Engineering Aspects of Water Control

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Importance of Design

Responsibilities of designers, manufacturers, importers, suppliers and installers

Regulation

HSW Act, sections 3 and 6.

Summary

This places a duty on any person who designs, manufactures, imports or supplies articles or substances for use at work, to ensure that they are safe and without risks to health at work and that any information related to the article or substance is provided.

ACOP

75 Designers, manufacturers, importers, suppliers and installers of water systems that may create a risk of exposure to legionella bacteria, must:

(a) ensure, so far as is reasonably practicable, that the water system is so designed and constructed that it will be safe and without risks to health when used at work;

Examples of Bad Design

Understanding Good Design

Consultant Anaesthetist

- Demonstrating height of tap levers to comply with hand-washing procedure

- Water should run off hands first, down forearm and finally off at elbow

Make Sure You Investigate & Test

Aerosols & Splashing

Right Tap for Right Application

Manual
On/Off

Single
Lever

Cycle
Valve

Push
Button

Electronic

Thermostatic

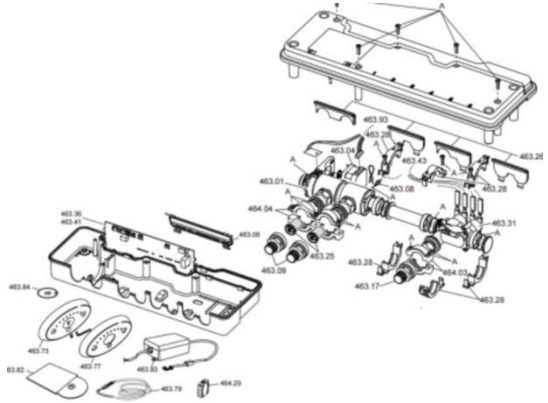
Price

Temperature Control

Cold < 20°C
Hot stored > 60°C
POU = 40°C

TMV’s vs Non TMVs

TMVs can be very complex



How to Limit Temperature

- Why limit?
- Hospitals need to circulate water at above 60 degrees C to help prevent bacteria. A temperature limit is needed to prevent burning (scalding)

Price

No protection

Temperature Stop

Temp Stop with Cycle Valve

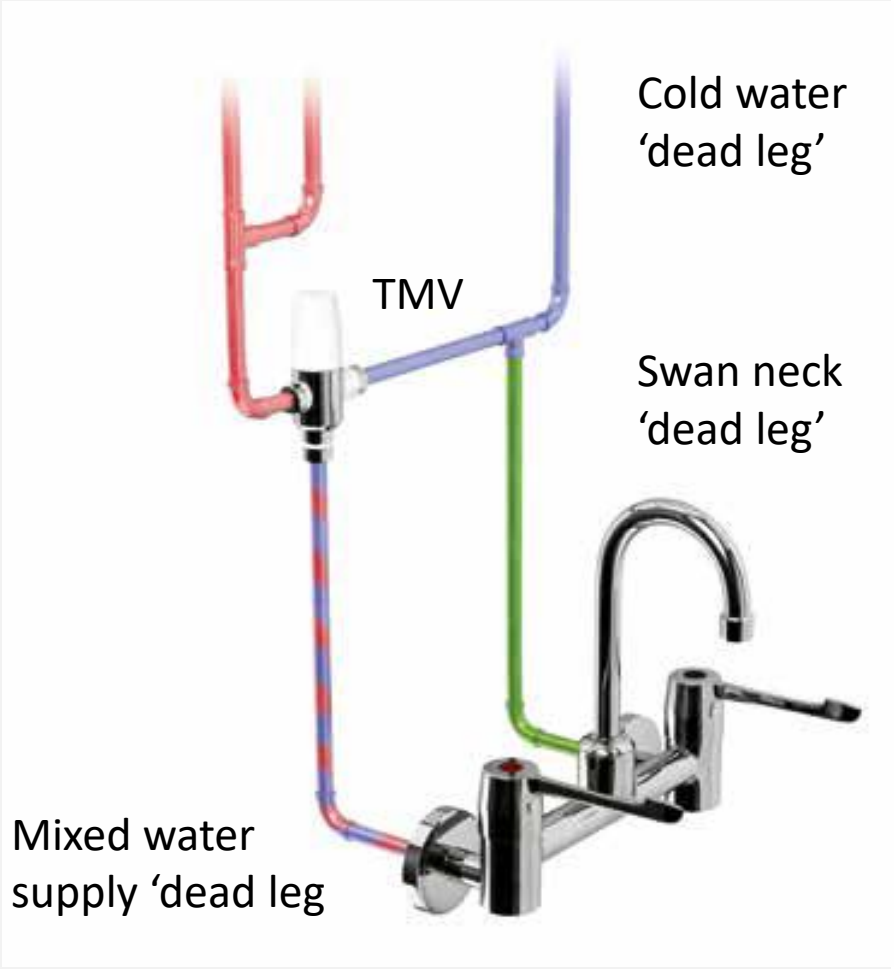
Separate Thermostat

Thermostatic Built-In

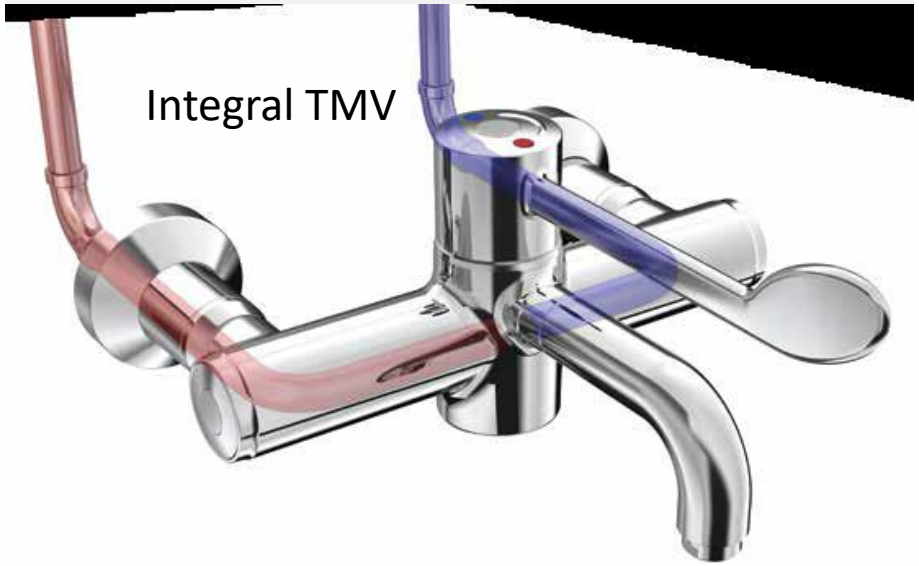
Thermostatic Built-In with Thermal disinfection system

Safety

Swan Neck Spouts Cause ‘Deadlegs’



Example of Clinical Tap Design



The horizontal spout allows warm water to fully drain

Insulate Technology helps to cool down the body preventing burns

Designed to Withstand Chemicals

Taps that can be Disinfected

Thermal
disinfection

Manual thermal flush allows you to prevent the build-up of bacteria by re-directing hot water through the cold side of the tap

Pipework must be Kept Separate & Lagged

Important to Understand and React Quickly

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Share

Baby dies in Southmead Hospital pseudomonas outbreak

A premature baby died and 12 others were given treatment after an outbreak of a water-borne bacterium at a Bristol neonatal unit, it has been confirmed.

Southmead Hospital said it had found traces of pseudomonas aeruginosa in the water system for its neonatal intensive care unit.

The hospital said the baby died in August after contracting the bacterium.

Filters have been fitted to the unit's water system

Four babies died after contracting the bug in hospitals in Northern Ireland in December and January.

It was also found at the Norfolk and Norwich University Hospital in March.

NI Taps Report Exec Summary

All taps were replaced from clinical hand wash basins in neonatal units across Northern Ireland, plus a number of other taps which Trusts deem to be at higher risk. A representative sample of these tap assemblies (n=30) and rosettes (n=8) were couriered to HPA Porton Down, Salisbury for investigation. Tap assemblies were dismantled into separate and discrete components (n=494). Each component was assessed for the presence of microbial contamination by enumerating total aerobic colony counts and *Pseudomonas aeruginosa* colony counts using non-selective and selective agars. *P. aeruginosa* isolates recovered from tap components were typed by the variable number tandem repeat (VNTR) technique at HPA Colindale. Selected tap components were also subjected to microscopy to visualise the presence of biofilm using fluorescence and scanning electron microscopy.

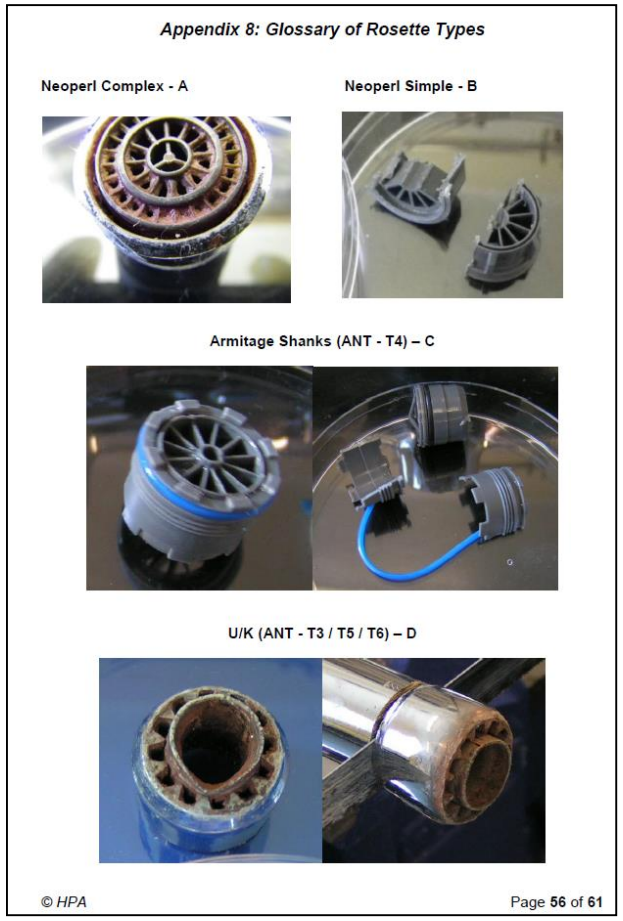
There was little correlation (r=0.33) between the aerobic colony count and *P. aeruginosa* presence, indicating that the aerobic colony count could not reliably be used to predict the presence of *P. aeruginosa*.

The highest aerobic colony counts were associated with the integrated mixer and solenoid whilst the highest *P. aeruginosa* counts were recovered from the rosettes and associated components, indicating that *P. aeruginosa* has a preference to colonise different tap location, e.g. the rosette, metal support collar and surrounding tap body.

The analyses of the rosette components and the rosette complexity, rosette type and rosette material indicated that on average a complex rosette (i.e. one with multiple component parts and a higher internal surface area) had a significantly higher expected *P. aeruginosa* count than a simple rosette. Microscopy identified the presence of biofilm on the rosettes and associated components.

Representative isolates recovered from tap assemblies from Belfast (Royal Jubilee Maternity) and Altnagelvin Hospital neonatal units had VNTR profiles that were consistent with the strains that were recovered from the water samples and those that were recovered from the infected patients.

This study has demonstrated a positive association of *P. aeruginosa* with a complex design of rosette in the tap outlet. Further work should determine whether tap outlets used in neonatal units can be redesigned such that complex rosettes are not necessary and manufacturers should investigate the possibility of making the tap outlet removable for decontamination by autoclaving.



Appendix 8: Glossary of Rosette Types

Neoperl Complex - A

Neoperl Simple - B

Armitage Shanks (ANT - T4) – C

U/K (ANT - T3 / T5 / T6) – D

© HPA

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Tap Outlets

Problem: Contamination in flow straighteners or spray outlets

NO

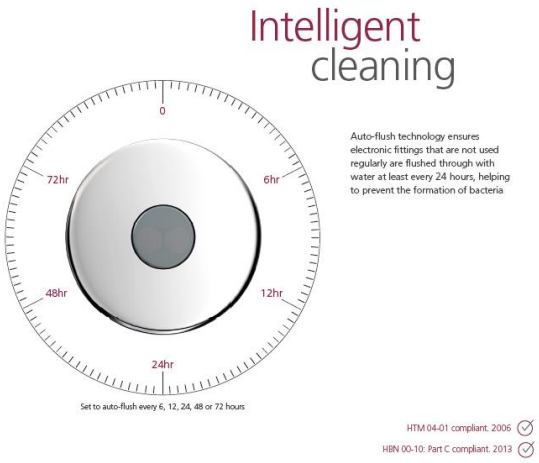
Tap Outlets

Solution: Use an open outlet which is copper-lined

YES

Sensor Fittings

- Proximity
- Sensor position
- Consider extra complexity
- Timed flow
- Auto-cleanse

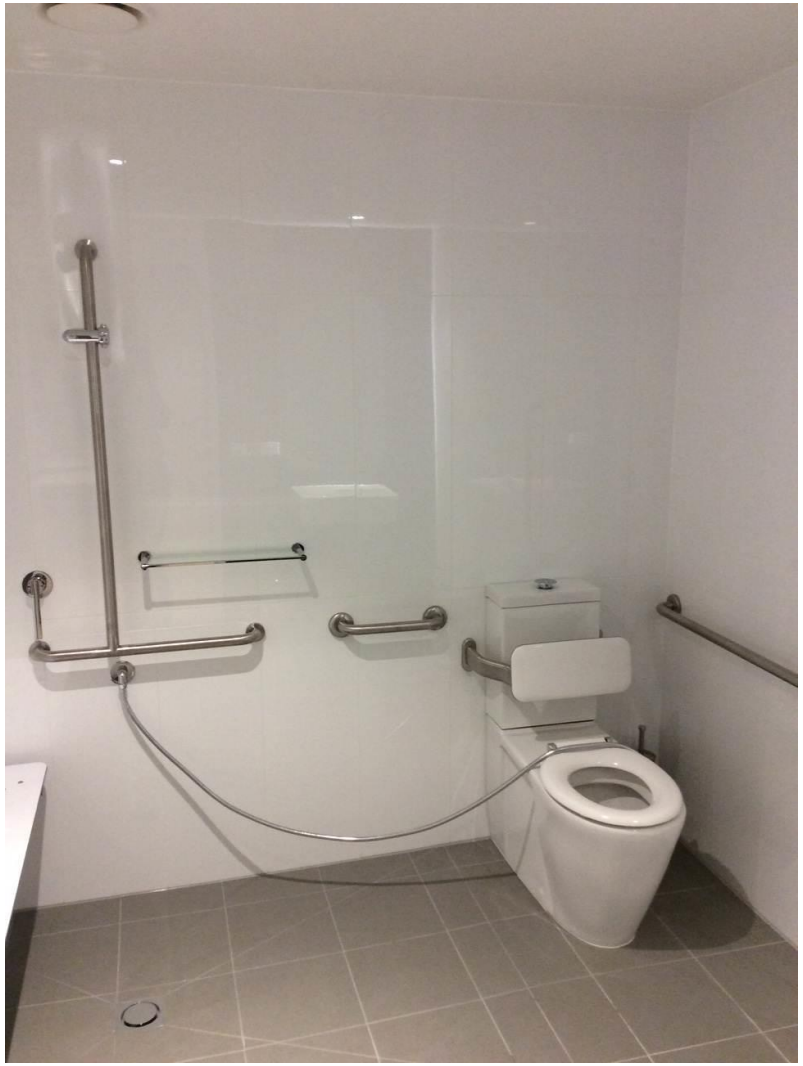


Commissioning

- Pressure testing – Ideally with air
- If water is used then constant flushing is needed up to building opening
- Consider taps with purge system
- For maximum safety consider use of filters – short term

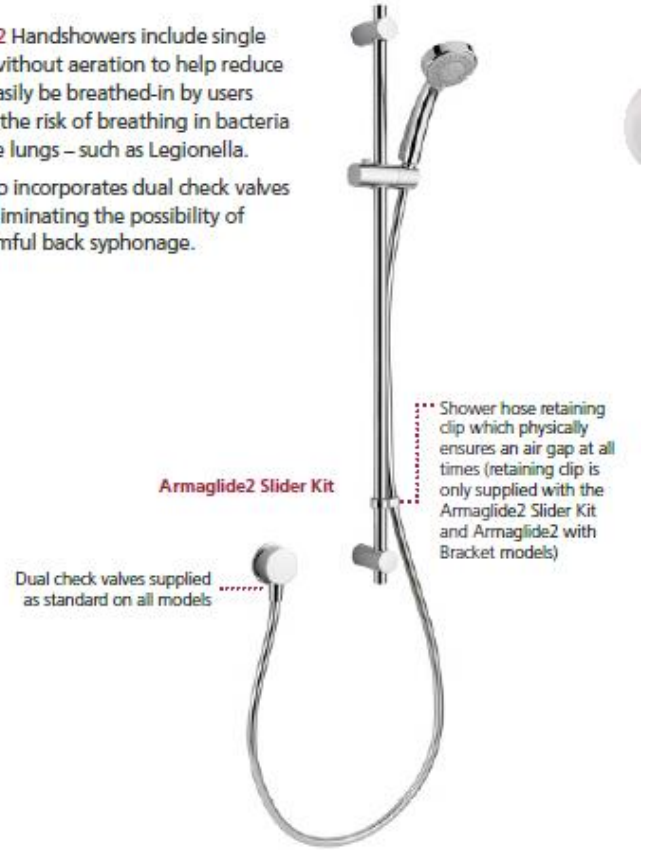
Point of Use Filters

Shower Heads



The Armaglide2 Handshowers include single function flow without aeration to help reduce mist that can easily be breathed-in by users and so reduces the risk of breathing in bacteria directly into the lungs – such as Legionella.

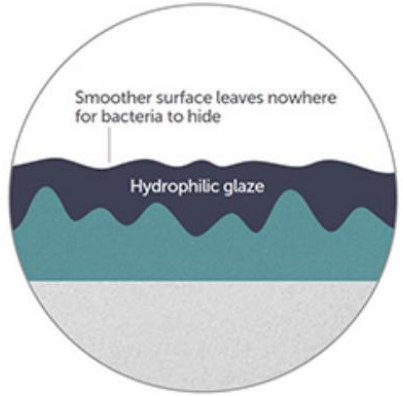
Armaglide2 also incorporates dual check valves as standard – eliminating the possibility of potentially harmful back syphonage.



The Future?

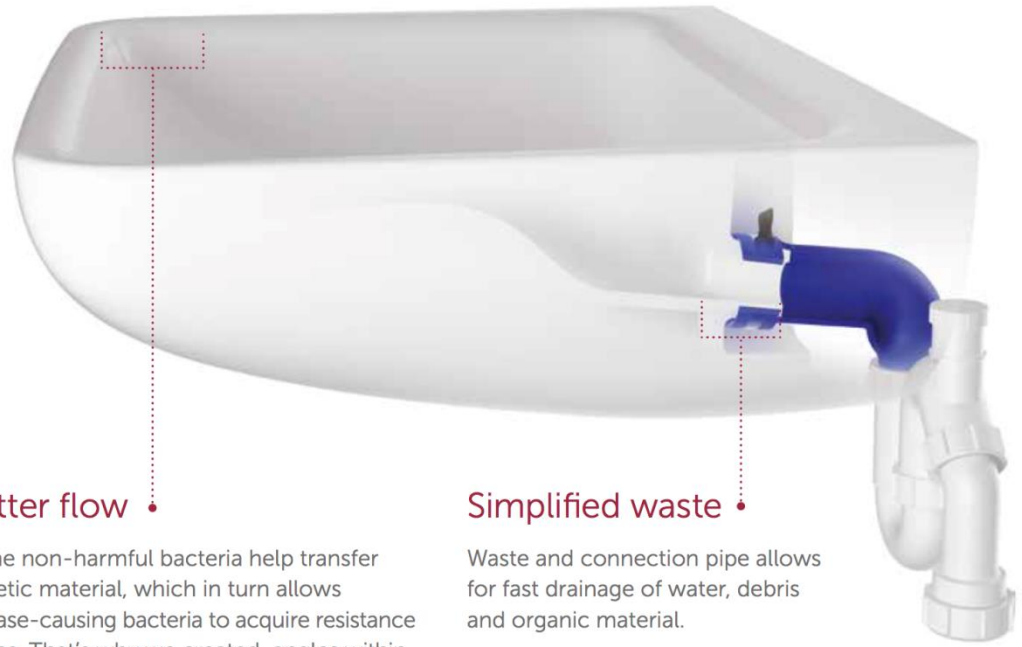
Clinical Washbasins

- Ultra Smooth glaze
- Silver additive
- Patented anti-splash technology
- No tap shelf



Waste Outlets

- Unique waste system
- Smooth internal basin shape encouraging flow
- Back outlet
- Simplified waste connection
- Special valve to eliminate positive and negative pressure
- Silver additive



WC’s

- New fully sealed seat with cover
- Zero risk of aerosol
- WC and seat have silver additive
- 1.5 litre effective flushing

New Clinical Taps

- Small bore waterways with built-in turbulence
- Reduced use of plastics
- Less water retention
- All parts can be easily removed and autoclaved
- Open outlet
- Easy to operate thermal disinfection
- Easy to install Pall filters

MARKWIK 21+ has 52% less waterways*

MARKWIK 21+ has 34% lower static water volume*

MARKWIK 21+ is over 85% brass reducing the polymer content by 66%

New Filters & Shower Heads

Filters

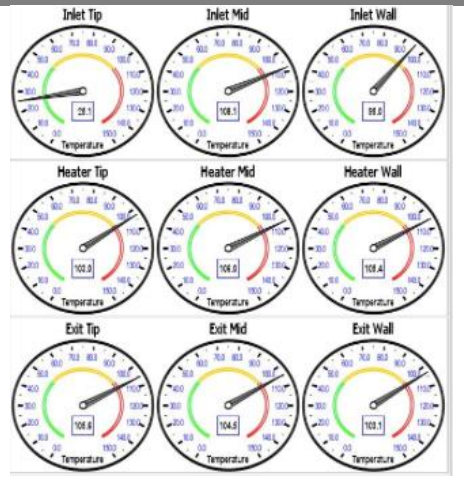
- 60 day filters now available
- Easy to install
- Offer a high level of protection
- Basin, sink and shower options

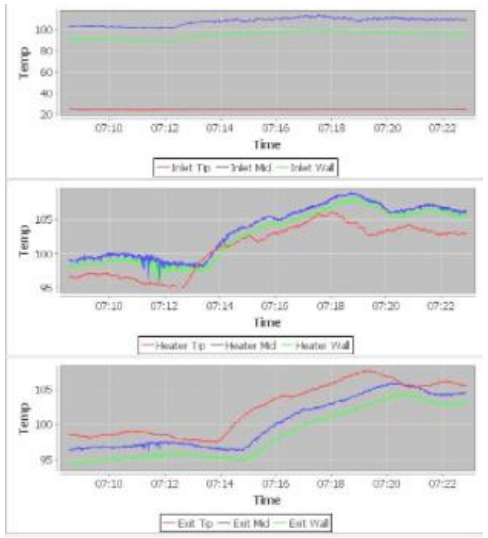
Shower Heads

- Disposable shower heads
- Handset and fixed head options
- Replacement and collection services available
- Eco-friendly

Monitoring

- Central monitoring of temperature and flow
- Multiple points monitored
- Reminders for water testing and log of results
- Reminders for filter renewal
- Testing points within room in addition to outlets
- Leak detection system





New Dirty Utility System

- Two rooms – one clean and one dirty to prevent cross contamination
- No sluice sink – zero aerosol
- Machine takes all waste
- Use of solid surface tops with – no gaps
- Handwash only within both clean and dirty rooms – not possible to tip waste down sinks

New Surgeons Scrub-Up

- Troughs used currently
- Areas of the arm can be missed
- High levels of aerosol are created
- Instead create a machine that the doctors/nurses can place their arms in
- Washer disinfector with UVC light afterwards

Thank You!

Questions?