www.johnsonmedical.com

GUIDED AIRFLOW™

UltraClean

Operating Theatre

Safety through innovation™

JOHNSON MEDICAL

Infection Control

Did you know?

A surgical wound infection can develop at any time from 2 to 3 days after a surgery up until the wound has healed, which is usually 2 to 3 weeks after the operation. Occasionally, an infection can occur several months after an operation.

Did you know?

The UK Government figures show that MRSA cases in England rose from just over 1,000 in 1996 to more than 7,000 in 2005. It is estimated that hospital-acquired infections strike nearly 100,000 people in England each year, costing them NHS £1billion.

Source: www.timezone.co.uk. "Hospitals face watchdog's hit squads in blitz on superbug" By Philip Webster and Joanna Bale. 20 June 2005

Did you know?

"Normal speech liberated up to 200 droplets bearing bacteria, less than 100 microns in diameter. Various coughs liberated up to 3500 bacteria and sneezing liberated between 4500 and 1 million droplets less than 10 microns in diameter."

Source: Riley and O'Grady. Airborne Infection-Transmission and Control. New York: Macmillan 1961

INTERNATIONAL FEDERATION OF INFECTION CONTROL

According to Nosocomial Infection National Surveillance Services (NINSS) in an English Hospital, infections acquired in hospitals are likely to complicate illnesses, causing anxiety, discomfort and can lead to death.

Infections of the surgical wound are one of the most common HAI and are important cause of morbidity and mortality for patients undergoing surgery.

There are several factors that could affect such infection, namely, patient factors (i.e., susceptibility to infection), surgical field factors (i.e., the thermal plume from the site), room factors (i.e., cleanliness of the OR), and HVAC factors (i.e., air change rate [ACH] and direction of airflow).

The delay in recovery and increased hospital stay also has economic consequences. It is estimated that each patient with a surgical site infection requires an additional stay of 6.5 days and hospital costs are doubled.

In Modern day Hospitals, it's a pre-requisite that Operating Theatres achieve Ultra-Clean status, especially for deep wound surgery.

INTERNATIONAL FEDERATION OF INFECTION CONTROL (IFIC)
"States it is now accepted that ULTRA CLEAN AIR (<10 cfu/m³) reduces the risk of infection in implant surgeries"

ASIAN HEALTHCARE WORKER HANDOUT BY PACIFIC SOCIETY OF INFECTION CONTROL

Type of Operating Theatre	Condition	Criteria (cfu / m^3)
Conventional	Empty During Operation	< 35 < 180
ULTRA CLEAN	**Empty** **During Operation**	**< 1** **< 20 (periphery)** **< 10 (centre)**

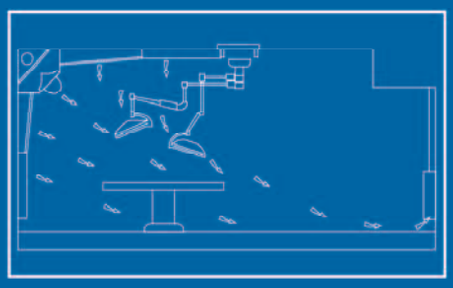
STANDARD DESIGNING RULES FOR OPERATING THEATRE

Factor	HTM 2025	ASHRAE
Pressure	Positive pressure with respect to corridor and adjacent areas The pressure differential should be around 9 up to 30 Pa	Positive pressure by supplying 15% excess air
Air Filter	Primary and Secondary filter - 80 - 90%	Primary filter - 25% Secondary filter - 90% HEPA filter - 99.97% efficiency
Humidity	55% +/- 5%	45% - 55%
Temperature	Range for working condition is 16°C to 21°C	Range for working condition is 16°C to 26°C

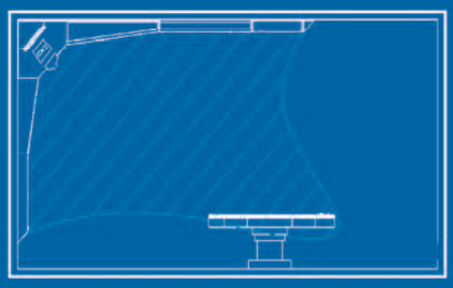
As a highly specialized medical engineering turnkey builder, Johnson Medical International is thoroughly familiar with these challenges and their solutions. We provide not only a highly efficient functional and ergonomic environment, but also equipment and finishes of the highest quality and standards.

Johnson Medical
Guided Airflow™

Johnson Medical Guided Airflow™ Ventilation system has its unique design whereby the supply air is flowing diagonally from supply air surface towards the operating theatre. The supply air stream is guided with a slit injection booster fan system. Medical instrument-laying table is continuously flushed with fresh/sterile air. The design is based on air guiding principle whereby the filtered air is guided to flow from a clean area to a less clean area and exhausted totally.



Johnson Medical Guided Airflow Ventilation™ System

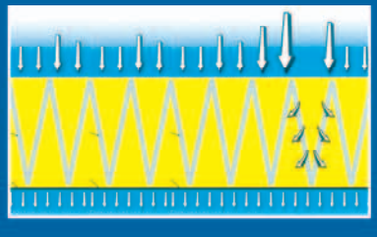


GAF Achieving a Larger Area of Clean / Sterile Zone

KEY FEATURES

1. Guided Airflow™ system comes complete with 3 HEPA Filters located at the back of the jet stream booster fan
2. Specially curved walls designed to reduce bacteria accumulation and ease of cleaning
3. 7 integrated light tubes on the GAF and 8 more surrounding the system with special reflector designed to produce more than 800 LUX throughout the whole operating theatre.
   Every single light tube is protected by an acrylic cover for ease of cleaning
4. Unique double-wall exhaust system reduces airflow and turbulence to enhance the cooling effect of the entire room

Fully Equipped Operating Theatre



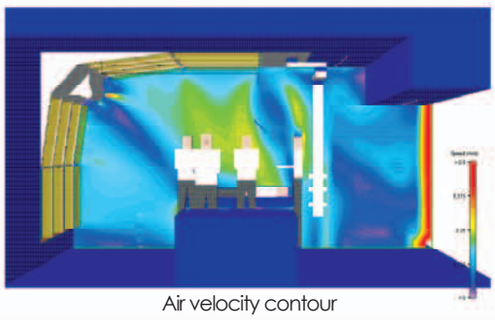
Johnson Medical uses a HEPA (High Efficiency Particulate Air) Filter with a minimum efficiency of 99.97% at 0.3µm particles.

The unique V-shaped pleats produce extremely low pressure drop and efficient utilization of the filter surface, which keeps energy costs low and results in a long service life.

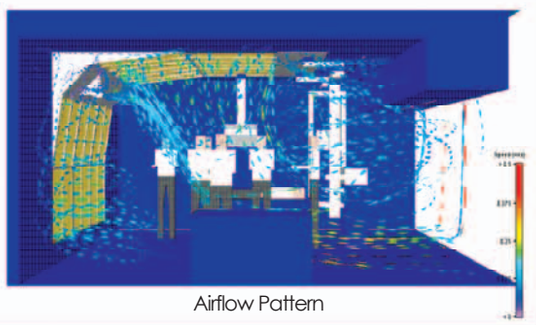
Computational Fluid Dynamics (CFD)

FLOVENT

As part of our quality system, the CFD analysis conducted in-house is a core part of our airflow design. CFD can be used to model internal and external environmental conditions to assess air movement and temperature distributions. CFD is a method to calculate and to predict the behaviour of fluids for given boundary conditions inside a predefined enclosure. The behaviour of the fluids normally seek by researchers include pressure differentials, relative pressure with adjacent rooms, temperature gradient, humidity contour, particles flow, bacterial growth prediction, airflow velocity and general airflow pattern. The fluid in question is air at ambient, temperature and pressure. Commercial software of various types are available with varying degrees of accuracy and varying levels of users interface. The commercial software used for this application is "FLOVENT".



Air velocity contour



Airflow Pattern

Computational Fluid Dynamics (CFD) Approach

- Made possible by high speed personal computers
- Applies the law of fluid dynamics
- Modeling of fluid / airflows
- Modeling of temperature distributions
- Potential modeling of particle distributions
- Allow designs and variations to be tested without the need to construct prototypes

TESTING

Johnson Medical will perform a range of tests to ensure optimal performance of the system

- Airborne Particle Count
- Airflow Velocity
- Temperature
- Relative Humidity
- Room Pressurization
- Colony Forming Unit

Colony Forming Unit Testing Method

1. Air Sampler is placed 1m from the floor in 5 locations
2. Sampling rate for about 15min per test
3. Samples are then sampled on to 5% blood or nutrient agar plate
4. All plates are incubated at 37˚C for 48 hours
5. Count the number of colonies (CFU)

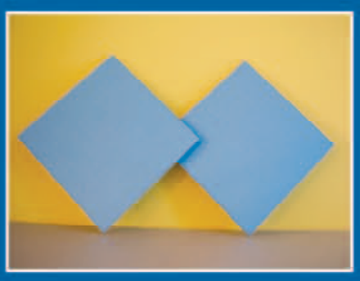
Turnkey Solutions

1 "Pass-through" cabinet is an innovative design of Johnson Medical. The unique design of the cabinet allows high-pressure sterile air to flow from the top to the bottom of the cabinet in order to maintain sterility of the surgical equipment, which is kept in the suture cabinet.

2 High-density laminated doors integrated with a special hydraulic locking system to ensure proper closing. Optional Elbow Switch Electric Door is available.

3 Stainless steel scrub basin with unique non-drip bowl and sinks minimize splashing on the floor or wall; while deep bowl, sloping bottom and curve support eliminate wet floors caused by elbow drip.

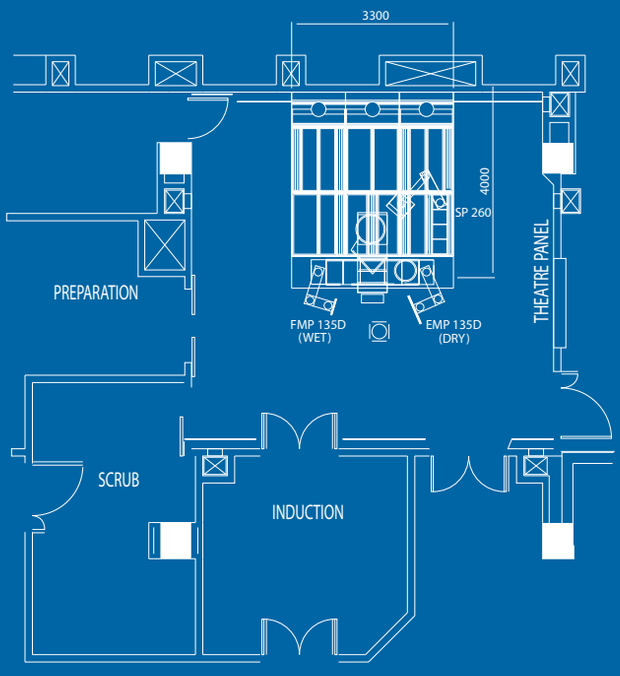
4 Surgical control panel with glass door on switches side come with stainless steel frame. Type of components installed will be based on customer's requirement with a basic of X-ray viewer, medical alarm clock etc.

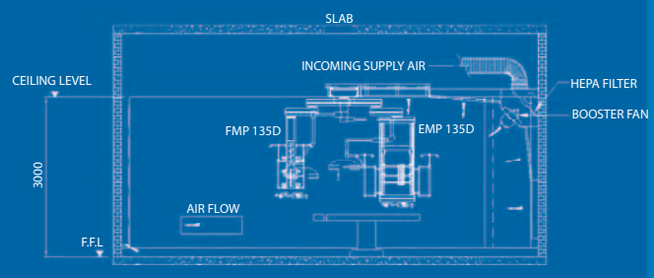


The wall façade of the Johnson medical operating theatre is constructed of structural wall clad with high pressure laminates (HPL). The HPL board is made up of Kraft paper impregnated with Phenol and a surface layer of textured paper impregnated with Melamine.
The boards give resistance to corrosion, anti-fungus, anti-scratch, anti-impact, and fire retardant and is highly durable.

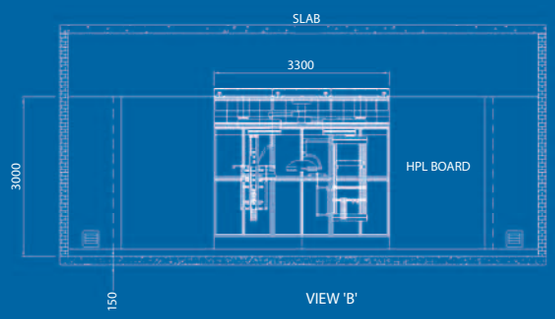
Turnkey Solution Guided Airflow

Technical Data





VIEW 'A'



VIEW 'B'

Disclaimer
1.These are typical configuration. They may vary from project to project based on customer requirements.
2.There may be improvements to the design without prior notice.
3.Pendants sold separately.

GUIDED AIRFLOW™ - GAF

Major Components	:	The entire GAF system is constructed by means of modules. All modules consist of a basic frame structure. The basic frame structure forms a typical grid of the entire ventilation system. The lower face of the ventilation system grid consists of perforated air grilles.
Material	:	Aluminum with an Epoxy Powder Coated finish.
Dimension	:	3300mm(l) x 3300mm(w) x 2850mm(h)
Filters	:	HEPA filters with 99.97% efficiency
AHU Pressure Requirements	:	Initial: 39 mm wg / 1.56 inch wg Final: 79 mm wg / 3.16 inch wg
Compliance	:	ISO 9001:2003, ISO 13485: 2003, HTM 2025

Safety through innovation™

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