

The innovations moving Passivhaus construction forward

A passive house does not work by magic, but through a set of well-chosen and better-executed technologies. We review the innovations PAPIK Group integrates into every Eskimohaus.

Passivhaus homes need very little energy for heating or cooling, and it is common to attribute that behaviour to a kind of magic. The reality is more precise: a set of key technologies, well thought out and better executed, working together to create a comfortable environment with minimal consumption. At PAPIK Group, as builders specialised in passive houses with timber structures, we not only follow the Passivhaus standard to the letter, but constantly explore the latest innovations to build our homes, which we have named Eskimohaus. Recent years have brought advances that raise efficiency, comfort and sustainability to a higher level.

Beyond basic insulation: the new materials

The first principle of a passive house is good insulation, and that is shared knowledge. What has changed is the material. It is no longer only a matter of placing a thick layer of polystyrene: we now work with high-performance natural insulation such as wood fibre or cork, materials with very low embodied energy and a notable ability to regulate humidity naturally.

These natural insulators insulate and, at the same time, contribute to a healthy indoor environment, absorbing and releasing moisture as needed. In a home where the structure is already certified timber, using an insulator also derived from wood closes a natural cycle. The result for the occupant is a more stable thermal comfort and a home that better regulates indoor air, without giving up a degree of energy efficiency.

Mechanical ventilation is no longer what it was

The heart of a passive house is the mechanical ventilation system with heat recovery. It is what allows the house to stay closed and, instead of the air becoming stale, renews it constantly without losing the energy, the heat or the coolness, already inside. For a long time the main challenge was heat recovery in winter. The open question was what happened in summer.

The relevant advance is equipment with cold recovery and a bypass. When the warm season arrives and the system detects that the outdoor air is cooler than the indoor air, for example at night, it introduces that air directly without exchanging its temperature, saving cooling energy. The most modern models are also very quiet and can be integrated with home automation systems to adjust airflow according to occupancy or air quality. The perceptible benefit is sustained acoustic and thermal comfort throughout the year, with very low electricity consumption.

Glazing and frames: the window is no longer the weak point

Windows have always been the weak point of the building envelope. That is no longer the case. Double glazing, and in some cases triple glazing, with argon gas and super-insulating frames are today the standard in a Passivhaus, but innovation has not stopped there.

We now have glazing with selective filtering that lets more solar heat through in winter, passively warming the interior, and reduces its entry in summer. Frames, especially timber-aluminium ones with a thermal break, have improved to the point where their insulating capacity is almost equivalent to that of the wall. This eliminates the sensation of a cold draught when approaching a window on a winter day and turns openings into sources of free light and heat, without penalties. For a builder who prioritises timber, the combination of an interior wood frame with exterior protection represents a balanced solution: aesthetic warmth and technical durability without maintenance.

Intelligent airtightness

One of the key tests in passive house construction is the airtightness test, the Blower Door. The need to build a very airtight house has always been stressed. The novelty does not lie in making it even more airtight, which it also is, but in how it is achieved.

Today we have airtightness membranes and tapes that are far more efficient, durable and easy to install than those of years past. This makes it possible to ensure the continuity of the envelope without fear of degradation over time. The benefit is twofold: we guarantee maximum energy efficiency by preventing infiltration, and at the same time we protect the timber structure from possible moisture ingress, which extends its service life. It is a technology that is not visible when the house is finished, but is fundamental to its long-term health. This same criterion also guides our [energy retrofit](#) work.

Home automation and energy management: the brain of the passive house

A passive house is already efficient in itself. When an intelligent system that learns from the occupant's habits is added, the result gains an extra degree. Home automation has ceased to be a simple remote control and has become the nervous system of the home.

Today all systems can be integrated: ventilation, blinds for passive solar control, LED lighting and even appliances. The system learns from routines and can ensure an optimal ventilation level and a suitable temperature when needed, saving energy the rest of the time. This active management of every parameter is the final step to maximise savings and comfort, so that the house adapts to the occupant and not the other way around.

Renewable energy, the final piece of the puzzle

A Passivhaus consumes so little energy that supplying it with renewable sources becomes a realistic and economical option. The advance is not only more efficient solar panels, but the integration of storage systems and the intelligent management of that energy.

Domestic batteries make it possible to use at night the solar energy produced during the day, and management systems prioritise self-consumption. In a well-oriented house with consumption as low as that of a Passivhaus, it is perfectly possible to reach a nearly neutral balance and become free of the price volatility of the large electricity companies. This is what we call building without an energy mortgage, a fundamental value in PAPIK Group projects and one of the reasons we are committed to timber-frame construction.

Building today with tomorrow in mind

Passivhaus construction is a field in constant evolution, where technology is placed at the service of comfort, people's health and respect for the planet. At PAPIK Group we integrate these innovations naturally into our timber-structure homes, because we understand that a home must be a healthy, efficient and beautiful space, not only today but for decades.

A passive house is not the result of a single extraordinary product, but of well-coordinated decisions: material, ventilation, window, airtightness and energy working as a single system.