

A high-speed photograph of water splashing, with numerous bubbles and droplets visible, set against a light blue background. The water is in motion, creating a dynamic and refreshing visual.

THE
Water
BOOK

RAMCO
 **HILUX**

The best-rated boards for Wall, Ceiling and Panel Systems

CONTENTS

1.	Hilux Tiles and Water Resistance	-	3
2.	Extreme Scenarios	-	4
3.	Hilux Water-Testing	-	6
4.	Drop Ceiling Systems	-	8
5.	Facets of tiles quality	-	9
6.	Tile Testing	-	11

WATER

THE Water BOOK

The most ubiquitous of natural elements on this earth. So vital to life and living. However, when present in the wrong places and in the wrong ambience, can become a menace, too. So it is with interior building materials which are susceptible to its silent workings – its seepages into dry walls and ceilings which lead to their slow decimation; its relentless trickling down from rooftops and air-conditioning ducts onto false ceilings which crumble slowly; the dampness that it causes which lead to unhealthy fungus growth and facilitates breeding of the most destructive of germs and microbes. This is the destructive face of water.

Hilux Calcium Silicate Board insulates you from all of these because of its masterly and unique composition. Hilux Calcium Silicate Board is made of calcareous and siliceous materials, reinforced with fibres. It is cured under high steam pressure and temperature to provide a stable, strong crystalline structure, which is completely impermeable to water. This makes Hilux uniquely suitable for dry walls and ceilings.

Hilux Tiles and Water Resistance

Hilux tiles are highly water resistant and maintain their strength under conditions that other tiles would not be able to withstand. During tests, when a Hilux tile is immersed in water for 24 hours, they absorb water but are found to be dimensionally stable and regain their full strength as soon as they are dried. Placing them in water has no long-term effect on the tile-face or on most of the decorated surfaces, hence they can be used in high humid areas or in places where there is a risk of water accidentally coming in contact with the tile.

Hilux tiles are designed to withstand a high level of humidity and are best suited for shower areas, swimming pools, salons & kitchens.

Many ceiling tiles that are not designed to withstand a high humidity can be adversely affected by the moisture in the air, causing a gradual weakening of their structure. Over time, this will inevitably cause a distortion of their shape which can often result in the ceiling no longer looking level and flat. In extreme cases, tiles may visibly sag and may even fall out of the grid work.

Hilux tiles have a humidity resistance of 99% or even 100%. The air content of water vapour is expressed as % relative humidity (RH), if the RH reaches 100%, the vapour will condense.

Generally, it is the composition of a tile that will dictate its humidity resistance – ours are made from Calcium Silicate Board. These light weight tiles need no acclimatization period and can be installed immediately. Hilux tiles offer:

- **Good value**
- **Modern & aesthetic ambience**
- **Excellent humidity resistance**
- **Excellent sound absorption**
- **High light reflectance**
- **Excellent resistance to fire**

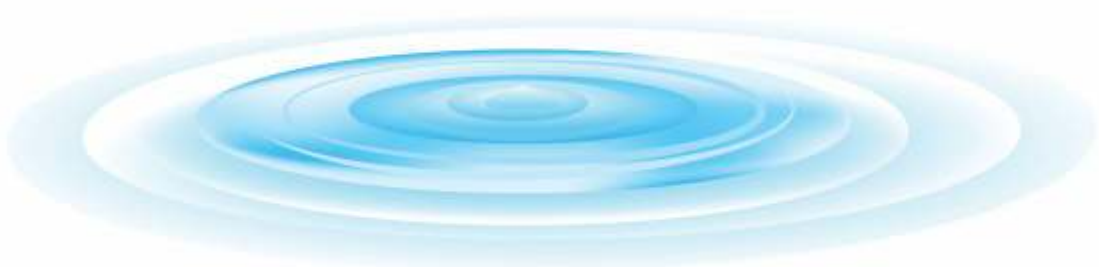
Extreme Scenarios

Extreme Scenarios

We all know that maintenance of drop ceiling tiles or suspended ceiling panels can be tedious and expensive when using "traditional" products. It's a never ending cycle of replacing them and dealing with mould, water spots, and sagging tiles and panels. Cheap ceiling tiles always lead to expensive long term issues.

Here is the solution: Hilux tiles work in your existing grid framework and the benefits are extensive

- Waterproof, so much so we can recommend cleaning them by washing them.
- Mould, Bacteria, and Mildew Resistant.
- They will never sag from humidity; you can even use them outdoors! Perfect for high humidity locations.
- Flame Retardant as per British Standard- 476 - have Class-1 Surface Spread of Flame with Ignitability as "P"- not easily ignitable.
- UV Resistant
- Recyclable



Extreme Scenarios

This is not a paper-thin or glued-on product as a majority of local or imports are - this meets all code specifications for indoor and semi-outdoor applications.

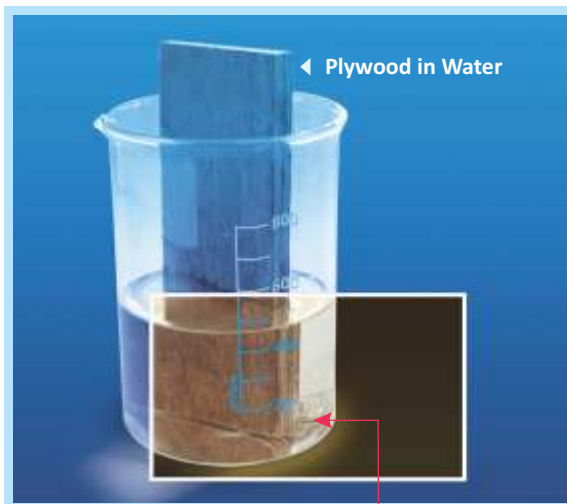
Imagine having a drop ceiling in your business or home that no longer makes people sick. No mould, no asbestos, no lead, no mildew odours, no more water spots or stains. The next time you get a roof leak, or a pipe bursts, or you're a a/c condensation drips on your tiles/panels, you will not have to worry about any mould issues, water stains, or replacing the tile. Use Hilux and this will be a reality - it doesn't rust when it gets wet; just wipe it clean.

Here is the chance to have a worry-free ceiling that looks great and is easy to maintain. Our ceiling tiles can be used wherever there is a drop ceiling, suspended ceiling, or surface mount ceiling!



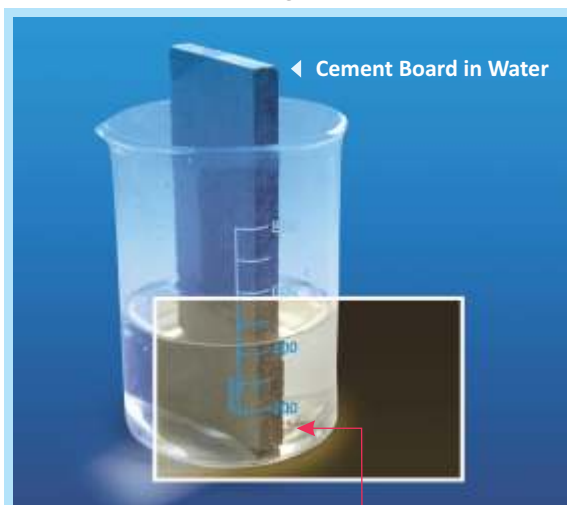
Hilux Water-Testing

Fig:1



Particles start to dissolve within one-and-half hours.

Fig:2



Decolourization and dissolution within one hour.

Testing of Boards for Moisture

Fig:3



Contaminates and viscous liquid formation is noticed within 15 minutes.
Starts disintegrating into the liquid in half-an-hour.

Fig:4



Dimensionally stable even after two hours; 0.15% expansion which contracts to original dimensions within one hour.

Drop Ceiling Systems

The drop ceiling or suspended ceiling was developed to cover pipes, ac ducts and electrical systems installed below the roof. The surface mount ceiling is to cover an existing ceiling system.

Advantage of the suspended ceiling is that you don't have to heat or cool the area above it. Some try to enhance this by putting insulation in this layer. The issue with using insulated tiles is they do not insulate the grid area and they are very easy to damage. Your best bet is to use rolls or batts on top of the ceiling tile system.

Cheap ceiling tiles? Well, you are not going to find cheap water resistant tiles. You won't find cheap long lasting tiles either. So your best economical decision is to buy a product that does not need replacing every three years, looks nice consistently, and is manufactured with precision for durability and consistent performance. Most fibre board products are highly susceptible to mould growth, easily damaged, and prone to sagging from humidity. Our drop ceiling tiles and panels are decorative and functional while being durable and 100% water proof.



Cosmetic and functional failures

The most catastrophic failures involve the debonding of tiles; tiles falling from external facades. 'Pop-up' failures, often initially detected as widespread drumminess, are more consequential than shading variations and staining problems.

Tile de-bonding is principally caused by differential movement (due to compression of the tiling layer because of shrinkage of the background or growth of the tiles). Naturally, the quality of the adhesive bond and the amount of adhesive coverage on the tile will have a significant influence. Structural building movements (such as creep, inelastic column shortening, and deflection of concrete slabs) can cause compression of the background.

Almost all tiles expand as they are heated and shrink as they cool. Many materials also expand as they absorb water and shrink as they dry, undergo short-term wetting and drying movements, including humidity changes. Unless a tiling system is appropriately designed and properly installed, such reversible moisture movements can be sufficient to induce failures.

Moisture expansion is essentially due to the chemical and physical adsorption of water (as vapour) on the crystallisation phases within the tile body. The rate of moisture expansion will depend on how readily moisture can reach the various phases (a function of porosity and permeability), the reactivity of the phases, and the creation of new surfaces for further reaction (via micro-cracking and chemical modification).

The progress of moisture expansion with time is generally characterised by an initial rapid rise, which gradually slows down through a transitional region. The curve continues to rise steadily at a much slower rate, and the final part of the curve approximates to a straight line. The rate of natural moisture expansion can often be described by a logarithmic function of time (which can be useful for predictive purposes or forensic analysis). The rate of expansion is also a function of temperature and relative humidity. Put simply, the rate of growth will slow gradually.

Cryogenic tile growth

When a water-saturated moderately porous tile is frozen, there is about a 10% increase in volume when the water forms ice. The associated internal stress can cause residual expansion. As the tile is exposed to a number of freeze-thaw cycles, the residual expansion will increase if the fracture-inducing freezing expansion phase induces a greater volume change than the thawing contraction phase. Localised frost damage may occur if saturated tiles are exposed to sufficient freeze-thaw cycles, but this will also be a function of the tile characteristics. Dry tile specimens do not exhibit permanent cryogenic growth.

ISO 10545-1~16 are the 16 internationally general testing standards, mainly including the following items:

- Dimensions and surface quality
- Water absorption, apparent porosity, apparent relative density and bulk density
- Modulus of rupture and breaking strength
- Impact resistance by measurement of coefficient of restitution
- Resistance to deep abrasion
- Resistance to surface abrasion
- Linear thermal expansion
- Moisture expansion
- Frost resistance
- Resistance to stains
- Small colour differences
- Resistance to thermal shock
- Craze resistance for glazed tiles
- Chemical resistance

Water absorption, apparent porosity, apparent relative density and bulk density mainly determine the water-absorbing capacity of tiles.

Chemical resistance and resistance to stains are used to test if the tiles can stand the pollution caused by daily usage - poor results indicate that the tiles are difficult to clean and maintain.

ISO, EN, GB Standard List

Item	ISO No.	EN No.	GB No.	Standard Title
1	ISO10545-1	EN ISO10545-1	GB/T3810.1-200X	Sampling and basis for acceptance
2	ISO10545-2	EN ISO10545-2	GB/T3810.2-200X	Determination of dimensions and surface quality
3	ISO10545-3	EN ISO10545-3	GB/T3810.3-200X	Determination of water absorption, apparent porosity, apparent relative density and bulk density
4	ISO10545-4	EN ISO10545-4	GB/T3810.4-200X	Determination of modulus of rupture and breaking strength
5	ISO10545-5	EN ISO10545-5	GB/T3810.5-200X	Determination of impact resistance by measurement of coefficient restitution
6	ISO10545-8	EN ISO10545-8	GB/T3810.8-200X	Determination of linear thermal expansion
7	ISO10545-9	EN ISO10545-9	GB/T3810.9-200X	Determination of resistance to thermal shock
8	ISO10545-10	EN ISO10545-10	GB/T3810.10-200X	Determination of moisture expansion
9	ISO10545-11	EN ISO10545-11	GB/T3810.11-200X	Determination of crazing resistance for glazed tiles
10	ISO10545-12	EN ISO10545-12	GB/T3810.12-200X	Determination of frost resistance
11	ISO10545-13	EN ISO10545-13	GB/T3810.13-200X	Determination of chemical resistance
12	ISO10545-14	EN ISO10545-14	GB/T3810.14-200X	Determination of resistance to stains
13	ISO10545-16	EN ISO10545-16	GB/T3810.16-200X	Determination of small colour differences

These wonderful properties vis-a-vis water make Hilux eminently suitable for specialist applications in select industries, which require a consistent level of dryness in processes / operations:

Industry	Application
Pharmaproduction	General Production Facility, Clean Rooms
Textiles & Yarn Production	Production, Storage, Lab
Hospitals	Special Care Wards, Clean Rooms
Precision Industry	Micro-production facilities



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		



Auras Corporate Centre, 98-A, Dr. Radhakrishnan Salai, Mylapore, Chennai - 600 004. India.

☎ +91 44 - 4298 3109 / 91767 75882 ✉ info@ril.co.in www.ramcohilux.com