

Technology

How do they work?

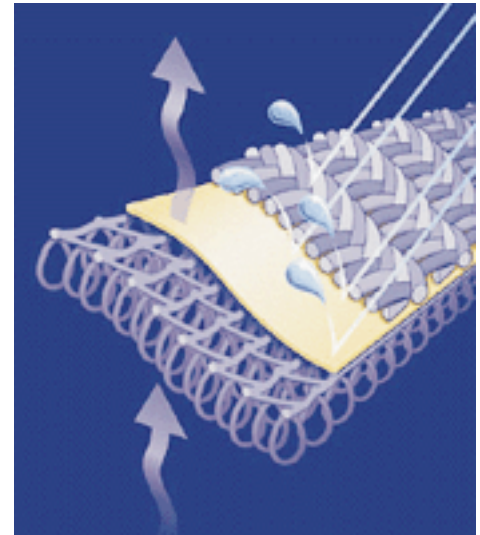


Waterproof and Breathable.

Why Both?

A jacket or trousers used for protection from the elements needs to be both waterproof AND breathable. A garment which is totally waterproof but non-breathable would be very uncomfortable to wear, as perspiration would have no means of escaping, and would condense on the inside of the garment, leaving the wearer 'wet from within'.

Conversely a very breathable but non-waterproof garment would be so open, allowing air to pass freely through, that it would offer little protection from the elements (for example the canvas tents which let water through if you lean against them!)



Types of Waterproofing.

There are two commercial ways to make a fabric resist water:

- **1. Coating** Some garments are made water resistant by coating the outer surface with a layer of hydrophobic ("water hating") chemical or wax. When water droplets fall onto the fabric they "bead" due to the surface tension of the water, and roll off. The disadvantage of this method is that the coating is not always durable, and can be damaged during repeated washing and flexing.
- **2. Laminate** A more durable method is to use a waterproof breathable film or "membrane", which lies inside the garment. **Sealskinz** socks and gloves incorporate a film in this way. It lies between the inner and outer textile fabrics. The film is both waterproof AND breathable, and will never wash away.

Next Page: The two types of waterproof membranes.

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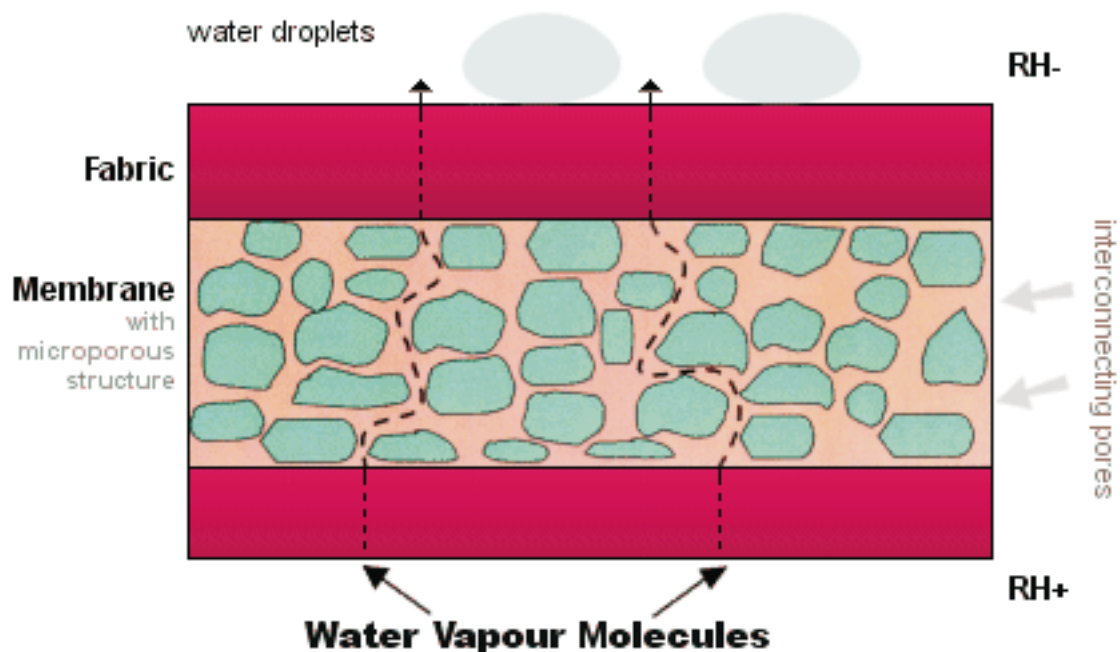
Waterproof and Breathable (continued)

The Microporous waterproof membrane.

Microporous films are perforated with tiny microscopic holes or pores approximately 5 microns in diameter. Water droplets are typically 500-5000 microns in diameter, 'drizzle' droplets can be as small as 200 microns in diameter. Attraction between the water molecules forces molecules to group together in a droplet. Water droplets are too large to penetrate the pores in the film. It is impossible for water droplets to pass through, and therefore the film is 100% waterproof. Water vapour molecules, generated by the body perspiring, are much smaller (typically less than 0.0003 microns) and pass easily through the holes, carrying moisture away.

	WV mol size	Pore Size	Droplet Size
Size (microns)	0.0003	5	200+
Ratio	1	10,000	1,000,000

A WV molecule is a million times smaller than a typical water droplet.



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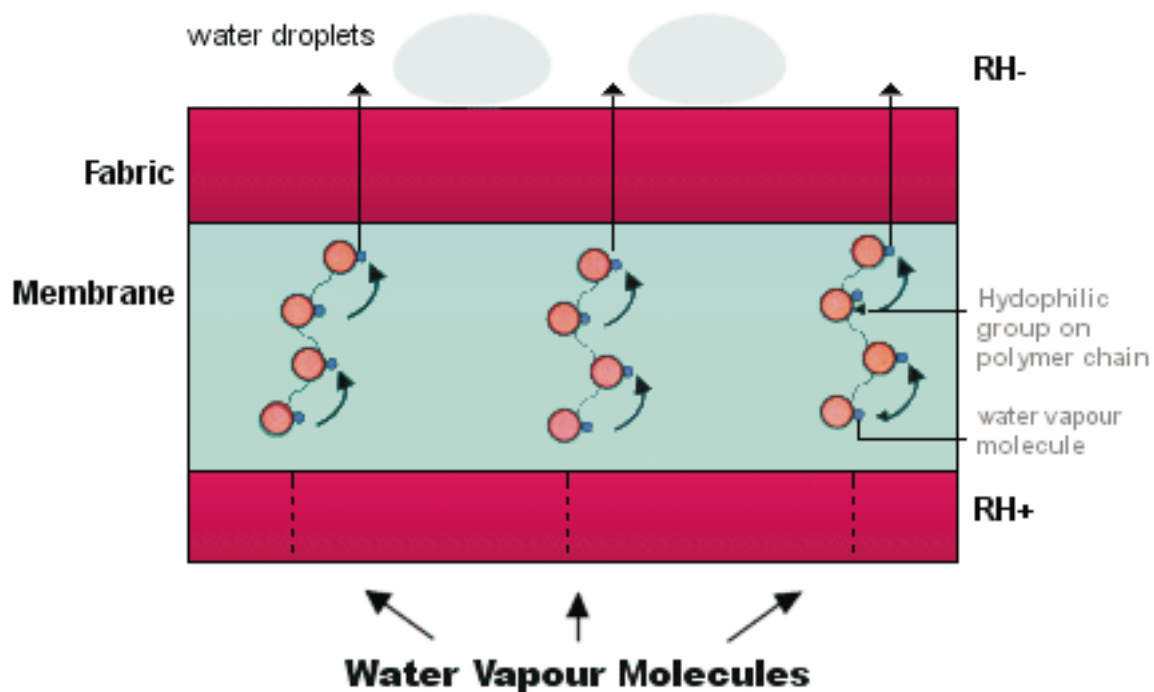
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Waterproof and Breathable (continued)

The Hydrophilic waterproof membrane.

Hydrophilic. SealSkinz socks and gloves use another type of film, a hydrophilic ("water loving") film. Hydrophilic films are totally solid, without pores. It is therefore physically impossible for droplets of liquid water to pass through. The film is breathable because water vapour molecules are transmitted from molecule to molecule through the film and expelled on the other side. The driving forces are the differences in humidity and temperature between the atmospheres on each side of the film.



The internal climate, next to the skin, is hot and humid because the body is generating heat and moisture as it exercises. The external climate is much drier and cooler. Consequently water vapour is driven from the inside of the garment to the outside. As the foot gets hotter during an activity, so the film becomes more efficient at expelling moisture.

Next Page: Testing Information and the Breathability Index.

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Waterproof and Breathable (continued)

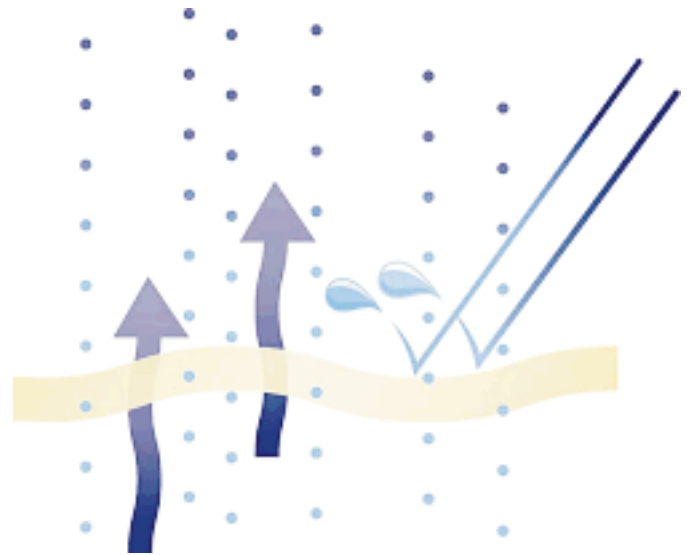
SealSkinz 100% Waterproof Testing.

Each SealSkinz product is tested before it leaves the factory. The sock or glove is mounted onto a machine which subjects one side of the fabric to water pressure. If any water penetrates the fabric the item is rejected and diced. Every **SealSkinz** product is therefore guaranteed to be 100% waterproof.

The waterproof film can withstand 10psi of hydrostatic head pressure, the equivalent of a column of water 700cm high standing on the fabric surface. This is **7 times** the level required to meet European Standards for waterproof clothing.

Breathability Index.

Breathability is measured by a water vapour permeability index in accordance with BS 3424: Part 34: 1992 Method 37. In this test, pieces of fabric are used to cover a small cup which holds a measured mass of water. The cup is allowed to stand in a controlled climate for several hours. At the end of the test, the cup is re-weighed to determine how much moisture from within the cup has evaporated and been expelled through the film.



A water vapour permeability rating is then determined by comparison to a standard fabric given the same treatment. The **SealSkinz** multi light, long light and mid thermal products have a water vapour permeability index of 50-60% when measured in accordance with BS 3424: Part 34: 1992 Method 37. The **SealSkinz** glove product has a WVP of 15%.

www.sealskinz.com

Email professor@sealskinz.com if you have a technical question about a product from the SealSkinz range of waterproof socks and gloves