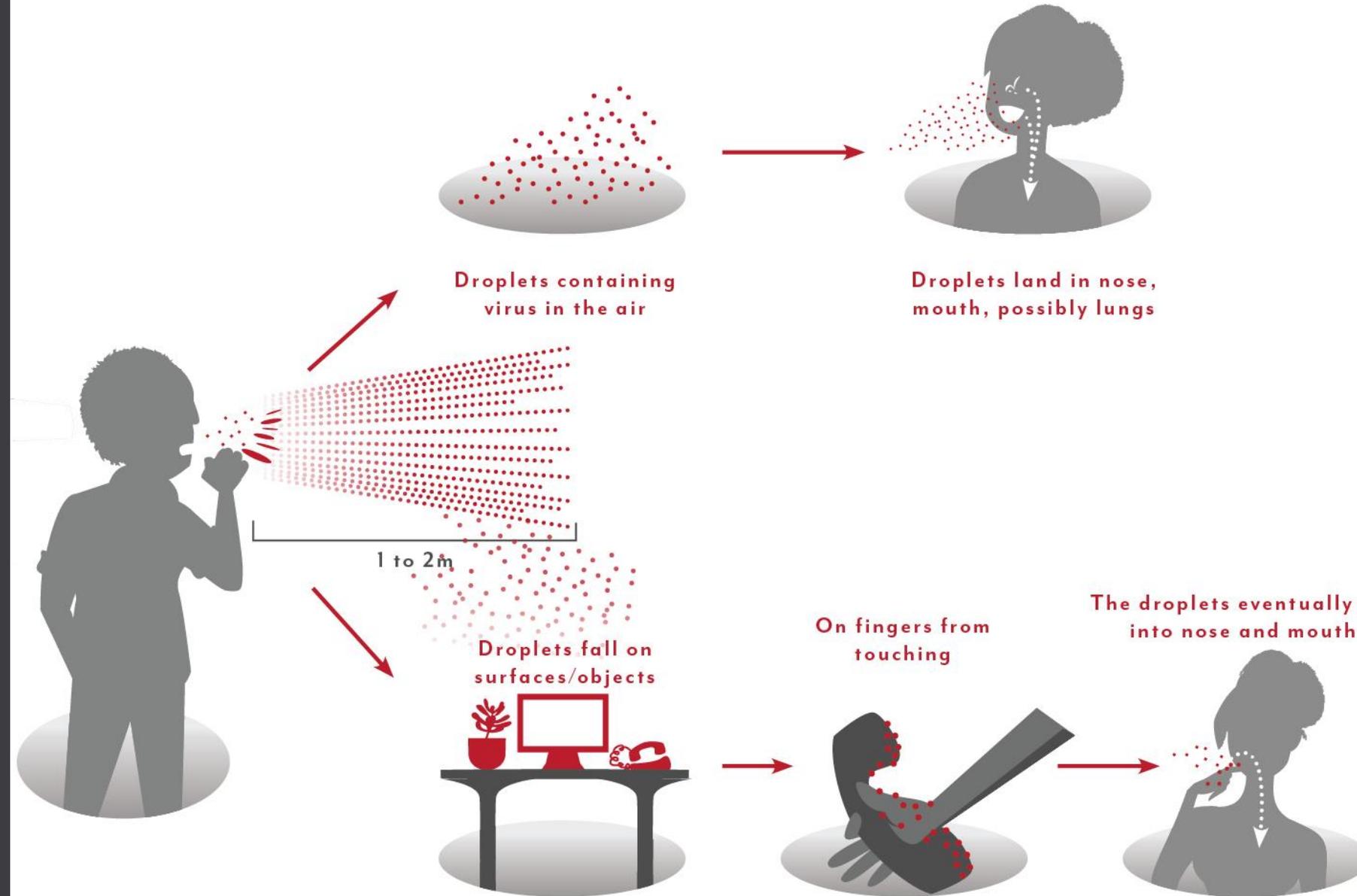
A healthcare professional in green scrubs is shown from the back, washing their hands at a sink. The hands are covered in white soap suds. The background is a plain, light-colored wall.

Healthcare professionals,
patients and residents deserve
the best possible protection against COVID-19.

This raises the bar for disinfection
from the high standards already
applied to battle healthcare-associated infections.

Virus transmission occurs through:

1. Direct air-borne transmission **between people**
2. Indirect air-borne transmission through **air flows**
3. Indirect surface-borne transmission via **contaminated surfaces**



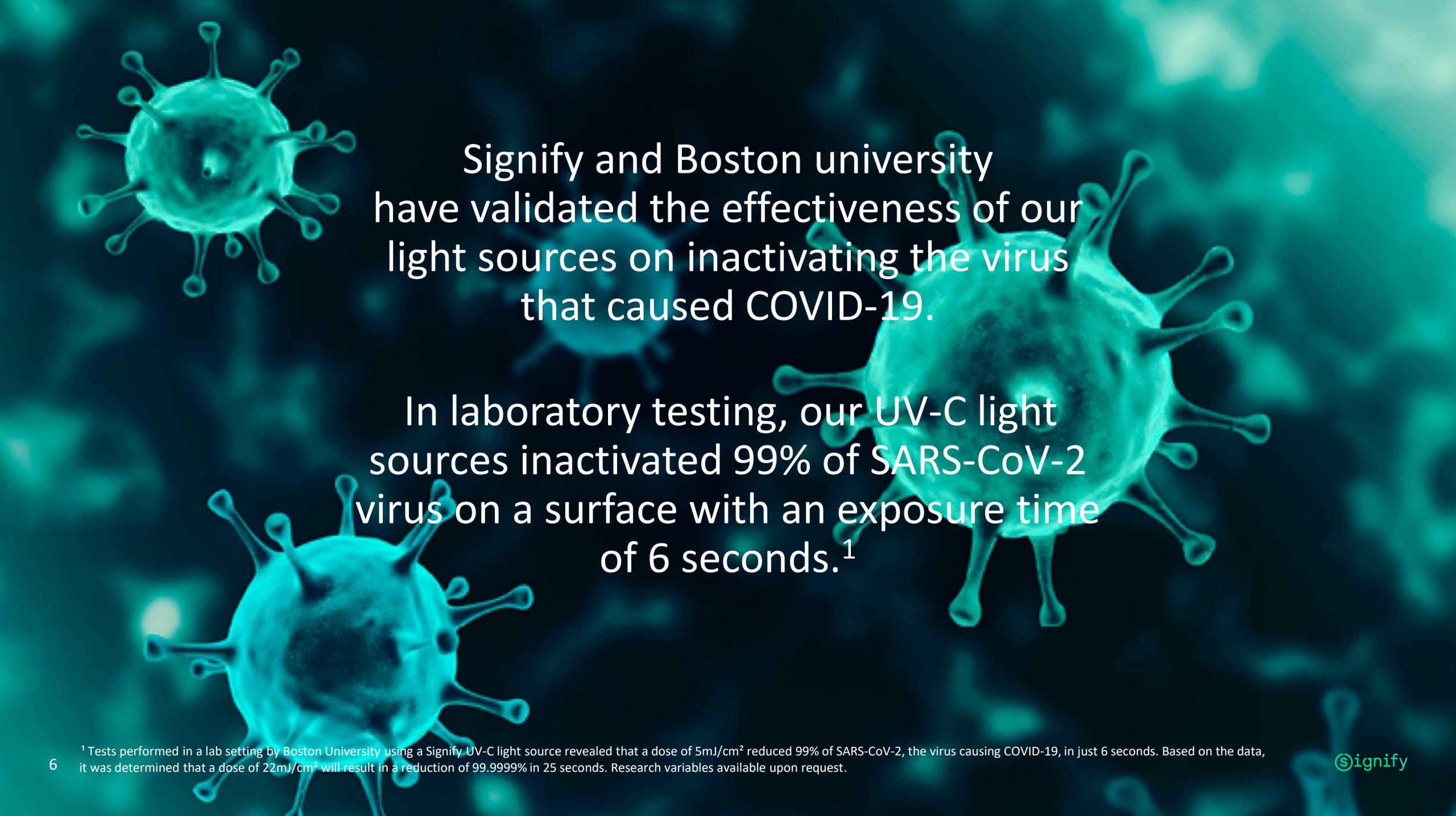
That's why air and surface
disinfection are important in
protecting the health of patients,
residents and staff

UV-C light

has the power
to disinfect



We are building on 35 years experience providing solutions to disinfect spaces with light, we are ready to help you protect your staff, patients, visitors and residents.



Signify and Boston university
have validated the effectiveness of our
light sources on inactivating the virus
that caused COVID-19.

In laboratory testing, our UV-C light
sources inactivated 99% of SARS-CoV-2
virus on a surface with an exposure time
of 6 seconds.¹

¹ Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Based on the data, it was determined that a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds. Research variables available upon request.

UV-C disinfection

How can UV-C light support effective disinfection?



Trusted

UV-C disinfection is a proven technology for over 40 years



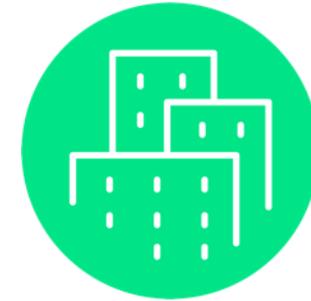
Effective

All bacteria and viruses tested to date respond to UV-C disinfection¹



Fast

UV-C can disinfect surfaces and objects in minutes



Versatile

UV-C can be used in numerous applications

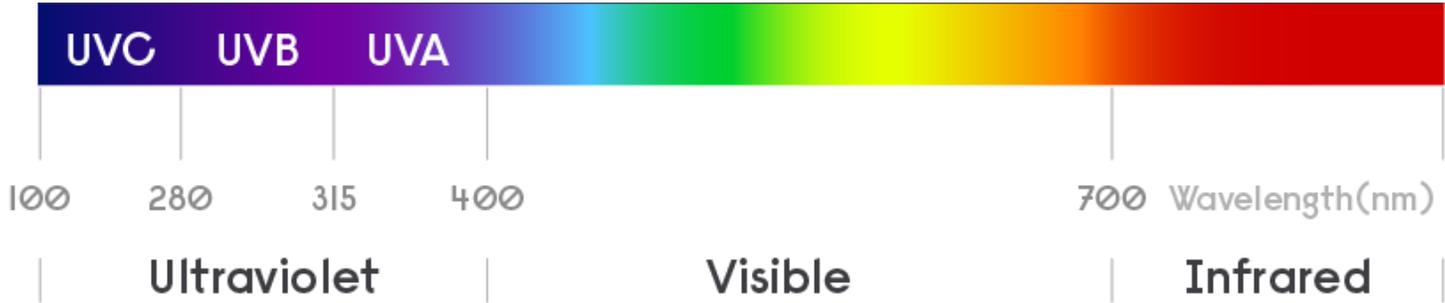
UV-C is typically used as part of a multi-barrier protection approach

¹Fluence (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 Chevretils (2006) and Eric Caron (2006) With peer review by Benoit Barbeau, Harold Wright (1999) and Karl G. Linden

What is UV radiation?

Ultraviolet (UV) light is invisible to human eyes. It can be subdivided into three categories:

UV-C from 200 to 280 nm	UV-B from 280 to 315 nm	UV-A from 315 to 400 nm
<ul style="list-style-type: none">For disinfection purposes and germicidal application	<ul style="list-style-type: none">For medical use (i.e. phototherapy to treat skin conditions, including psoriasis)	<ul style="list-style-type: none">For use with curing, suntanning and insect traps.



How does it work?

- UV-C radiation can **break the DNA and RNA** of bacteria, viruses and spores, meaning that they leave them harmless. **All bacteria and viruses tested to date respond to UV-C disinfection.**¹
- UV-C technology has been used **safely and effectively** in hospitals and governmental buildings for more than **40 years**²
- Most UV-C solutions **utilize conventional lighting**, with LED now improving in efficiency
- The **peak output of our germicidal lamps (253.7nm)** is close to the maximum effectiveness of UV-C (265nm)

¹Fluence (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 Chevretils (2006) and Eric Caron (2006) With peer review by Benoit Barbeau, Harold Wright (1999) and Karl G. Linden

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

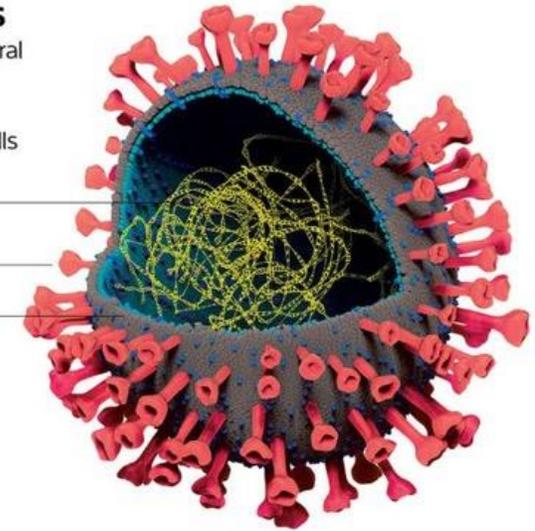
Anatomy of a virus

The covid-19 virus has several features we may be able to target with drugs to break it down and stop it entering cells

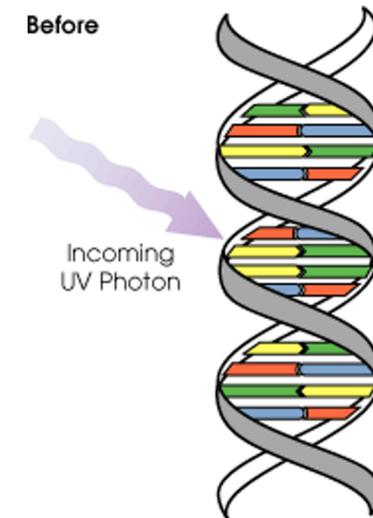
RNA enclosed in protein

Spike protein

Lipid membranes



Before



After



UV-C solutions have been tested to neutralize the following pathogens:

- Adenovirus type 15
- Bacillus anthracis spores - Anthrax spores
- Candida
- Clostridium tetani
- Salmonella typhimurium
- Calicivirus feline
- Giardia lamblia
- Porcine Epidemic Diarrhea
- Porcine Respiratory and Reproductive Syndrome
- Influenza
- Staphylococcus aureus
- Salmonella enteritidis
- Cryptosporidium parvum
- Legionella pneumophila
- Rabies virus
- Escherichia coli - O157:H7
- Campylobacter jejuni
- Canine Parvovirus
- Bovine Coronavirus (BCV)

Full overview can be found on: www.philips.com/uv-c

Micro-organisms effective resistance to UV-C radiation varies considerably.

Moreover, the environment of a particular micro-organism greatly influences the radiation dose needed for its destruction.



Proven effectiveness on inactivating the virus that caused COVID-19

- The National Emerging Infectious Diseases Laboratories (NEIDL)¹ at Boston University in the US have conducted research that validates the effectiveness of Signify's UV-C light sources on the inactivation of SARS-CoV-2, the virus that causes COVID-19.
- During their research they have treated inoculated material with different doses of UV-C radiation coming from a Signify light source and assessed the inactivation capacity under various conditions.
- **In laboratory testing, our UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.**¹
- Based on the data, it was determined that **a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds.**²

¹ Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Research variables available upon request.

² Dr. Griffiths' team develops vaccines and therapeutics for Risk Group 3 and 4 viruses, which include organisms that can cause serious or deadly diseases in humans

'Our test results show that above a specific dose of UV-C radiation, viruses were completely inactivated: in a matter of seconds we could no longer detect any virus.'

Dr. Anthony Griffiths, Associate Professor of Microbiology at Boston University School of Medicine

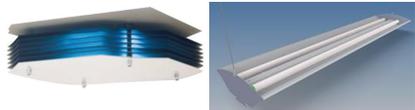
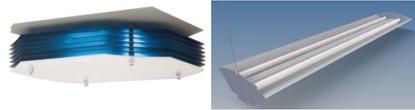
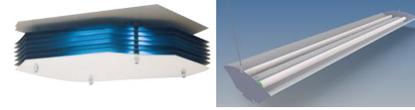


Using UV-C in a safe way

- Like any disinfection system, UV-C lamps and devices must be used properly to be safe.
- UV-C light can cause a severe sunburn-like reaction to your skin and similarly, could damage the superficial tissue of eye (photo keratitis), if exposed ... this is very painful. It is, therefore, key that people are always shielded from direct radiation.
- All products need to follow the standard product safety releases and approbations.
- All products require at least -
 1. An Instructional Safeguard **and...**
 2. A Time Safeguard, **or** an Equipment Safeguard, **or** a Containment Safeguard



Which safeguards are needed

	UV-C safeguard	Upper air disinfection	Open luminaires	Carts & robots	Cabinets, closed air/ HVAC disinfection units
					
Instructional safeguard					
And					
Time safeguard	Recommended only for Risk Group 1 and 2 (low exposures) Signify products do not fall in these groups. Timers may be secondary safeguards in all applications				
Or					
Closed enclosure	—	—	—	—	
Or					
Partially closed enclosure		 In combination with a reflector	—	—	—
Or					
Presence detection: Detects static as well as dynamic presence	—			—	—
Or					
Controlled access locations + training					

Instructional Safeguard is always required. Combination safeguards is allowed and will improve the safety, but at least one is strictly required
Further details can be found in GLA UV-C safety guide.

Why use UV-C as disinfectant?



Reduce exposure for staff, residents, patients and visitors



Make staff, residents, patients and visitors feel better protected



Save cost by reducing disinfection cycle time



Prevent excessive spending on chemical sanitizers

Applications, recommendations, solutions

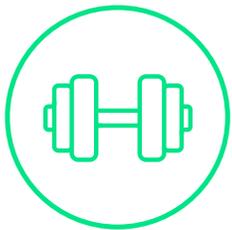
Healthcare applications



Resident apartments



Lobbies & public areas



Gym & exercise



Staff, patient & resident devices

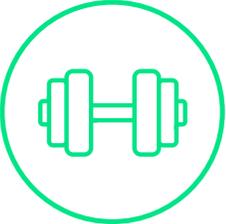


Mail & deliveries

UV-C applications in healthcare and senior living



Lobbies & public spaces



Gyms



Resident apartments



Staff & resident devices



Mail & deliveries

Surface disinfection solutions	✓	✓	✓		
Air disinfection solutions	✓	✓	✓		
Object disinfection solutions		✓		✓	✓



Surface disinfection Applications

When someone coughs or exhales, they release droplets of fluid. Most of these droplets fall on nearby surfaces and objects - such as desks, tables or telephones.

If the person is carrying a virus, other people could become infected by touching contaminated surfaces or objects, then touching their eyes, nose or mouth.

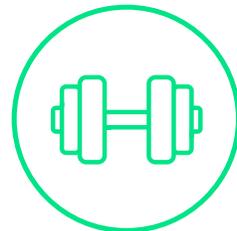
Source: World Health Organization



Lobbies, waiting rooms and other public areas (Hospitals, Senior Living)

Public spaces carry a high volume of people increasing the risk of a carrier passing through.

UV-C can be used to for a full disinfection of these areas outside of opening hours, such as overnight, to supplement existing cleaning processes.



Gyms and exercise (Hospitals, Senior Living)

Gyms are both high contact areas and due to physical activity have higher levels of exhalation.

UV-C can be applied to conduct a full disinfection of these areas outside of opening hours, such as overnight, to supplement existing cleaning processes. In addition, upper air disinfection in high ceiling as well as low ceiling environments can be applied while people are present. As well, UV-C chambers can be used to disinfect small equipment such as dumbbells, matts, etc.



Resident apartments (Senior Living)

Adding UV-C as new disinfection method can be suitable in case room surfaces cannot be cleaned with chemicals to ensure disinfection or in case you want to raise the levels of confidence in room disinfection.



Surface disinfection Solutions

UV-C battens

- A fixed installation of luminaires on the ceiling are used at controlled times to fill a room or enclosed space with disinfecting UV-C radiation
- In laboratory testing, Signify's UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.¹
- Provides disinfection outside of opening hours for high contact areas such as gyms, leisure or back of house prep areas

Coverage

- To ensure adequate coverage, our design team can help to create a layout with placements for your space

Safety

- ✓ Multiple safeguard options to be considered as a system
- ✓ Multiple, redundant occupancy detection methods to be designed in:
 - Occupancy sensors in the space deactivate the system if someone is present during operation
 - Door sensors at each entrance provide a further deactivation trigger in case anyone tries to enter the space during operation
 - Visible and audible triggers can be used during operation



Asian version



European version



Controls

Safe control system for UV-C surface cleaning: Authorized activation with sensor monitoring, door monitoring and emergency override.



Availability – Presale consultation available now

✓	APAC, MET & China	Available
✓	Europe	Q3'20
✓	Americas	Q3,'20, US & Canada require UL approbation by site or application

¹Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Based on the data, it was determined that a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds. Research variables available upon request.



Surface disinfection Solutions

UV-C trolley

- ✓ 360 degree UV-C exposure to ensure disinfection of all surfaces within line of sight
- In laboratory testing, Signify's UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.¹

Coverage

- Designed to disinfect up to 30sqm of surfaces in line of sight²
- Multi arm options are available to cover larger areas

Safety

- ✓ Timer to plan disinfection for a predefined period.
- ✓ Remote control - staff can safely position and leave before disinfection is started
- ✓ Motion sensors - automatically stop disinfection if someone enters within range of the sensors

Availability

✓	APAC, MET & China	Pre-order July, delivery from August '20
–	Europe	n/a
–	Americas	n/a



¹ Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Based on the data, it was determined that a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds. Research variables available upon request.

²Detailed design and effectiveness guidelines are being finalized, we will publish product guides soon



Air disinfection Applications

Viruses, bacteria, or fungi can also be airborne, spreading through breathing, talking, coughing, sneezing, raising of dust or any activities which generate aerosol particles.

Heating, cooling and air circulation in your spaces can further distribute airborne bacteria.



Lobbies, waiting rooms and other public areas (Hospitals, Senior Living)

Public spaces carry a high volume of people increasing the risk of a carrier passing through.

Throughout normal hours, you can also disinfect the upper air to avoid the recirculation of viruses and bacteria.



Gyms and exercise (Hospitals, Senior Living)

Gyms are both high contact areas and due to physical activity have higher levels of exhalation.

You can help to protect the transmission of viruses and bacteria in these spaces both through surface and air disinfection with UV-C.



Resident apartments (Senior Living)

Adding UV-C as new disinfection method can be suitable in case room surfaces cannot be cleaned with chemicals to ensure disinfection or in case you want to raise the levels of confidence in room disinfection.



Air disinfection Solutions

UV-C upper air luminaires

- Place into circulation to disinfect the air with UV-C
- In laboratory testing, Signify’s UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.¹
- Allows disinfection of air while business activity continues

Coverage

- Ceiling and wall mounted options to suit your layout
- To ensure effective coverage, our team can design a layout for your space

Safety

- ✓ Positioned above the highest door in a room and at a minimum height of 2.3m, out of the reach of people to disinfect the air at this level as it circulates
- ✓ Integrate with Interact to enable scheduled operation, remote control and monitoring

Availability – Presale consultation available now

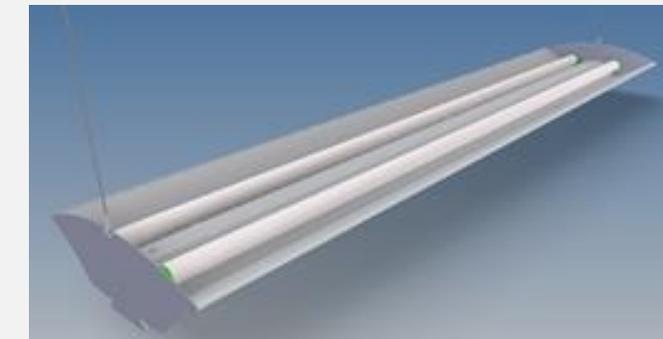
✓	APAC, MET & China	Q3 '20
✓	Europe	Q3 '20
✓	Americas	Q3 '20 US & Canada may require UL approbation by site or application



European version



European version



North America version

¹ Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Based on the data, it was determined that a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds. Research variables available upon request.



Air disinfection Solutions

Portable UV-C air disinfection

- Integral fans create air circulation, disinfecting the air with UV-C
- In laboratory testing, Signify’s UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.¹

Coverage

- Ideal for apartments, small meeting rooms, private office spaces and spa treatment rooms
- Designed to disinfect and circulate the air in spaces of 20-40 sqm²

Safety

- ✓ UV-C radiation is sealed inside and cannot reach a person’s eye or skin
- ✓ Timer to plan disinfection for a pre-defined period

Availability

✓	APAC, MET & China	Pre-order July, delivery from August '20
–	Europe	n/a
–	Americas	n/a



Product image for reference only, product design being finalized

¹ Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Based on the data, it was determined that a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds. Research variables available upon request.

² Detailed design and effectiveness guidelines are being finalized, we will publish product guides soon



Object disinfection Applications

Viruses can live on surfaces for up to 5 days, so devices which come in to either regular contact or are shared between multiple people can provide a higher risk.

Introducing a disinfection process to your daily cycle of item reuse and recharging helps ensure that viruses and bacteria are inactivated.



Staff and resident devices (Senior Living)

Everyday your staff bring their own devices in, as well as use ones you issue them with. As shared devices, these devices carry a risk of surface transmission between staff members. Viruses can live on glass surfaces such as that on smart devices, for up to 5 days.

Placing the devices in a UV-C chamber ensures a much faster and thorough sanitization process than sanitization wipes.



Deliveries (Hospitals, Senior Living)

Deliveries have touched many hands before they arrive at your doorsteps. Although the Covid-19 virus reportedly doesn't survive longer than 24 hours on cardboard additional disinfection measures, like exposure to UV-C, can be considered.

Placing the packages in a UV-C chamber ensures a much faster and thorough sanitization process than sanitization wipes.



Object disinfection Solutions

Once BioShift® germicidal chamber

- Inactivates the majority of viruses in a recommended five-minute disinfection cycle*
- Rugged shelving supports heavy items
- Pass-through lockout protects against accidental exposure
- Heavy-duty stainless-steel chamber
- Chemical-free disinfection
- Two formfactors; Small (600 mm H x 585 mm L x 750 mm W) and Large (1828 mm H x 1180 mm L x 762 mm W)

Safety

- ✓ To ensure sufficient dose is provided in the BioShift®, the controller can frequently sample the UV dose. UV dosimeter card is placed in the center of the unit, and the 'dose test' is run via the maintenance screen



Availability

✓	GCGM	Available
✓	Europe	Available
✓	NA	Available



Home Screen Components

- (1) Disinfection Time Display
- (2) Chamber Start / Stop
- (3) Chamber Status
- (4) Settings
- (5) Maintenance



Settings Screen Components

- (1) View Set Lamp Cycle
- (2) Set Lamp Cycle
- (3) Set Sleep Time
- (4) Expired Lamp Life
- (5) Contact ONCE®



Maintenance Screen Components

- (1) View Lamp Life Remaining
- (2) Reset Lamp Life
- (3) View Lamp Replacement Info
- (4) Run 100mJ/cm² Dose Test
- (5) Run 250mJ/cm² Dose Test
- (6) Run 1000mJ/cm² Dose Test

*<https://www.once.lighting/one-minute-three-minutes-or-ten-minutes-oh-my/>



Object disinfection Solutions



Large UV-C chamber

- In laboratory testing, Signify's UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.¹
- Height of 1700 mm (323 liters)

Safety

- ✓ Heavy-duty stainless-steel chamber
- ✓ Pass-through lockout protects against accidental exposure

Availability

✓	APAC, MET & China	Q3 '20
–	Europe	n/a
–	Americas	n/a



Medium UV-C chamber

- In laboratory testing, Signify's UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.¹
- Height of 600 mm (112 liters)

Safety

- ✓ Heavy-duty stainless-steel chamber
- ✓ Pass-through lockout protects against accidental exposure

Availability

✓	APAC, MET & China	Q3 '20
–	Europe	n/a
–	Americas	n/a



Small UV-C chamber

- In laboratory testing, Signify's UV-C light sources inactivated 99% of SARS-CoV-2 virus on a surface with an exposure time of 6 seconds.¹
- Height of 450 mm (66 liters)

Safety

- ✓ Heavy-duty stainless-steel chamber
- ✓ Pass-through lockout protects against accidental exposure

Availability

✓	APAC, MET & China	Q3 '20
–	Europe	n/a
–	Americas	n/a

¹ Tests performed in a lab setting by Boston University using a Signify UV-C light source revealed that a dose of 5mJ/cm² reduced 99% of SARS-CoV-2, the virus causing COVID-19, in just 6 seconds. Based on the data, it was determined that a dose of 22mJ/cm² will result in a reduction of 99.9999% in 25 seconds. Research variables available upon request.



Control Solutions



Control systems

- The Philips Dynalite UV-C control system ensures that an **authorized operator** can manage the UV-C solution for optimal safety.
- By incorporating **multiple mechanical and network safety features**, the control system provides confidence that the UV-C devices will be operated in a safe way and that the appropriate UV-C dosage is applied.

Safety

- ✓ Constant monitoring to ensure that no occupant will be directly exposed to the UV-C lamps
- ✓ Ensure that the correct conditions have been met for an authorized user to begin the UV-C cycle

Redundancy

- Mechanically isolated switches ensure the automated system cannot self-trigger a cycle and that - if required - an emergency stop button will cut power to the UV-C lamps
- The system checks its own network sensors and inputs to ensure that no network device has gone off-line which would lead to a false indication of occupancy status

Simple to deploy

- A single box solution
- Use of industry standard dry contact inputs reduce complexity of installation
- Network sensors are configured for self-discovery so no need for any on-site configuration

Availability – Presale consultation available now

✓	GCGM	Q3 '20
✓	Europe	Q3 '20
✓	NA	Q3 '20

Ease of use

- The control cabinet gives a clear info on the status of the different input conditions
- The only requirement is to set the disinfection time via the Antumbra Display panel mounted on the outside and key operation to begin the cycle; All other process are automated and monitored

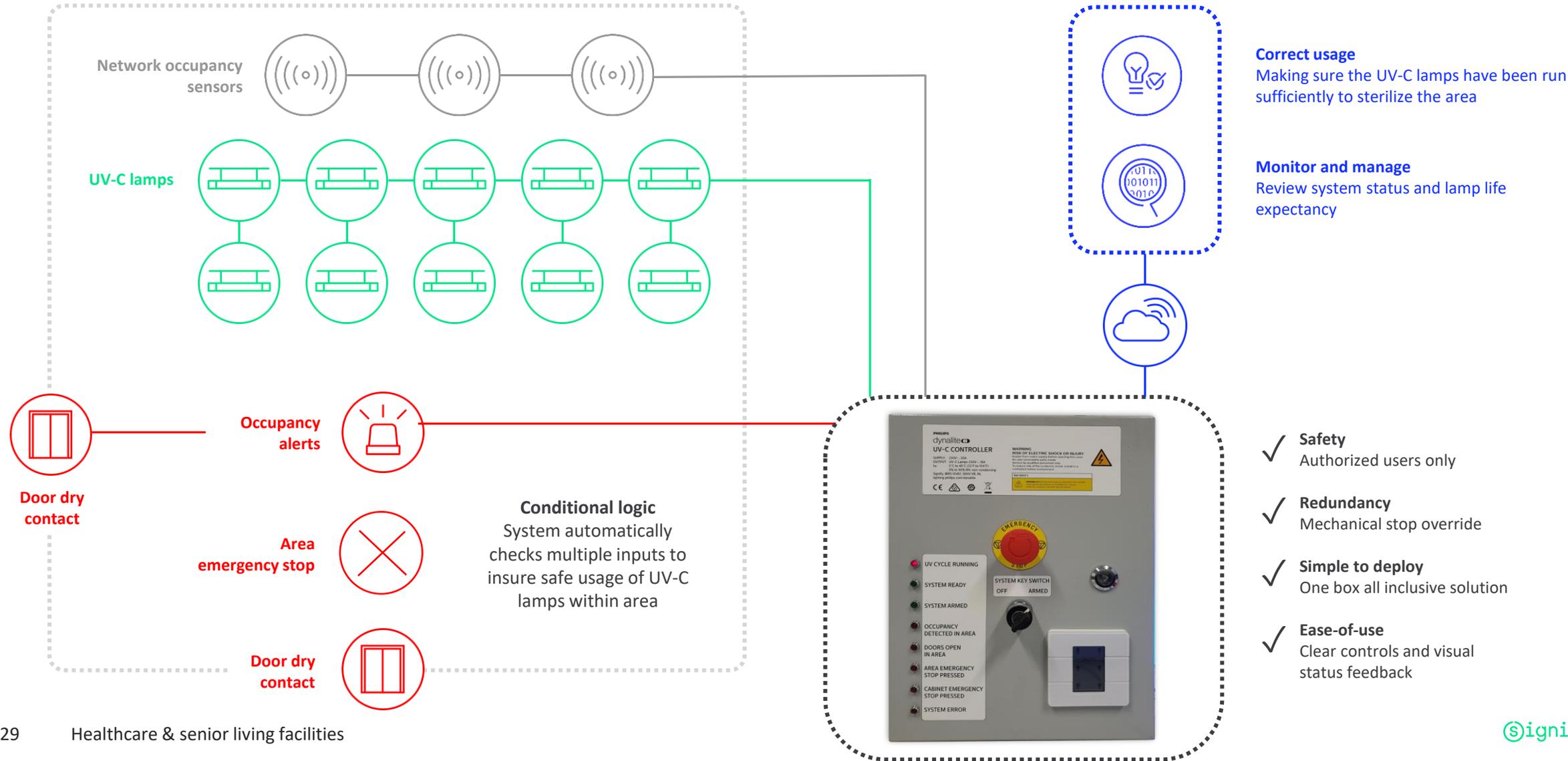
Monitor and Manage

- All network messages are being tracked and stored; Any issue, such as run time of the lamps, can be traced and the data can be used for preventative maintenance and re-lamping activities

Correct usage

- The UV-C lamps must run for a pre-described time to ensure that full disinfection of an area has taken place
- An automated system can ensure this and report back if there has been any issues in performing the full duty cycle

Control Solutions - Total system architecture





Professional services

The effectiveness and safe application of a UV-C solution starts with the right application design

- Our lighting design team will analyze with you in which type of areas you want to apply the UV-C solution
- An audit on type of walls, materials used, fans, ventilation of these areas can be performed to define the dynamics of the room to ensure a maximum effect and application safety.
- Furthermore, a UV-C lighting and system design will be made for these areas with the right UV light output, the right position, mounting height, angle and functionality of the UV-C devices

Staff training & certification

Before your staff operate UV-C devices as part of new cleaning processes, we will provide safety training courses.

These can be done via our lighting academy and will certify installers and staff members:

- To be knowledgeable on all major aspects of UV-C, its effectiveness and potential risks
- How to install, use and maintain the solutions in a safe manner, avoiding UV-C exposure to people and animals





Lifecycle Services

Like all lighting products, UV-C lamps have a defined lifetime within which they are operating at maximum effectiveness.

- Our control systems can monitor and report on lamp burning hours or failures of fixed installations to provide proactive lamp maintenance to ensure effective use.
- Our service teams plan scheduled visits to provide and install replacement lamps safely and verify UV-C output so you can trust that solutions remain at optimal effectiveness.

Lifecycle Services Packages for UV-C systems

Service package details

	Non-connected systems / stand alone	Cloud connected systems	
Our Lifecycle Services	Premium services	Remote services Remote Operations	Premium services
Helpdesk and service ticketing	✓	✓	✓
Remote diagnostics and fault finding (on request)	✓	✓	✓
Commissioning (defects)	✓	✓	✓
Remote Monitoring & Reporting*		✓	✓
<u>Preventive maintenance via <i>Remote System Health Checks</i>*</u>		✓	✓
Documentation in My Services Portal*		✓	✓
Remote Operations*		✓	✓
Remote System Optimization*		✓	✓
Preventive maintenance via <i>On-Site System Health Checks</i>	✓		✓
Ongoing User Training	✓		✓
On-site Software and Firmware updates	✓		✓
Corrective maintenance (on site)	✓		✓
Spare parts supply for failures	✓		✓
Spare parts kit	✓		✓
Group replacement at end of lifetime (products and labour)	✓		✓

* applicable for connected systems only

Working with Signify

- ✓ Safe solutions from a trusted partner with 35 years experience in UV-C
- ✓ Products rigorously tested, with documented application guidance
- ✓ Design-in and lifecycle services to ensure the right doses are installed and maintained over time
- ✓ Training to ensure safe installation, use and maintenance

As Signify we foresee wide-ranging applications for UV-C that extend well beyond initial domains.

It is gratifying to know that the lighting technology we're providing can be on the front-line helping to eliminate the spread of the virus and enable business continuity.

Signify