



ANGEL GUARD

MONITOR • CLEAN • PROTECT • TRUST

# RAPHAEL

The Next Generation of Clinical Washbasin Units

CLARENCE



FEATURING CLARENCE AND SERAPH PROTECT

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## Company profile

Angel Guard is a water management company that seeks to save time, money and most importantly lives, founded on the experience of Managing Director Jonathan Waggott and Director of Sales and Marketing Elaine Waggott, both very well experienced in the world of water health and plumbing.

With its offices and manufacturing both based within the UK, Angel Guard is proud to be part of Made in Britain to encourage growth and production within the country. Each Angel Guard product has been created with the consultation of respective experts within their field to target critical issues within the water health sector.

Angel Guard are the creators of the world's first clinical washbasin unit which utilises AI technology, as well as the world's first remote water monitoring system with biofilm detection. Angel Guard has one goal - saving time, money and most importantly lives through the deployment of many innovative, scientific, and technological solutions.



Innovation of the Year 2023



SME Recognition Award



Technical Innovation of the  
Year - Products



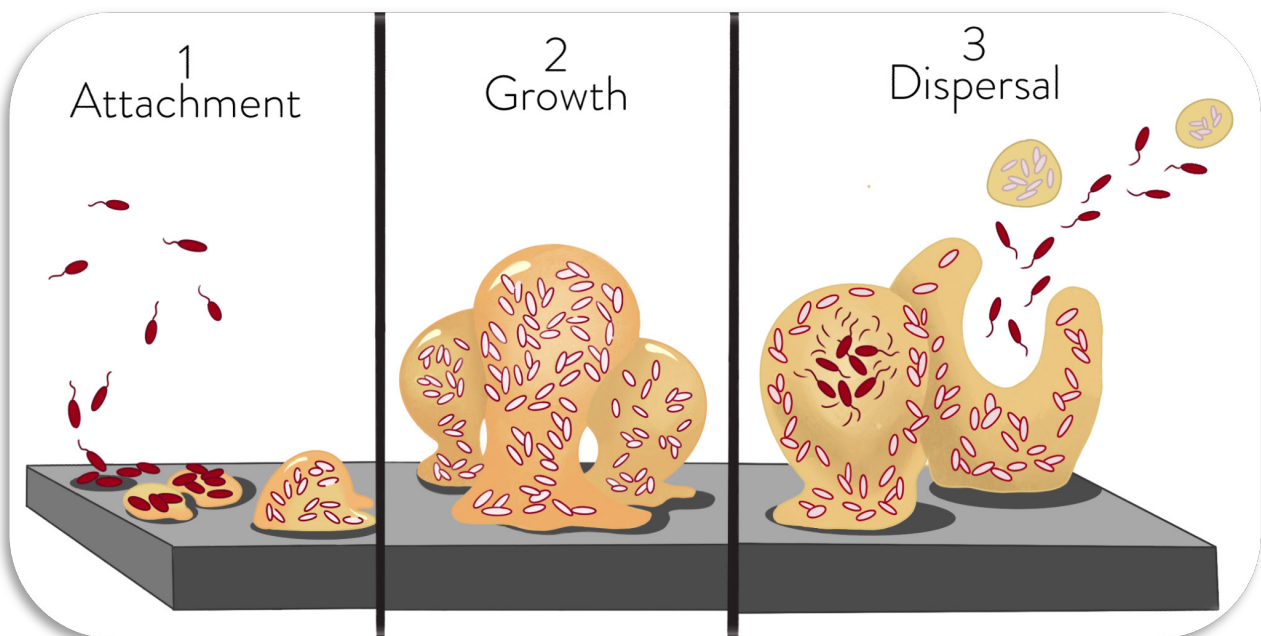
Clinical Washbasin of the  
Year

# How pipework systems can make water unsafe

## Nosocomial infections, and what they can lead to

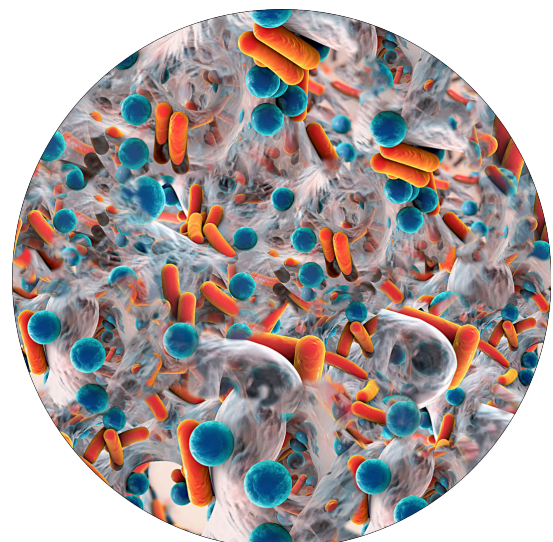
Nosocomial infections, or healthcare acquired infections (HCAs) are infections contracted within a healthcare environment and not prior to or afterwards. In one year alone, HCAs were estimated to have cost NHS England alone £2.1 billion. These costs cover additional bed space, litigation costs and the cost of specialist drugs and treatment. Commonly, the cause of these infections can be found within the water systems of hospitals and other healthcare settings.

Failing to put the proper measures or remote water monitoring systems in place can cause once-safe water systems to rapidly degenerate into breeding grounds for harmful bacteria. These water systems then begin to house water-borne pathogens and gives them a greater chance for transmission.



## Biofilm

Bacterial biofilms are excreted by clusters of bacteria that have stuck together and attached themselves to a surface. This often tends to look like a layer of slime, when in reality it is essentially a huge colony of bacteria, able to disperse as particles through water and air. Unfortunately, biofilms pose an even bigger threat to public health, as they can be highly resistant to conventional antibiotics, which only furthers the threat of antibiotic resistant pathogens.

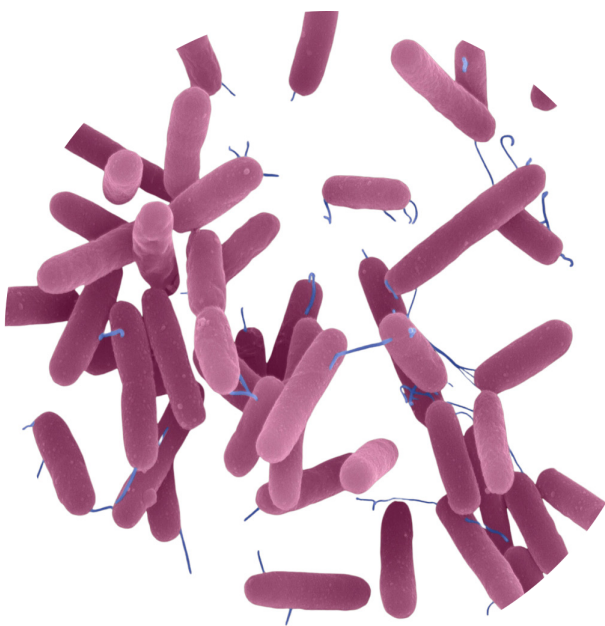
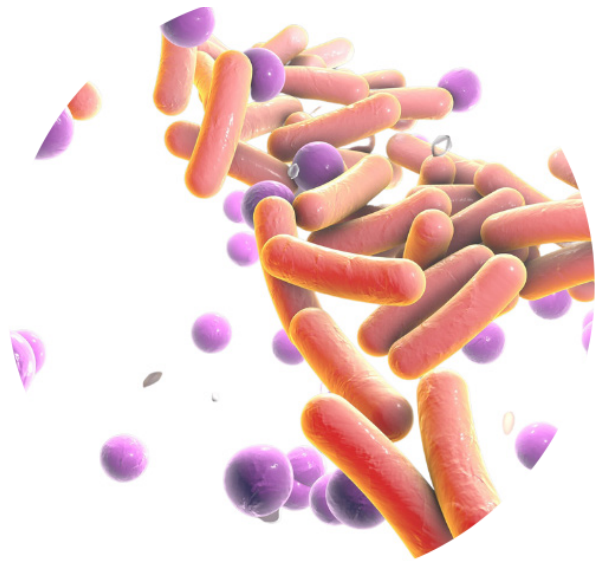


# The harmful bacteria that can often be found in water systems

Including, but not limited to:

## Legionella

Genus of pathogenic gram-negative bacteria. Capable of causing Legionnaire's disease, legionella grows especially quickly at temperatures between 30 degrees Celsius and 45 degrees Celsius. To ensure that your water system remains legionella-free, you will need to guarantee that your cold water is kept at under 30 degrees Celsius, and hot water kept above 55 degrees Celsius. Another essential safeguard to prevent legionella is to keep water moving and ensure suitable flushing of taps in low use areas.

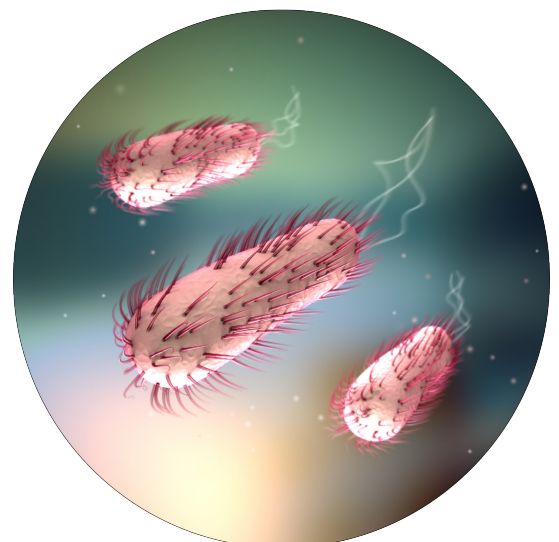


## Pseudomonas Aeruginosa

Pseudomonas Aeruginosa is a common bacterium, capable of causing disease in plants, animals, and humans. Known for its intrinsically high level of antibiotic resistance, this bacterium can prove incredibly dangerous to immunosuppressed people. Unfortunately, pseudomonas aeruginosa is capable of thriving up to two metres before point of use, meaning not only the outlet but everything leading up to it, including pipework and the waste trap can become contaminated. Preventing pseudomonas aeruginosa necessitates the regular flushing of taps and fitting outlets without plastic parts that avoid retrograde contamination risks.

## E. Coli

Escherichia coli (E. coli) bacteria are frequently found in the intestines of humans and animals. E. coli is often spread through water contaminated with fecal matter, leading to further, serious illness in the form of severe stomach cramps, bloody diarrhoea and vomiting. Like other water-borne pathogens, regular hand washing, flushing and temperature control are vital in preventing further spread of serious illness.



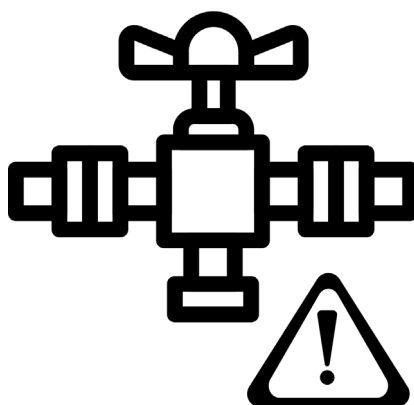
## The risks of retrograde contamination

Retrograde contamination can occur when pathogens enter the outlet and the spout of the tap, allowing biofilm to grow and spread. This typically occurs during cleaning, when users make contact with the outlet and splash-back from the washbasin onto the underside of the outlet. Once pathogens enter the basin spout, biofilm is then able to grow and can be transmitted to patients via water splashing and aerosol.



## Waste outlet contamination, a CPE challenge

The contamination of waste outlets is another cause for concern, as they can end up heavily contaminated with pathogens and biofilm, which can lead to Carbapenemase Producing Enterobacteriaceae (CPEs) becoming commonplace, leading to an extreme degree of risk. Users disposing of liquids (drinks, medicines, bodily fluids etc) and other such contaminants into the washbasin outlet creates a source of nutrients for bacteria to thrive and spread.



## TMV contamination

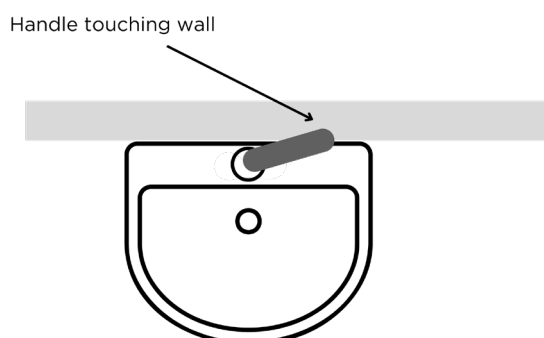
Thermostatic Mixing Valves (TMVs) often have many plastic parts and complex waterways that encourage the growth of harmful biofilm. Often difficult to clean, maintain, service and are reliant on manual intervention which can be time-consuming and costly. Under the guidance of HTM 04-01, a risk assessment should be taken on all TMVs as to whether the danger of patient infection coming from them is greater than the scalding risk. HTM 04-01 guidance recommends that hospitals should consider the removal of TMVs in most areas where scalding is not considered a risk (as shown and confirmed by the risk assessment). With TMV installations being commonplace, water temperature is often blended close to or behind the point of delivery. The materials and designs of TMVs, in conjunction with a trend of under-utilisation and turnover of all handwash basin outlets, can be considered a significant risk factor in promoting water-borne bacterial growth and a means of transmission to vulnerable patient populations.



# healthcare environments

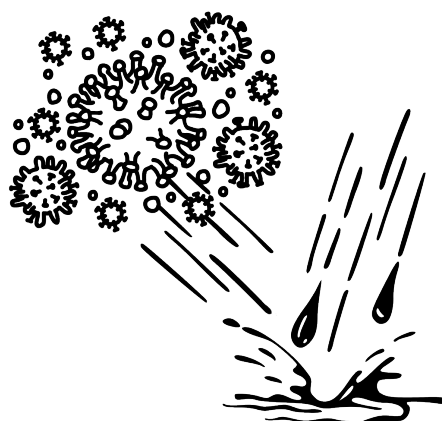
## Difficulties and costs in gathering data and risk assessments

Currently, risk assessing traditional IPS units is limited when compared to the advances in technology that can guarantee faster and more accurate results. Manually recording data in the first place can be a lengthy and costly procedure. Incoming hot and cold water temperatures, mixed water temperatures, usage levels, flushing frequency and biofilm presence are all required. This process uses up a lot of time and varies on an hour-to-hour, day-by-day basis, meaning current risk assessments are only based on a very narrow scope of data, covering only a short period of time and a limited number of outlets.



## Touch point taps leading to contamination risks

Levers for traditional handle hospital mixers are often set incorrectly and make contact with the walls where they are affixed. When considering this problem, the initial issue is that hospital mixers use a lever in the first place, creating a touch point where multiple users make contact, increasing the risk of transmission greatly. This lever then becomes a hotspot for pathogens to spread between users. Current guidance states that these taps are to be used by turning on with hands but off with elbows to decrease the possibility of transmission. However, this is not always the case as users tend to simply use their hands instead of their elbows for convenience.



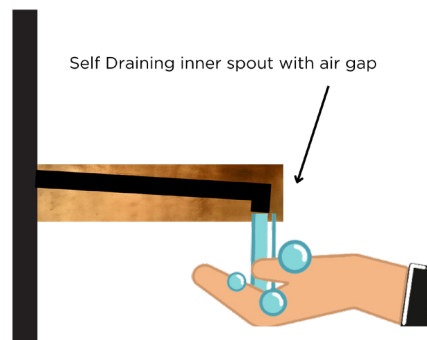
## Unexpected pathogen transmission - Splashing and aerosol

Frequently, pathogens spread through the air via splashing. Pathogen transmission through splashing and aerosol can lead to further contamination of patients, drug preparation cups and other sterile equipment. This risk is then further increased when traditional designs, instead of preventing splashing, often accommodate water splashing and allow for water flow to splash against the washbasin and/or the waste outlet, releasing harmful pathogens into the air, spreading contamination further.

# Introducing Raphael: The Next Generation of Clinical Washbasin Units

## Antimicrobial construction

The Raphael IPS unit is lined with BioClad antimicrobial PVC, preventing bacterial growth anywhere on the unit. The cladding is also constructed whole, with no dirt or bacterial traps at any point. The core, made up of millions of minute bubbles is known as closed cell technology. Raphael's exterior is also 100% waterproof, fire resistant, extremely durable, easy to clean and eco-friendly.



## Anti-retrograde tap spout (A.R.C.)

Raphael's unique patent pending A.R.C. tap spout is concealed with a patent pending pipe-within-a-pipe design, constructed from copper with an antimicrobial outer casing. The air gap within the outlet virtually eliminates the chance of retrograde contamination through cleaning or users from making physical contact with the tap spout. Another benefit of the air gap in conjunction with the anti-splash basin is that it vastly reduces the opportunity for water to splash from the basin back up into the tap spout, whether the water splashes from the basin or from a user's hands, preventing contamination further.



Raphael's unique washbasin  
(pictured with A.R.C. tap spout)



Standard IPS washbasin

## Raphael's unique ceramic bowl basin

Raphael comes equipped with a unique washbasin developed by Angel Guard. Expertly crafted, Raphael's basin has been designed in such a manner to allow for the natural flow of water, minimising splashing from the A.R.C. tap spout to the basin itself. Such measures further minimise the risk of water and aerosol splashing onto beds, clothing, hospital equipment and floors. Coated with an antimicrobial glaze, Raphael's basin ensures a smooth surface, helping to prevent bacterial growth.





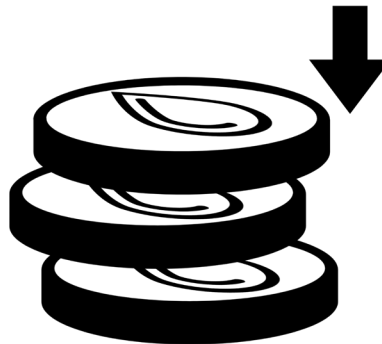
## Hygienic Mixing Valve - Preventing biofilm build-up

Traditionally, water systems tend to use Thermal Mixing Valves (TMVs) and solenoid valves, which typically house and accommodate biofilm growth through plastic, rubber and complex waterways. However, Raphael utilises simple waterways and is equipped with Angel Guard's innovation in water mixing technology, the Hygienic Mixing Valve (HMV). The HMV itself is coated with KELT-7, the innovative polymer developed by Angel Guard. KELT-7 is an antimicrobial polymer capable of creating surfaces that pathogens and biofilm cannot adhere to, significantly reducing biofilm build-up. This provides all the benefits of a TMV (consistent mixed water temperature with no scalding risk) with 100% touch-free operation, without compromising on biofilm prevention.



## Incredible water savings

Raphael clinical washbasins are capable of saving staggering amounts of water, with figures on average of 9.4 million litres of water per year.\* In monetary terms, this works out to £7,128 per year.



## Blockage preventing waste and trap

Angel Guard have considered the problem often confronting many traditional waste outlets within washbasins, with contamination through blockages and discharge. Raphael features a waste and trap constructed from antimicrobial copper. The trap helps to reduce the risk of blockages occurring with an air-admittance device fitted, helping to prevent positive/negative pressure build-up – stopping the contents of the trap and waste from discharging back into the washbasin.

\*Based on 10 installed Raphael units compared to existing hospital taps running for 40 seconds per use – 300 uses per day, with a flow of 6 litres per minute

# The power of two in one: Clarence system integration



Another of Angel Guard's innovations, the Clarence system is truly an evolution in water monitoring, being the world's first remote water monitoring system capable of detecting biofilm within water flow, detecting as low as 6 CFUs (Colony Forming Units). For Raphael customers, the washbasin has optional inclusion of the Clarence system within the Raphael unit. With this addition, Clarence can strengthen the already incredible features of Raphael.



## Temperature, flow events and biofilm sensing capabilities

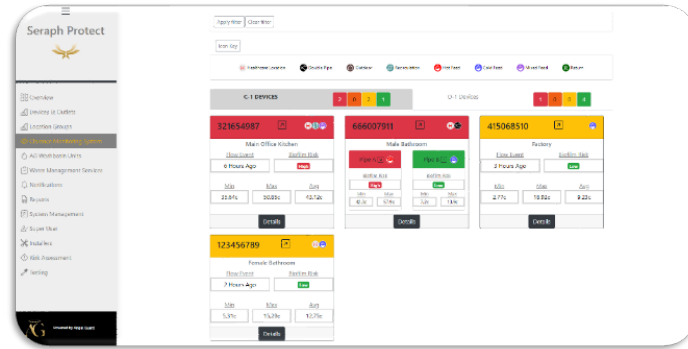
The Clarence system is capable of measuring not only the temperature of the water within the outlet and the number of flow events, but it is also the world's first remote water monitoring system capable of detecting biofilm. The C-1 makes this possible with a ceramic sensor located within the water flow, picking up readings as low as the aforementioned figure of 6 CFUs. Combining these sensors into one system eliminates the need for clipboard testing to ascertain the flushing frequency of outlets, and in tandem with the biofilm sensor it will allow for better targeted water testing, rather than ad hoc data gathered from only a few outlets at time of recording.

### C-1 Features

- \* Unique biofilm sensor(s) monitors pathogens and biofilm
- \* Hot, cold, mixed and return water temperature measuring capabilities
- \* Capable of measuring up to 2 temperatures simultaneously
- \* Measures flow events
- \* Leak detection
- \* TMV failure detection
- \* 4G/5G connectivity

### O-1 Features

- \* Hot, cold, mixed and return water temperature measuring capabilities
- \* Capable of measuring up to 4 temperatures simultaneously
- \* Measures flow events
- \* Leak detection
- \* TMV failure detection
- \* LoRaWAN connectivity
- \* Battery powered



## Seraph Protect, any time, any place

Further limitations crop up in water testing as the data only goes so far as to reflect the water testing at time and place of recording. However, the Clarence system also includes Seraph Protect, cloud-based water management service allowing clients to check the health of their water 24/7, an internet connection being the only necessary requirement. With Seraph Protect, clients can check their water health from multiple Clarence boxes at once. Seraph Protect creates a holistic picture of water health, with readings being taken every second, rather than a limited scope of data that quickly becomes outdated.



## Increases compliance

The Clarence system is highly effective in identifying issues within water systems, whether it be temperature, flow or even biofilm. Seraph Protect will alert you, allowing for a targeted deployment of the required countermeasures in response to any issue - improving and exceeding compliance levels.



## Reduces cost

The Clarence system is constantly alert, monitoring a breadth of parameters 24/7, reducing the need for unnecessary flush testing and lengthy, costly manual temperature monitoring. Working in tandem with Seraph Protect allows the Clarence system to ensure better targeted water testing and disinfection, saving time and money.

# Constructed in line with the latest guidance

Health Technical Memoranda (HTMs) are publications which give guidance and comprehensive advice on the design process, installations and operations of specialised building and engineering technology used in the delivery of healthcare. In particular, HTM 04-01 gives guidance on safe water in healthcare premises. Angel Guard believes that it is not enough to merely comply with these measures, but to exceed them in their delivery of world class washbasins.

Angel Guard have compiled a number of points from HTM 04-01 which were considered relevant to the Raphael washbasin. They have also compiled a number of reasons as to how Raphael complies with these standards, or in some cases exceeds them.

## **HTM 04-01 C: 3.2b - Wastewater drain outlets are particularly risky parts of the basin/ system and are almost always contaminated.**

Raphael comes fitted with an all-copper waste and trap, ensuring that the antimicrobial material will help protect the outlet from biofilm growth.

## **HTM 04-01 C: 3.3d - Do not touch the spout outlet when washing hands.**

The tap spout of Raphael is hidden within the outer casing, and the air gap between the casing and the outlet prevents any users from making direct contact with the spout.

## **HTM 04-01 A: 10.59 Note 1 - Where installed, ensure that thermostatic mixing valves (TMVs) are fitted directly to the mixed temperature outlet or be integral with it.**

Raphael units are all fitted with a Hygienic Mixing Valve (HMV) incorporating an integral outlet.

## **HTM 04-01 A: 10.59 Note 3 - Automatic taps can be considered through risk assessment. Sensors should be offset to reduce risk of accidental contamination of outlet.**

The sensor for Raphael's tap is positioned at the side as a separate component, helping to prevent contamination.

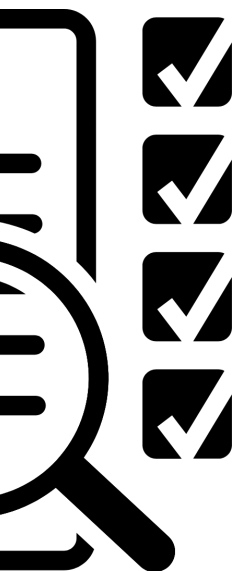


**HTM 04-01 A: 10.59 Note 5 - Taps, components and fittings should be removable and easily dismantled for cleaning and disinfection.**

The design of Raphael's outlet allows disassembly of the outer body from the IPS panel, and the inner components to be removed from the HMV within the unit.

**HTM 04-01 A: 10.58 - Components should be selected for their ability to minimise the accumulation of debris and splashing.**

An anti-splash basin has been developed to help prevent splashing. The design of the IPS unit and the outlet allows for easy cleaning and a low amount of build-up of debris/contaminants.



**HTM 04-01 A: 3.41 - Flexible hoses should only be used to allow for vibration of equipment, to accommodate high and low sinks/baths and essential maintenance and access of bespoke equipment when no alternative is available.**

There are no flexible hoses used in the construction of the Raphael clinical washbasin unit.

**HTM 04-01 A: 3.44 - Where possible, leak-testing should be carried out using nitrogen or medical quality compressed air.**

All of the leak-testing for the Raphael clinical washbasin unit is carried out using nitrogen gas.

**HTM 04-01 C: 3.1 I - An integral TMV should be considered to help minimise the risk of stagnation.**

Raphael uses an HMV that is integral, and has a unique drain down system, ensuring the removal of mixed water.

For more on the Health Technical Memoranda, you can read online through the NHS website at <https://www.england.nhs.uk/publication/safe-water-in-healthcare-premises-htm-04-01/>.

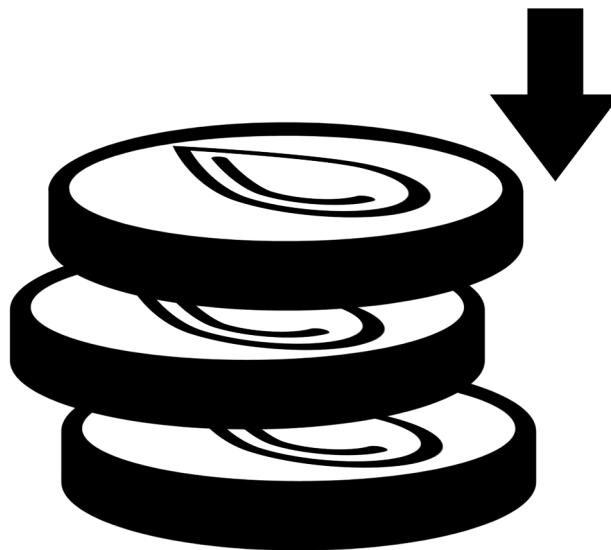
# Water savings, environmental and financial

The technology used to create Raphael and powering it each day excels at saving water, translating to both ecological and financial savings for you and the environment.

## Reducing water wastage

With Raphael, water usage is kept to a minimum. Angel Guard have put this into practice with an installed timer within Raphael's framework, guaranteeing that water is only dispensed at fixed intervals as opposed to continuous flow, with automatic flushing only carried out when needed. This ensures that the minimal amount of flushing and water is needed, whilst also preventing stagnant water.

***9.4 million litres of water per year***



## Increased water savings

Angel Guard are aware of the value of water, hence why Raphael units will be saving (on average) 9.4 million litres of water per year\*. To put this into perspective, the amount of water saved would equal to more than two Olympic-sized swimming pools. In monetary terms, this equates to cost savings of £7,128 per unit.

***£7,128 saved per Raphael installed***

\*Based on 10 installed Raphael units compared to existing hospital taps running for 40 seconds per use – 300 uses per day, with a flow of 6 litres per minute



# Not just dependable, but sustainable

Angel Guard are committed to not only saving lives through the use of their clinical handwash basins, but also through its promise to help reduce its ecological impact on the environment. Keeping this ideal in mind, measures have been taken to ensure that Raphael will help Angel Guard achieve these goals.

## **98% recyclable by weight**

Raphael's construction is more than just for the here and now. Thanks to Angel Guard's careful attitude towards the future of manufacturing, many parts of Raphael are completely recyclable at end of use.



## **Copper tap spout and pipework**

Raphael's A.R.C. tap spout and pipework are made with copper, which is 100% recyclable. As copper maintains its integrity even after being recycled, it's highly likely the tap spout is already created from recycled copper, and will work just as well as recently mined copper.



## **Raphael's recyclable exterior**

Raphael's antimicrobial cladding makes up a large amount of the weight of the unit, and is also completely recyclable at end of use.

# Raphael vs. Traditional clinical washbasin IPS units

## A cut above the competition

Throughout the design process for Raphael, Angel Guard have endeavoured to make Raphael truly stand out amongst its contemporaries. That is why many decisions have been made after studying what has and has not worked for traditional clinical washbasin units.

### Panelling

**Industry standard:** Panelling that lacks an antimicrobial coating, susceptible to bacterial growth

**Raphael:** Antimicrobial panelling, durable and easy-to-clean

### Tap spout

**Industry standard:** Often chrome spouts, non-antimicrobial and uncovered, vulnerable to retrograde contamination

**Raphael:** Concealed antimicrobial copper spout, complete with air gap preventing contact, vastly reducing the possibility of retrograde contamination

### Basins

**Industry standard:** Often incapable of being run without splashing onto floors, surfaces or beds, raising contamination risks considerably

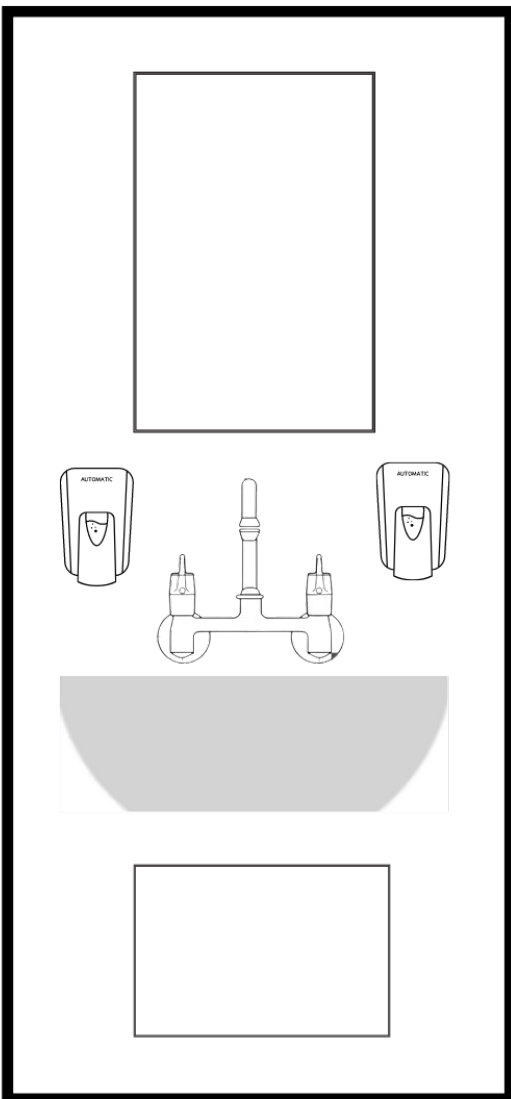
**Raphael:** Unique antii-splash washbasin, allows for natural flow of water and helps to reduce splashing, aerosol and contamination risks



## Water monitoring capabilities

**Industry standard:** Incapable of remote water monitoring on its own

**Raphael:** Constructed to be compatible with Angel Guard's Clarence system, easily allowing a remote water monitoring system to be installed for further security



## Waste and trap

**Industry standard:** Made from plastic, not large enough to prevent blockages

**Raphael:** Enlarged waste and trap to prevent blockages and is constructed from copper, meaning it is antimicrobial. Also fitted with an air admittance device to prevent positive/negative pressure build-up

## Visibility

**Industry standard:** Designed to fit into the space it is, creating a low visibility washbasin, fails to draw attention to itself

**Raphael:** Designed to stand out from its surroundings, allowing people to be fully aware of where the washbasin is at all times

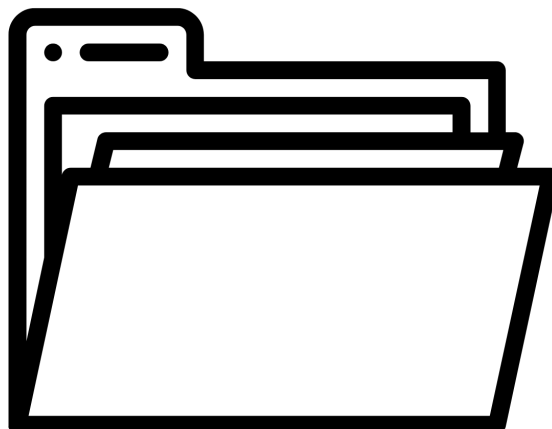
# Technical information and associations

## Technical information, always available

Angel Guard ensure that all technical information regarding their products is always made available online, ready for viewing at <https://www.angel-guard.co.uk/>

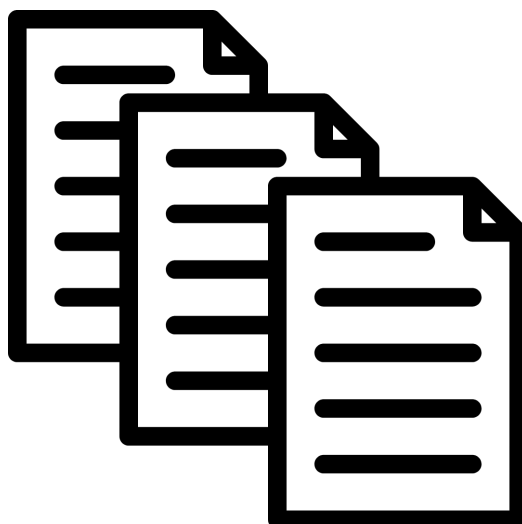
## BIM files

In order to make the commissioning process as simple as possible, Angel Guard offer building information modelling (BIM) files upon request. BIM files are commonly used in the construction process, and to streamline this process, files will always be available.



## Data sheets

Data sheets are also available on demand, allowing prospective decision makers a full breakdown of Angel Guard's Raphael clinical washbasin units, including product dimensions, features and benefits gained from their use.



# Associations

Angel Guards are members of several organisations, as well as being partnered with other organisations to deliver their world class service.

## Snowbird Finance

Angel Guard recognises that in some cases, capital expenditure can be an issue, which is why Angel Guard have collaborated with Snowbird Finance Ltd, tailoring financial solutions to meet any circumstance with low monthly or quarterly payments. Please contact Angel Guard's dedicated staff for more information.



## Royal Society for Public Health (RSPH)

Angel Guard is a corporate member of the Royal Society for Public Health (RSPH). As the aims of Angel Guard, and RSPH align, together they hope to create healthier environments, improve, and protect the public's health, made possible thanks to products manufactured by Angel Guard.

## Made in Britain

As Angel Guard's products are manufactured within the United Kingdom, they are proud to promote their Made in Britain membership.





Tel: 0141 280 9488 Email: [info@angel-guard.co.uk](mailto:info@angel-guard.co.uk)  
Website: <https://www.angel-guard.co.uk/>