

K-del Carril

The first certified Passivhaus home in Sant Cugat del Vallès. A 315 m² single-family house wrapped in a timber envelope and built to the Passivhaus Classic standard.

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K-del Carril is a 315 m² single-family home in Sant Cugat del Vallès, and the first certified Passivhaus in the town. Designed for a family of five, it brings together contemporary, family-friendly architecture with the highest level of energy efficiency and indoor comfort.

The house proves that a large home can run on very little energy without giving up on generous space or natural light.

Technical data

- **Location:** Sant Cugat del Vallès
- **Construction:** 2018, certification 2019
- **Built area:** 315 m²
- **Floors:** 2 floors plus basement
- **Rooms:** 4 bedrooms, 3 bathrooms
- **Type:** detached single-family, new build
- **Certification:** Passivhaus Classic
- **Architecture:** Energiehaus Arquitectos
- **Construction system:** light timber frame, SATE façade
- **Insulation:** blown cellulose
- **Climate control:** aerothermal
- **Ventilation:** Zehnder ComfoAir Q450 with heat recovery

Energy performance

- **Blower Door test:** 0.52 h⁻¹

- Heating demand: 14.47 kWh/m²|yr
- Heating load: 18.83 W/m²
- Cooling demand: 12.12 kWh/m²|yr
- Cooling load: 9.14 W/m²

These figures place the home firmly within the Passivhaus standard, well below what conventional building regulations require.

Bioclimatic siting

The plot sloped gently to the west, and the design turns that to its advantage: the garage is reached by a natural ramp, and the house sits more lightly in its surroundings.

The siting follows clear bioclimatic principles. The garden and pool face south, large openings on the south façade catch the winter sun, a pergola and timber louvres provide shade in summer, and cross ventilation happens naturally. Every design decision earns its place on energy grounds.

Spatial layout

The ground floor is where daily life happens, with a split-level living room, a dining room that flows into it, an open kitchen, the main bedroom with dressing room and bathroom, and the service areas. The change in level shapes the living room without ever walling it off.

Upstairs there are three bedrooms, a bathroom and an open flexible room. Throughout, the living spaces face south for the sake of views, daylight and solar gains.

Construction system

The structure is a light timber frame with 168 mm studs, closed with an exterior OSB board and an interior board, blown cellulose insulation and a SATE external finish. The walls reach a thermal transmittance of 0.16 W/m²K and the roof 0.18 W/m²K.

The windows are Llodiana timber units with low-emissivity double glazing at a glass transmittance of 1.20 W/m²K, and the main door reaches 0.65 W/m²K. An envelope well beyond what the regulations ask for.

Building services

Aerothermal

A single high-efficiency heat pump handles all heating, cooling and hot water, with a 300-litre tank that keeps up with a large family.

Ventilation with heat recovery

The Zehnder ComfoAir Q450, one of the benchmark units on the market, recovers 88 % of the heat and draws very little power. It is one of the cornerstones of the home's comfort.

Comfort and performance

At 0.52 air changes per hour, the Blower Door test confirms a very airtight envelope. That means lower running costs, greater comfort, no draughts or condensation and genuinely good indoor air quality, with a heating demand far below that of a conventional home.

A large family home with the highest level of energy efficiency, comfort and low running costs.