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.

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

Stainless steel scrub basin with unique non-drip bowl and sinks minimize splashing on the floor or wall; while deep bowl, sloping bottom and round support columns prevent water from collecting and dripping off the floor.

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 facade 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. This provides resistance to corrosion, anti-fungus, anti-scratch, anti-impact, and fire retardant and is highly durable.

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 has perforated air grilles integrated with the entire 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:

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.
Infection Control

According to Nosocomial Infection National Surveillance Services (NINSS) in an English hospital, infections acquired in hospital can lead to complications, causing serious discomfort and can lead to death.

Infection is the single greatest risk of all the most common risk and are important cause of mortality and morbidity for patients undergoing surgery.

There are several factors that could affect such infection, namely patient factors (i.e., abscesses to infection), surgical factors (i.e., the thermal point from the liquid), use factors (i.e., cleanliness of the OR), and HVAC factors (i.e., air change rate [ACH] and disinfection of airflow).

The delay in recovery and increased hospital stay also has economic consequences. It is estimated that the additional stay with surgical site infection requires an additional stay of 3 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.

Did you know

- The air system in operating theatres is designed to reduce the risk of infection to the patient's surgical site. This is achieved through the use of high-efficiency particulate air (HEPA) filters, which can remove 99.97% of airborne particles.

Johnson Medical

Guided Airflow™

Johnson Medical's Guided Airflow™ ventilation system has a unique design whereby the supply air is flowing diagonally from supply air at floor level, the operating theatre. The surgery area is continuously flushed with filtered sterile air. The design is based on air guiding principle whereby the filtered air is guided to flow in a manner to effect clean zones and reduce bacterial load.

Did you know

- Johnson Medical uses a M.A.Q.S.™ 90 (Mold, Aroma, Quality, Safety) air filter with a minimum efficiency of 99.97% for all operations.

Did you know

- The unique M.A.Q.S.™ 90 filter is designed to remove 99.97% of airborne particles, ensuring a clean and sterile environment.

KEY FEATURES

1. Guided Airflow™ system comes complete with 3 HEPA filters situated on the back of the jet (cleaner booster fan).
2. Specially curved walls designed to reduce bacteria accumulation and ease of cleaning.
3. 3 jetted exhaust fans on the GAF and air is directed into the corridor and adjacent areas.
4. Unique double wall exhaust system reduces airflow and turbulence to enhance the cooling effect of the entire room.

STANDARD DESIGNING RULES FOR OPERATING THEATRE

<table>
<thead>
<tr>
<th>Factor</th>
<th>Criteria (cfu / m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Operating Theatre</td>
<td>Condition</td>
</tr>
<tr>
<td></td>
<td>Criteria (cfu / m³)</td>
</tr>
<tr>
<td>Conventional</td>
<td>Empty</td>
</tr>
<tr>
<td></td>
<td>3.5</td>
</tr>
<tr>
<td>ULTRA CLEAN</td>
<td>Empty</td>
</tr>
<tr>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Empty</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
</tr>
</tbody>
</table>

Did you know

- The pressure differential should be around 9 up to 30 Pa to corridor and adjacent areas.

Johnson Medical Guided Airflow™ Ventilation System

- The design is based on air guiding principle whereby the filtered air is guided to flow in a manner to effect clean zones and reduce bacterial load.

Colony Forming Unit Testing Method

1. Air Sampler is placed 1m from the floor in 5 locations.
2. Count the number of colonies (CFU).
3. Compare the number of colonies at 5 locations.

Computational Fluid Dynamics (CFD)

As part of our quality claims, the CFD analysis conducted in house is a core part of our airflow design. CFD can take input from GA, EMF, IED, HVAC, Isoflow and other simulation software. The output is a digital model of the airflow, bacterial growth prediction, air velocity and other airflow patterns. The fluid is assumed to be an ideal fluid with no viscosity. CFD is a method to calculate and to predict the behaviour of fluids for given boundary conditions inside a defined enclosure. The behaviour of the fluids normally varies by interaction (i.e., free-slip, wall, slip-wall, etc.) and by fluid properties (i.e., pressure, density, viscosity). CFD can be used to model internal and external environmental conditions to assess air movement and fluid transport.

As part of our quality system, the CFD analysis conducted in-house is a core part of our airflow design. CFD can take input from GA, EMF, IED, HVAC, Isoflow and other simulation software. The output is a digital model of the airflow, bacterial growth prediction, air velocity and other airflow patterns. The fluid is assumed to be an ideal fluid with no viscosity. CFD is a method to calculate and to predict the behaviour of fluids for given boundary conditions inside a defined enclosure. The behaviour of the fluids normally varies by interaction (i.e., free-slip, wall, slip-wall, etc.) and by fluid properties (i.e., pressure, density, viscosity). CFD can be used to model internal and external environmental conditions to assess air movement and fluid transport.

At Johnson Medical, we perform CFD analysis to ensure optimum performance of the system.

- Analyse Airflow field
- Analyse Temperature
- Analyse pressure
- Analyse velocity
- Analyse the efficiency of the system
- Allow design and variations to be tested without the need to construct prototypes

TESTING

Johnson Medical will perform the airflow test to ensure optimum performance of the system.

- Analyse Airflow field
- Analyse Temperature
- Analyse pressure
- Analyse velocity
- Analyse the efficiency of the system

Colony Forming Unit Testing Method

1. Air Sampler is placed 1m from the floor in 5 locations.
2. 5 locations in 3 locations.
3. Compare the number of colonies at 5 locations.

Computational Fluid Dynamics (CFD) Approach

- Model the airflow dynamics
- Model the temperature distribution
- Model the pressure distribution
- Model the particle distribution
- Model the fluid dynamics

- Apply the law of fluid dynamics
- Apply the law of fluid dynamics
- Apply the law of fluid dynamics
- Apply the law of fluid dynamics
- Apply the law of fluid dynamics

- Applies the law of fluid dynamics
- Applies the law of fluid dynamics
- Applies the law of fluid dynamics
- Applies the law of fluid dynamics
- Applies the law of fluid dynamics

- Allowing design and variations to be tested without the need to construct prototypes

Colony Forming Unit Testing Method

1. Air Sampler is placed 1m from the floor in 5 locations.
2. 5 locations in 3 locations.
3. Compare the number of colonies at 5 locations.
Infection Control

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

Infections in the surgical ward are one of the most common risks and are important causes 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 jet stream), non surgical 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 is a pre-requisite that Operating Theatres achieve Ultra-Clean status, especially for颢poraed surgical procedures.

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 surgery"

### ASIAN HEALTHCARE WORKER HANDOUT BY PACIFIC SOCIETY OF INFECTION CONTROL

<table>
<thead>
<tr>
<th>Type of Operating Theatre</th>
<th>Criterion</th>
<th>Criteria (cfu / m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>During Operation</td>
<td>&lt; 1000</td>
</tr>
<tr>
<td>ULTRA CLEAN</td>
<td>Empty</td>
<td>&lt; 10</td>
</tr>
<tr>
<td></td>
<td>During Operation</td>
<td>&lt; 10 (periphery)</td>
</tr>
</tbody>
</table>

### Johnson Medical Guided Airflow™

Johnson Medical Guided Airflow™ ventilation system has a unique design whereby the supply air is flowing diagonally from supply to air filter toward the surgical site. The supply of air is guided with an integrated jet to create a streamline. Medical instrument ejection tunnel is continuously filled with fresh sterile air. The design is based on all guiding principle whereby the filtered air is guided to flow in a clean area to keep clean areas and medication sterile.

### KEY FEATURES

1. Guided Airflow™ system comes complete with 3 HEPA filters located at the back of the jet stream booster fans.

2. Specially curved walls designed to reduce bacteria accumulation and ease of cleaning.

3. 7 integrated light tubes on the GAF and 8 integral systems with special reflector designed to produce more than 800 LUX throughout the whole operating room.

4. Unique double-wall exhaust system reduces airflow and turbulence to enhance the cooling effect of the entire room.

5. Every single light tube is protected by an acrylic cover for ease of cleaning.

6. Airflow velocity is 60-200 cm/s.

7. 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.

8. In modern-day hospitals, it is a pre-requisite that Operating Theatres achieve Ultra-Clean status, especially for 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 ventilation system but also an efficient clean area.

### Johnson Medical Guided Airflow™ System

- **1.** Guided Airflow™ system comes complete with 3 HEPA filters located at the back of the jet stream booster fans.
- **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.
- **4.** Every single light tube is protected by an acrylic cover for ease of cleaning.
- **5.** Unique double-wall exhaust system reduces airflow and turbulence to enhance the cooling effect of the entire room.

### Environmental Factors

<table>
<thead>
<tr>
<th>Factor</th>
<th>Range for working conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>16 to 18 kPa</td>
</tr>
<tr>
<td>Temperature</td>
<td>18°C to 21°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>45% to 55%</td>
</tr>
<tr>
<td>Airflow Velocity</td>
<td>60-200 cm/s</td>
</tr>
<tr>
<td>Air Filter Efficiency</td>
<td>&gt; 99.97%</td>
</tr>
<tr>
<td>Air Filter - Primary</td>
<td>25-30 μm</td>
</tr>
<tr>
<td>Air Filter - Secondary</td>
<td>&lt; 2 μm</td>
</tr>
<tr>
<td>Air Filter - HEPA</td>
<td>&gt; 99.99%</td>
</tr>
</tbody>
</table>

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 ventilation system but also an efficient clean area.

### Testing of Johnson Medical Guided Airflow™ System

1. Air Sampler is placed 1m from the floor in 5 locations.
2. Sampling rate for about 15min per test.
3. 3 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.
4. Every single light tube is protected by an acrylic cover for ease of cleaning.

### Computational Fluid Dynamics (CFD)

**Approach**
- **Modeling size of HVAC System**
- **Modeling ergonomic calculations**
- **Evaluating airflow over time**
- **Analyzing fluid flow**

**Testing**

Johnson Medical will perform orange or at least ensure optimal performance of the system.

- **Airflow Pattern**
- **Air velocity**
- **Airflow distribution**
- **Air velocity measurement**
- **Airflow uniformity**

**Colony Forming Unit Testing Method**

1. Air Sampler is placed 1m from the floor in 5 locations.
2. 3 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.
3. Every single light tube is protected by an acrylic cover for ease of cleaning.
4. **Count the number of colonies**
Infection Control

According to Nosocomial Infection National Surveillance Service (NINNS) 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 risk 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 flash room factors (i.e., cleanliness of the OR), and HVAC factors (i.e., air change rate [ACH] and decontamination 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 3.4 days and hospital costs are doubled.

In modern-day hospitals, it is a pre-requisite that Operating Theatres achieve Ultra-Clean status, especially for clean/clean-surge 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”

Johnson Medical Guided Airflow™

Johnson Medical Guided Airflow™ ventilation system has its unique design whereby the supply air is flowing diagonally from supply air shaft towards the operating theatre. The supply air, entering a guide with an angle inside the theatre, medical instrument passing area is continuously flushed with fresh sterile air. The design is based on air guiding principle whereby the filtered air guided to flow from clean area to less clean areas and the reverse.

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 five more surrounding the system with special reflector designed to produce more than 800 LUX throughout the whole operating theatre.
4. Unique double-wall exhaust system reduces airflow and turbulence to enhance the cooling effect of the entire room.

STANDARD DESIGNING RULES FOR OPERATING THEATRE

<table>
<thead>
<tr>
<th>Factor</th>
<th>Category</th>
<th>Criteria (cfu / m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure</td>
<td>Positive pressure with respect to corridor and adjacent areas</td>
<td>Positive pressure by supplying 15 35% excess air</td>
</tr>
<tr>
<td>Air Filter</td>
<td>Primary - Secondary filter</td>
<td>Primary - 25% Secondary - 20%</td>
</tr>
<tr>
<td>Humidity</td>
<td>45% ± 5%</td>
<td>45% ± 5%</td>
</tr>
<tr>
<td>Temperature</td>
<td>24°C ± 1°C</td>
<td>24°C ± 1°C</td>
</tr>
</tbody>
</table>

As a highly specialized medical engineering services 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.

Compartmental Fluid Dynamics (CFD)

As part of our quality claims, the CFD analysis conducted to ensure a safe scope of our airflow design. CFD can be used to model airflow in environments. It can be used to analyze the effects of variations in the boundary conditions inside a ventilated enclosure. The behaviour of the fluid mostly varies by interaction not only with the environment but also with the varying scales, temperature gradient in the humidity content, pressure changes, frictional losses, air density and even the light conditions. The fluid is a highly non-Newtonian fluid and varying density of air. CFD is a method to calculate and to predict the behaviour of fluids for given temperature distributions. Computational Fluid Dynamics (CFD) Approach

- Applications to fluid dynamics
- Simulation of fluid dynamics
- Simulation of dynamic systems
- Analysis of static systems
- Allow design and installation 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

Commissioning

- Preface Test
- Preface Test
- Preface Test
- Preface Test
- Preface Test

Colony Forming Unit Testing Method

1. Air samples are taken from the floor of operating rooms.
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. The unique V-shaped pleats produce extremely low pressure drop and efficient utilization of the filter surface, which takes energy costs and results in a long service life.
"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.

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

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.

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.
"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.

- High-velocity controlled down-ventilation with a special hydraulic locking system to ensure proper closing. Optional Power Switch Electric Door available.

- Stainless steel door with unique non-slip boot floor minimizing sliding on the floor or wall, while deep base, sloping bottom and curve support expands the space of the suture cabinet.

- Surgical control panel with glass door on switches side comes 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.

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 has a typical grid of the entire ventilation system. The lower face of the ventilation system 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:

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