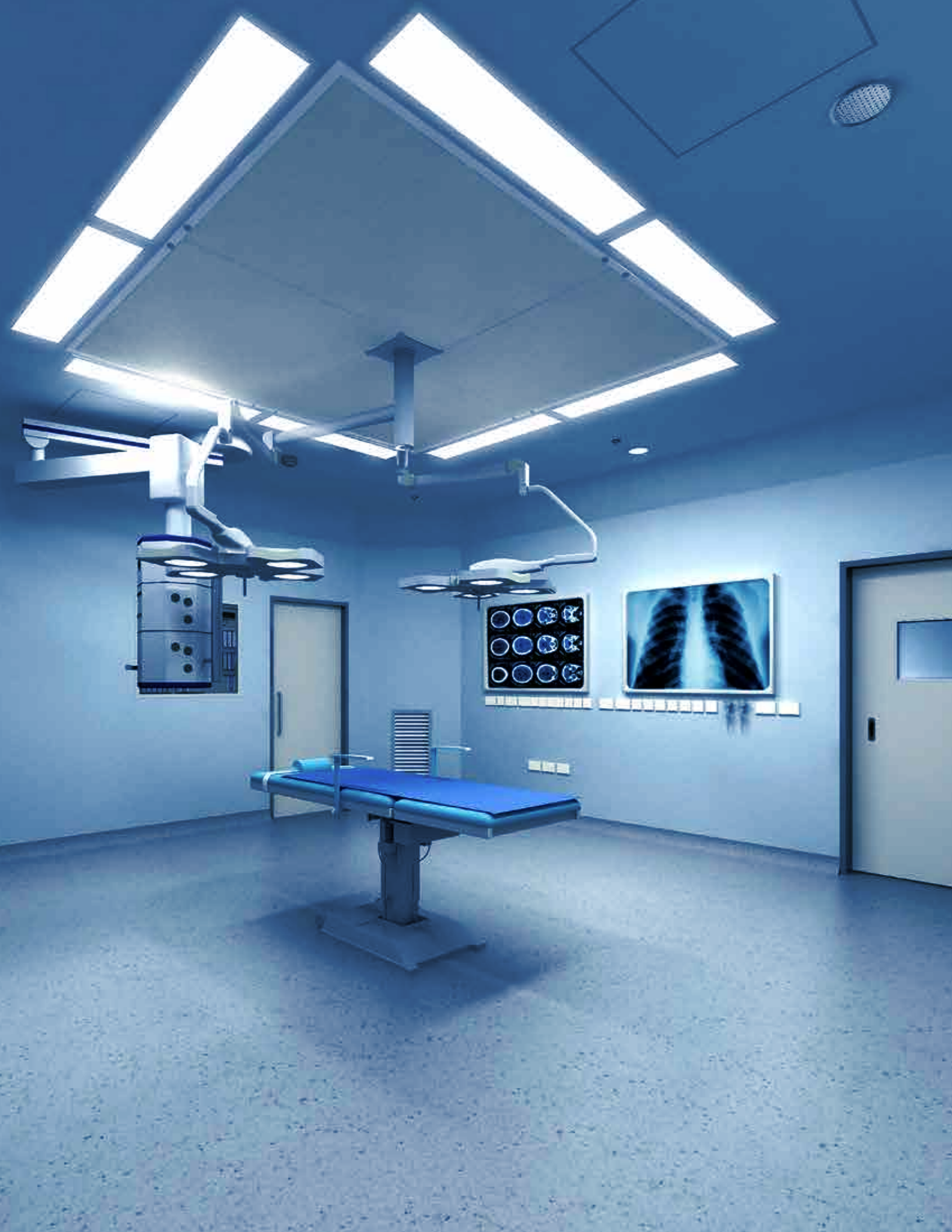


**CLEAN ROOMS**







**HILUX**

First Choice

for

**Clean Rooms**

Production and operational efficiencies are critical to success in the competitive pharmaceutical industry. However, these need to be achieved in conjunction with attaining the high quality standards prescribed for a life-saving product category. Both these can be achieved only with the right choice of materials for the production process.

The most critical requirement in a pharma production process is for setting up Clean rooms – specialized enclosures in the production process where the most quality-affecting process happen. So when it comes to dry walls and ceilings for Clean Rooms, it is imperative that they stand up to the most stringent quality requirement.

The room construction needs to be such that the enclosure material does not emit or generate particles and could be easily cleaned. Usually material like modular metal panels is used for walls and ceiling while flooring could be of Vinyl or epoxy. Also, PUF/EPS insulated panels are widely used.

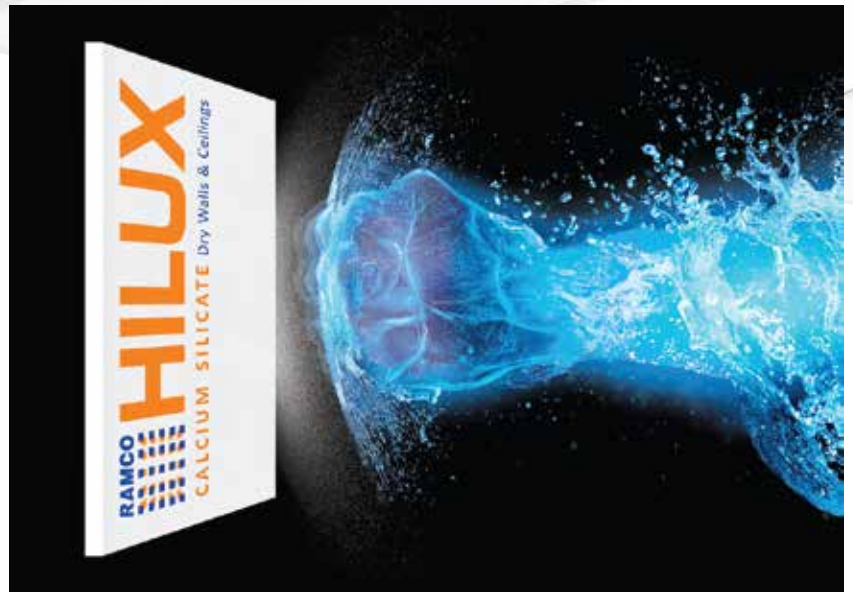
However, these materials are subject to corrosion/rust/fungus growth over repeated exposure to moisture, are heavier thus driving up structural costs and call for elaborate construction process.

**Ramco Hilux Calcium Silicate Boards have just the right mix of physical and chemical properties which makes them perfect for use in a Clean Room facility. HILUX can also help you bring in efficiencies at an optimum cost.**

# Why is HILUX Calcium Silicate Board best suited for Clean Rooms

## WATER RESISTANCE

Ramco Hilux Boards do not lose their dimensional strength even when exposed to moisture. Other light-weight boards, like Gypsum, cannot withstand such humid conditions without having suitable coating on all sides of the board. The coatings cannot last longer. Once the effect of the coating wanes, it cannot be redone. Thus the cost of coating not only makes plaster boards costlier but also unsuitable for the purpose.

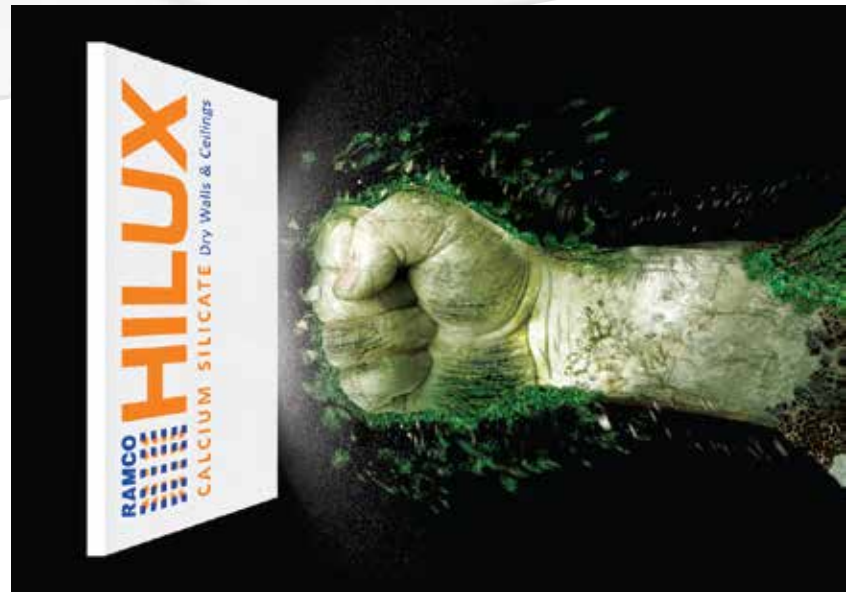


## TERMITE RESISTANCE

Ramco Hilux Boards are completely unaffected by termites.

## FUNGUS RESISTANCE

Humid environment is an ideal breeding ground for micro-organisms like fungus and bacteria. Ramco Hilux Boards resist any such growth and keep the environment clean and healthy.



## LIGHT WEIGHT

Ramco Hilux Boards are very light in weight, having dry density of  $850 \text{ Kg/m}^3$  which helps in reducing structural cost.

## FRIENDLY WITH EPOXY PAINT

Ramco Hilux board and systems can provide partition and ceiling systems to meet the technical requirements of clean room installation from class 10,000 to 100,000 with 3 coats of Epoxy Paint and class 100 to 100,000 with antistatic PVC film lamination on Hilux board surface.



## NO PARTICLE SHREDDING

Both ceilings and partitions are inert and non-particle shredding will form part of the Clean Room aseptic envelope to enable compliance with U.S. Federal Standard 290E and GMP standards.



## HILUX Clean Rooms Standards

Clean Rooms are confined areas in which various environmental elements, such as contamination, particle matter, microbes, temperature, humidity, etc. are controlled within precise limits. It is a room in which the concentration of airborne particles is controlled to specified limits. Eliminating sub-micron airborne contamination is really a process of control. These contaminants are generated by people, process, facilities and equipment. They must be continually removed from the air. The level to which these particles need to be removed depends upon the standards required.

Clean Rooms are generally used for the production and packaging of sensitive components, such as microchips and pharmaceuticals, which require high levels of cleanliness or precise temperature control. However, they are used in a wide range of industries also.

### Clean Room Air Flow Principles

Clean Rooms maintain particulate-free air through the use of either HEPA or ULPA filters employing laminar or turbulent air flow principles. Laminar, or unidirectional, air flow systems direct filtered air downward in a constant stream. Laminar air flow systems are typically employed across 100% of the ceiling to maintain constant, unidirectional flow. Laminar flow criteria is generally stated in portable work stations (LF hoods), and is mandated in ISO-1 through ISO-4 classified Clean Rooms. Proper clean room design encompasses the entire air distribution system, including provisions for adequate, downstream air returns. In vertical flow rooms, this means the use of low wall air returns around the perimeter of the zone. In horizontal flow applications, it requires the use of air returns at the downstream boundary of the process. The use of ceiling mounted air returns is contradictory to proper Clean Room system design.

## Clean Room Classifications

Clean Rooms are classified by how clean the air is. In Federal Standard 209 (A to D) of the USA, the number of particles equal to and greater than 0.5mm is measured in one cubic foot of air, and this count is used to classify the Clean Room. This metric nomenclature is also accepted in the most recent 209E version of the Standard. Federal Standard 209E is used domestically. The newer standard is TC 209 from the International Standards Organization. Both standards classify a Clean Room by the number of particles found in the laboratory's air. The Clean Room classification standards FS 209E and ISO 14644-1 require specific particle count measurements and calculations to classify the cleanliness level of a Clean Room or clean area. In the UK, British Standard 5295 is used to classify Clean Room. This standard is about to be superseded by BS EN ISO 14644-1.

Clean Rooms are classified according to the number and size of particles permitted per volume of air. Large numbers like "class 100" or "class 1000" refer to FED\_STD-209E, and denote the number of particles of size 0.5 mm or larger permitted per cubic foot of air. The standard also allows interpolation, so it is possible to describe e.g. "class 2000." Small numbers refer to ISO 14644-1 standards, which specify the decimal logarithm of the number of particles 0.1  $\mu\text{m}$  or larger permitted per cubic metre of air. So, for example, an ISO class 5 Clean Room has at most  $10^5 = 100,000$  particles per  $\text{m}^3$ .

Both FS 209E and ISO 14644-1 assume log-log relationships between particle size and particle concentration. For that reason, there is no such thing as zero particle concentration. Ordinary room air is approximately class 1,000,000 or ISO 9.





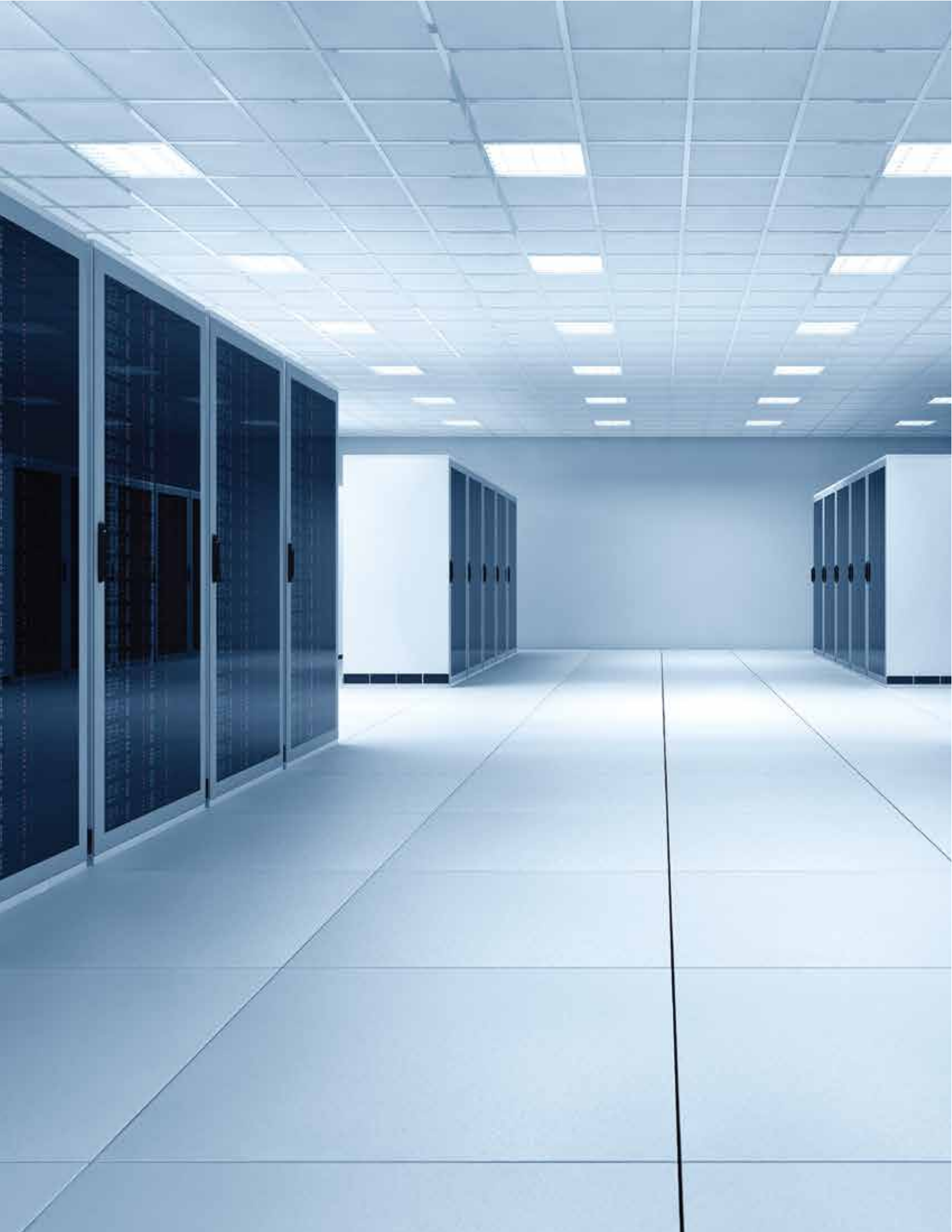
### ISO 14644-1 Clean Room Standards

Class	maximum particles/m <sup>3</sup>						FED STD 209E equivalent
	≥0.1 μm	≥0.2 μm	≥0.3 μm	≥0.5 μm	≥1 μm	≥5 μm	
ISO 1	10	2					
ISO 2	100	24	10	4			
ISO 3	1,000	237	102	35	8		Class 1
ISO 4	10,000	2,370	1,020	352	83		Class 10
ISO 5	100,000	23,700	10,200	3,520	832	29	Class 100
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293	Class 1,000
ISO 7				352,000	83,200	2,930	Class 10,000
ISO 8				3,520,000	832,000	29,300	Class 100,000
ISO 9				35,200,000	8,320,000	293,000	Room Air

### BS 5295 Clean Room Standards

Class	maximum particles/m <sup>3</sup>				
	≥0.5 μm	≥1 μm	0	0	0
Class 1	3,000		100	30	
Class 2	300,000	1,000,000	2,000	4,000	300
Class 3			20,000	40,000	4,000
Class 4					

Clean area separation: Adequately separating areas of operation is an important part of contamination prevention. To maintain air quality in areas of higher cleanliness, it is important to achieve proper air flow and a positive pressure differential relative to adjacent less clean areas. Rooms of higher air cleanliness should have a substantial positive pressure differential relative to adjacent rooms of lower air cleanliness.



## Interior finishing materials

### a) General requirements

Material shall have such properties as chemical resistance, contamination proof and clean, as well as the following features:

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#### Tight surface structure

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#### Easy to clean

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#### Long life and strong against shock

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#### Moisture proof

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#### Smooth surface

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#### Dust proof

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#### Easy workability

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#### Homogeneous

### b) Special requirements

Small dust sticking nature (anti- static):  
Small electro- static property provides better quality for interior finishing material.

#### Electric insulation

If volume resistivity reach to  $10^8$  cm and surface resistivity go up  $10^{10}$ , Contamination by electro-static shall be originated.

#### Abrasion proof

Sufficient surface hardness is required to prevent dust by vibration, earthquake & cleaning

#### Impact proof

Crack and breakage by outer shock or shrinkage will cause piling of dust or bacteria, so a material shall have sufficient strength against impact.

#### Heat resistance

Material required not to be influenced by high temperature steam sterilizing process (both base board and surface coating).

#### Reflection degree

Reflection co-efficient and surface gross rate shall be important factor to determine environmental design, data under consideration of color and lighting plan.

#### Bactericide ray

It is important to select a low reflective finishing material of Bactericide ray to minimize hazards by radiation.

#### Stain proof

Surface of material shall be easy to wash with sponge to keep a room clean.



# HILUX Walls & Ceilings

Ramco Hilux board and systems can provide partition and ceiling systems to meet the technical requirements of Clean Room installation from class 10,000 to 100,000 with 3 coats of Epoxy Paint and class 1000 to 100,000 with antistatic PVC film lamination on Hilux board surface. Both ceilings and partitions are inert and non-particle shedding and will form part of the Clean Room aseptic envelope to enable compliance with U.S. Federal Standard 290E and GMP standards. Detailed requirements and their compliance with Ramco Hilux board and systems are given below:

Sl. No.	Clean Room Requirements	Hilux painted with PU / EPOXY paint	Hilux laminated with PVC FILM on face side
<b>1</b>	<b>GENERAL REQUIREMENT</b>		
a.	Tight surface structure	The stable crystalline structure makes Hilux boards strong and durable. The boards are strong enough to take normal impacts. The boards neither degrade/ deteriorate physically nor turn into powder	Hilux surface laminated with PVC makes it stronger and takes care of incidental impacts
b.	Easy to clean	The painted surface can easily be cleaned	Laminated surface can be washed with spray, and light detergent and soap can be used with wet moping
c.	Long life and strong against shock	The boards are made from minerals, which do not allow to disintegrate	The boards are made from minerals, which do not allow to disintegrate
d.	Moisture resistant	The boards are moisture resistant and the coating adds to this requirement	Impermeability nature of the film makes it more moisture resistance
e.	Smooth surface	Hilux has smooth surface and the coating adds to this requirement	The laminated surface is more smooth hence does not allow the dust to settle on it
f.	Dust resistant ( anti- static)	The coatings make the boards dust resistant	PVC film provides antistatic surface and does not allow the dust to settle on it
g.	Easy workability	It is very easy to work with	It is very easy to work with.
h.	Homogeneous	The boards are Homogeneous because these are made out of one mix only	The boards are Homogeneous because these are made out of one mix only



2	SPECIAL REQUIREMENTS		
a.	Electric insulation	Dry board does not allow electric current to pass	Dry board does not allow electric current to pass
b.	Abrasion resistant	The painted surface will be abrasive resistant	The board surface is covered by the film therefore no rubbing is needed for surface preparation
c.	Impact resistant	The boards are hard enough to take care of normal impacts. The Impact strength of the board is 1700 J /M <sup>2</sup>	Laminated surface enhances the impact resistance. The Impact strength of the board is 1700 J /M <sup>2</sup>
d.	Heat resistance	Thermal conductivity is 0.18 W/mK, good enough to resist the heat	Thermal conductivity is 0.18 W/mK, good enough to resist the heat
e.	Reflection degree	Surface reflection (bare board) is 75%, however it will further depend on the paint used	Surface reflection (bare board) is 75%, however it will further depend on the paint used
f.	Stain resistant	The painted surface will be washable with sponge	The laminated surface will be washable with sponge



# HILUX Clean Room Partition

## General Description

A non-load bearing **90mm thick**, metal framed partition with **1½ hour fire resistance**, **42 Decibel sound insulation** and **up to a height of 3 mtr.**

## Performance

Overall thickness	– 90mm
Maximum Height	– 3000mm
Fire Resistance	– 1½ Hour with integrity and insulation as per BS-476 Part:22
Sound Insulation (100-3150Hz)	– 42dB

## System Specification

### Main System

90mm thick metal stud partition comprising of a composite framework which includes a 48mm stud of 0.55mm thick and having two unequal flanges of 48 and 50mm each placed at 610mm center to center in 50mm floor and ceiling channel with two equal flanges of 32mm each fixed to floor and ceiling at 600mm center, with the help of nylon sleeves and wood screws. Two layers of 10mm thick Hilux boards are then screw fixed to the studs and channels at 200mm centre on both sides of the frame work, with 25 & 35mm long self drilling & tapping screws having Phillips head with under head cutter, for first and second layer boards respectively. The board's joints are to be staggered to avoid through passage.

### Insulation

50mm thick mineral wool (Density -48kg/M3) is to be placed in the cavity of the Partition.



### **Jointing and Finishing**

Finally edges of the facing boards are to be jointed and finished so as to have a seamless finish which includes filling and finishing with specially formulated jointing compound and 48mm wide self-adhesive fiber tape.

### **Facing board treatment**

Ramco Hilux board and systems can provide partition and ceiling systems to meet the technical requirements of Clean Room installation from class 10,000 to 100,000 with 3 coats of Epoxy Paint and class 1000 to 100,000 with antistatic PVC film lamination on Hilux board surface. Both ceilings and partitions are inert and non-particle shedding and will form part of the Clean Room aseptic envelope to enable compliance with U.S. Federal Standard 290E and GMP standards.



**HILUX**

## Clean Room Suspended Ceiling (Seamless)

### System Specification

#### Main system

Metal framed Suspended ceiling comprises of G.I perimeter channel having 0.55mm thickness, two unequal flanges of 20 and 30mm and web of 27mm is fixed to surrounding walls/partition using nylon sleeves and screws at 450mm centers. Then Intermediate Channel (0.91mm thick) having two equal flanges of 15 mm. each and a web of 45mm is suspended from the soffit at 1220mm center with ceiling angle of width 25mm x 10mm x 0.55mm thick, fixed to soffit with G.I cleat and steel expansion fasteners. Ceiling section of 0.55mm thickness having knurled web of 50.5 mm and flanges of 26mm each with lips of 10.5mm are then fixed to the intermediate channel with connecting clips across to the Intermediate channel, at 610/457mm centers. 8mm thick square/tapered edge Hilux Boards are then screw fixed along/across the ceiling sections with 25mm long self drilling & tapping screws having Phillips head with under head cutter, at 200mm centers through the Hilux board fillets.

#### Jointing and finishing

The joints of the face boards are finished with specially formulated jointing compound and 48mm wide fiber tape to provide seamless finish.

Note:

G.I. perimeter channel and supporting materials are to be provided to make any Opening for light fittings, diffusers etc. and should be supported properly to Maintain the integrity of the ceiling, and should be charged extra.

## Marquee Projects

Intas Pharma	Zydus Cadila	Cadila Pharma
Torrent Pharma	Osaka Pharma	Dishman Pharma
Gujarat Medicraft	Medico Labs	Food Product
Mother Dairy	Animal Vaccination	Choksi Labs
Cipla Goa	Ds Antibio	Synchem Pharma
Raptakos Brett	Aglochem	Cipla, Baddi
Amartara Plastic	Technovinyl	Ethyl Pharma
Ciba, Goa	Emcure Biotech, Pune	Brocia Pharma, Jejuri
Ajanta Pharma, Aurangabad	Glen Pharma, Goa	Emcure Pharma, Pune
Serum Institute, Pune		

# Notes

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RIL, Keshwana Plant, Kotputli

# Ramco Industries

Ramco Hilux is brought to you by Ramco Industries Limited, a part of the US\$ 1 billion Ramco Group with interests in cement, dry walls & ceiling products, cotton yarn, surgicals & software. Ramco Industries is one of the leading building materials manufacturers in South Asia and has been in the forefront of innovation, answering perplexing challenges with definitive solutions.

Ramco Hilux is manufactured at the ISO 9001 & ISO 14001 certified state-of-the-art plant in Keshwana, Rajasthan and distributed across India through its 300-strong dealer network.



Boards	Acoustic Tiles	Ceiling Tiles	Accessories
Chroma Walls	Tiny Hole Perforated	Semi Pin Hole	Finishing Jointing Compound, Fibre Mesh Tape
Wall Woods	Random Slit Perforated	Semi Pin Hole Pquare	
Visual Walls	Round Hole Perforated	Tiny Stars	Frame Work Accessories G.I. Channels, Connecting Clip, Soffit Cleat, Rawl Plug
Marble Walls	Square Hole Perforated	9 Squares	
	Tiny Slit Perforated		
	Round Hole		Minor Accessories Self Drilling and Tapping Screws
	Straight Slit Perforated		



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