



Ultra Clean Ventilation System (UCV)

For Operating Theatres





Ultra Clean Ventilation

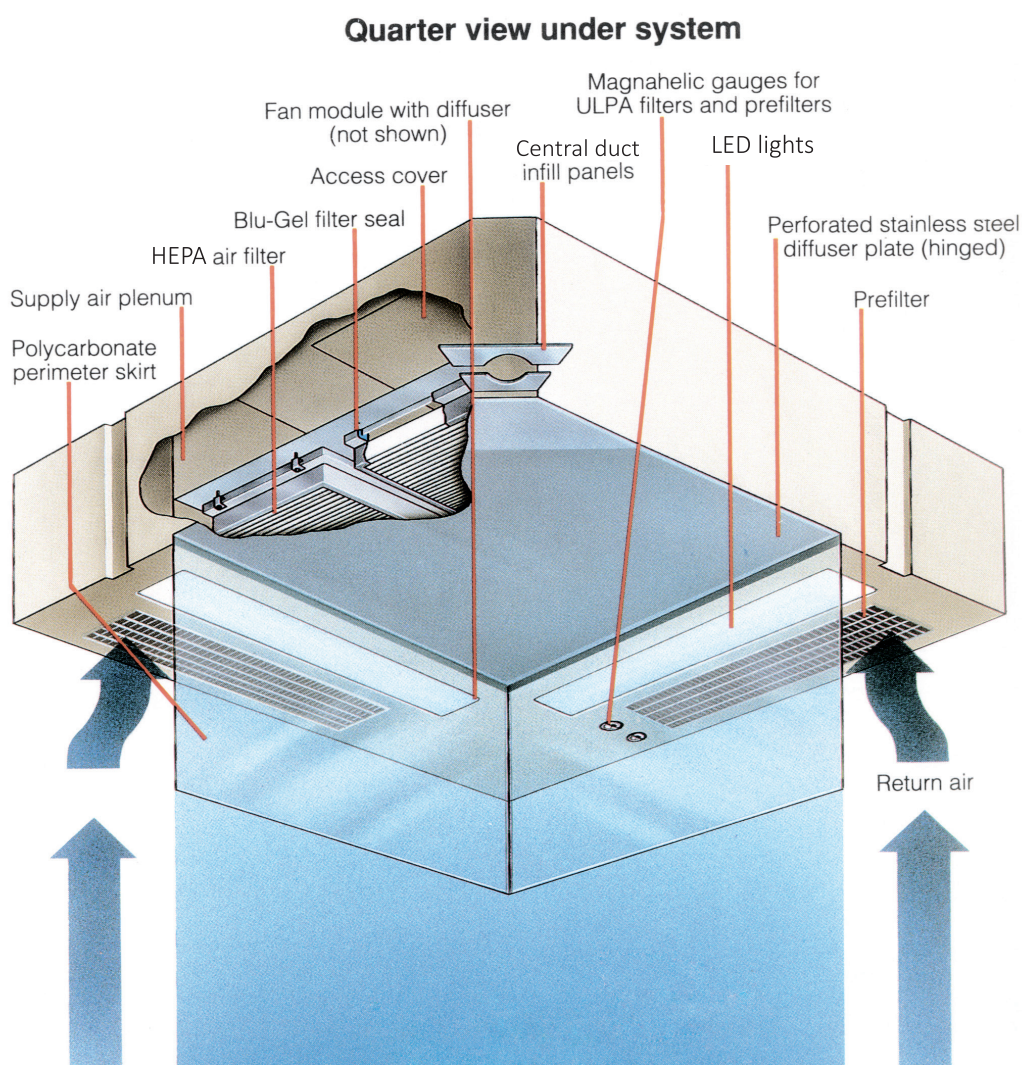
Reducing airborne bacteria in the operating theatre is a vital key to successful surgery. You can now dramatically rule out the incidence of deep sepsis in orthopaedic surgery, with similar benefits in such fields as neurosurgery and ophthalmology.

Previously acceptable levels of up to 500 bacteria-carrying particles per cubic metre are reduced to less than 10 particles per cubic metre with the UCV (Ultra Clean Ventilation) system, with obvious health and financial benefits to your patients and the hospital.

Produced as a modular system by Australia's leading manufacturer of air filters and laminar flow systems, the UCV is easily retrofitted to the ceiling or within the ceiling void of existing operating theatres.

A controlled column of ultra clean air is delivered down and over the operating table, your surgical team and their equipment. It then moves radically outwards and up to the return air intakes. Your team now has free access to and from the operating zone without the risk of introducing bacteria air from outside which can lead to contamination.

Our local manufacture provides you with immediate access to world class filter expertise, service, spare parts and NATA-accredited on-site testing facilities.



Applications

The UCV is designed for use in new or existing operating theatres where the elimination of airborne bacteria and other contaminants is of critical importance. A typical application is in orthopaedic operating theatres where the UCV's dramatic reduction of air contamination can minimise the incidence of infection in deep wound surgery, for example hip or knee replacement.

Description

The UCV is an Australian manufactured modular system that has been designed for easy installation in both new and existing operating theatres. Its attractively styled housing can be mounted almost flush with the theatre ceiling, concealing fans, pre-filters and the final HEPA or ULPA air filters with its purpose-built air diffuser in the ceiling void. Only the clear acrylic canopy extends into the theatre space, projecting to 2.0m above the theatre floor. Alternatively, it can be fitted directly to the ceiling, projecting only 750mm (plus canopy).

The configuration of filtration, diffuser and canopy removes contaminants from air drawn in by the fans and delivers a column of ultra-clean air down and over the operating theatre table and then radically outward. A unique silicone gel sealing system is used in place of traditional mechanical gaskets. This system effectively eliminates the chance of dirty air escaping between the air filters and their mounting frames. The UCV is fitted with perimeter lighting (optional colour-corrected lighting is available) and is supplied with a control panel for wall mounting.



State-Of-The-Art Filtration

Recirculating UCV systems require high efficiency terminal filters to prevent recirculation of bacteria. AES Environmental UCV HEPA filters are tested to 99.99% by Hot DOP to AS4260 to ensure full protection.

For even higher protection, ULPA filters, tested to 99.999% efficiency can be supplied. Whilst filters tested to 95% by the sodium flame test may suffice where a system employs 100% fresh air supply, consideration should be given to any risk posed by their lower efficiency.

Construction

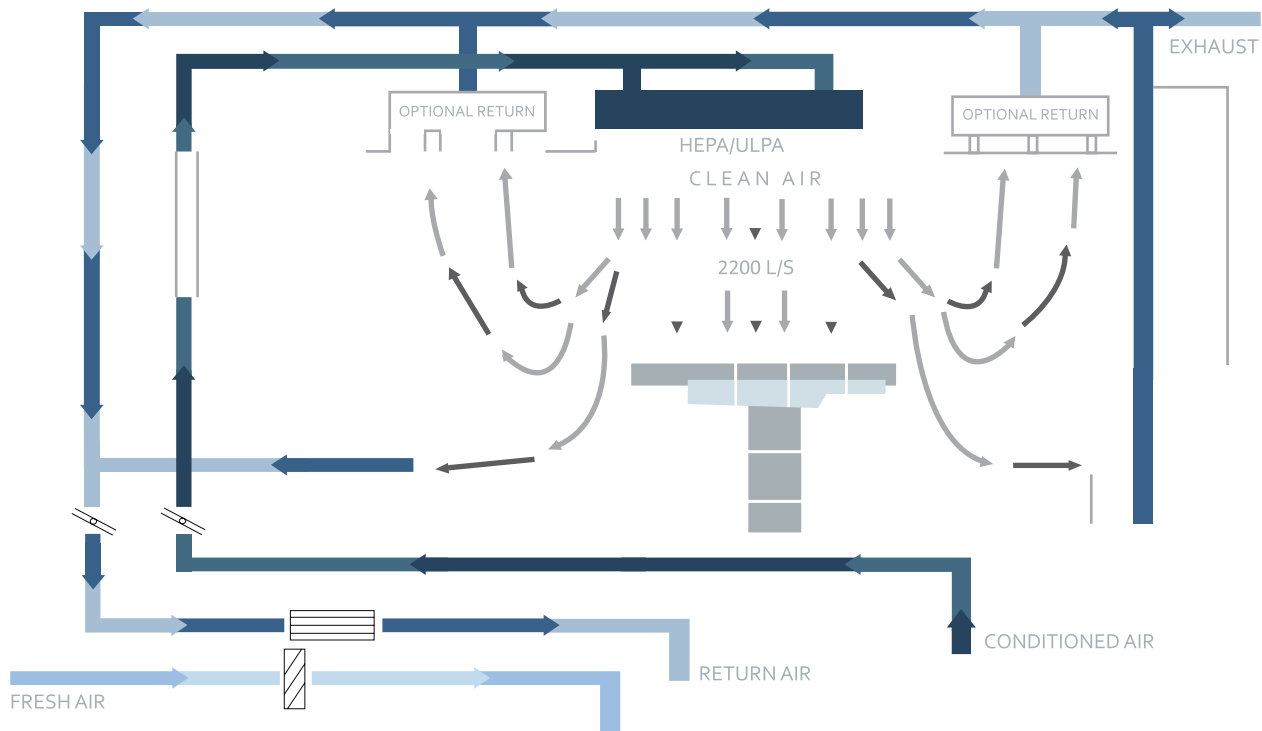
MATERIALS	Plenum zinc seal (zincanneal) steel, finished with a laboratory grade coating that is solvent, alkali and acid resistant to provide a durable and easily cleaned surface finish. The diffuser is constructed from perforated stainless steel which assists with the distribution of airflow.
FANS	Variable speed direct drive centrifugal fan/blowers enable airflow adjustment throughout the filter life and allow adjustment of the supply air velocity.
SILICONE GEL SEALING	The filters are sealed in place by a unique two-part silicone gel designed to create and preserve an airtight seal between the filter and the filter housing. The gel is factory installed and factory cured in the filter frame. Once cured, it has the self-healing qualities of a liquid while retaining the stability and non-flow characteristics of a solid. The risk of air bypass from conventional gaskets and seals is effectively eliminated.
FILTERS	HEPA or high performance ULPA filters with unique fluid seals. Medium-efficiency disposable pre-filters are fitted behind the hinged return air grilles to extend the life of the main filter. All filters are individually tested in strict accordance with the requirements of Standards Australia and the performance of the pre-filters and final filters is continuously monitored by Magnahelic differential pressure gauges.



Air Flow Pattern

This diagram shows the ideal airflow pattern for a typical UCV system. Careful design of the airflow distribution and return air grilles on all

four sides enables a controlled airflow pattern to be achieved. Average airflow rate is in accordance with the ACHS guidelines.



Operating Theatre Minimum Values

In operating theatres where deep wound surgery takes place, ultra clean air ventilation systems should achieve the following minimum standards:

- A maximum of 0.5 bacteria-carrying particles per m³ of air issuing from the final filters,
- Less than 10 bacteria-carrying particles per m³ of air within 300mm of the wound,
- Less than 20 bacteria-carrying particles per m³ of air in the 2.8m x 2.8m working area at table height (contamination of instruments and material within the sterile field will lead to wound contamination).

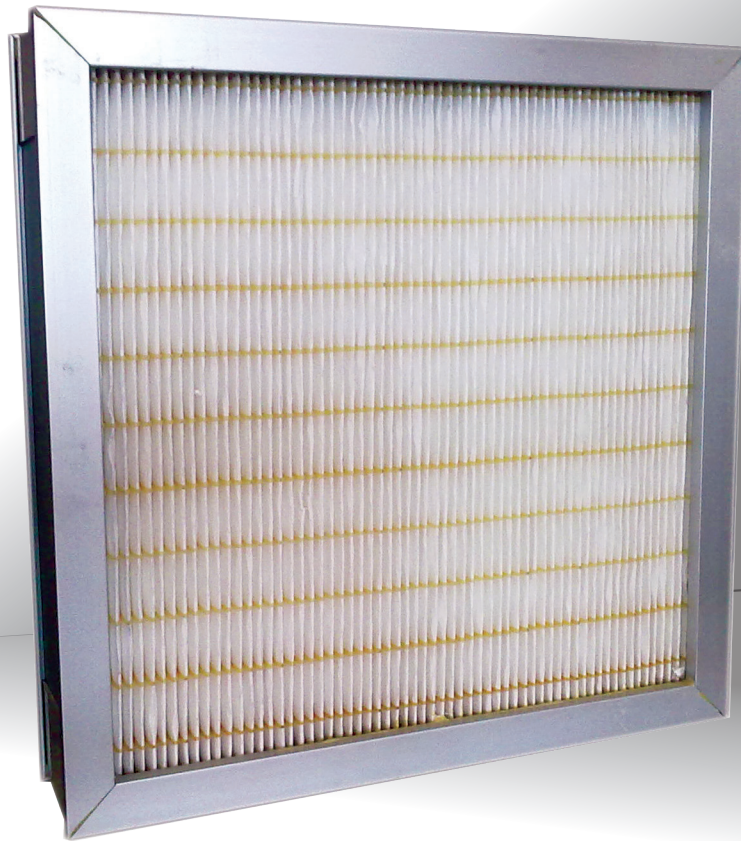
Sepsis Reduction

An extensive UK MRC-DOH study confirmed the effectiveness of UCV systems in preventing deep sepsis in the joint after total hip or knee replacement.

Design Considerations

The design of a partial walled Ultra Clean Air system should take into consideration of the entrainment from the room air into the clean zone, air velocity at the operating table and the temperature difference between supply and room air. Wound site air sampling has shown that velocities of around 0.3-0.4 metres/sec. give the best results with downflow systems proving to be between three and eight times more efficient than crossflow systems.





Filter Selection

Minipleat HEPA filters are supplied by AES Environmental and their efficiency is rated at 99.99% min efficiency on 0.3 micron. Optional ULPA filters (99.9995% min efficiency on 0.12 μm particles) are also available for the Ultra Clean Ventilation System.

Filter Information

HEPA and ULPA filters are individually tested and certified by a NATA-Accredited laboratory to ensure that it conforms to industry standards and meets or exceeds the expectations of the customer.



AES Environmental maintains an ISO 9001:2015 quality management system to ensure process and product conformance.



Engineering Data

Overall size of ceiling module with built in recirculating fan	3800x3800
Size of clean zone	2780x2780
Depth of unit below ceiling (variable)	60mm min
Supply air volume (normal airflow)	2.9401m ³ /sec
Average downflow velocity at lower canopy edge	0.38m ³ /sec
Approx. room air change if air supplied into UCV	100x per hr
Filtration standard	Final filters: 99.999% on HOT Dop to AS4260 Prefilters: 85% to AS1324 (No.4 Dust)
Electrical rating (high speed, including fluorescent lights)	Single phase, nom 3.9kW

On-Site Testing

UCV Systems and filters are factory tested and certified by a NATA-Accredited laboratory. Additional testing and certification is recommended as follows:

- On site prior to use
- After maintenance
- After filter replacement
- After re-location
- At least annually
- In special circumstances, e.g. if faulty operation is suspected.



The Company

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In keeping with our policy of continuing product improvement, we reserve the right to alter specifications without notice.



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