

# Energy-efficient refurbishment

## What is energy-efficient refurbishment?

Energy-efficient refurbishment involves applying sustainability criteria to materials, reducing energy demand and optimising energy efficiency in systems and installations during refurbishment work on existing buildings, whatever their function may be.

## Regulatory framework

The Royal Decree 235/2013 of 13 April 2013, which sets out the basic procedure to certify energy performance in buildings, regulates energy certification for the first time in existing buildings, as has been applied to new buildings since 2007 (RD 47/2007). Although it is certain that these regulations have not set out any minimum requirements for carbon dioxide emissions or imposed energy demand limits on existing buildings, it has at least made it obligatory to measure emissions on a scale from A (most efficient) to G (least efficient) to display when buying or selling buildings, residences or premises.

Although other regulations such as the CTE, the Regulations on Building Heating Installations (RITE) or the Eco-efficiency Decree of the Government of Catalonia provide reference parameters for refurbishments based on their impact, a framework that is robust enough to incorporate sustainability, demand reduction and energy efficiency optimisation is not yet in place, which leaves things up to the will of the client and the architect's judgment.

## Justifying energy-efficient refurbishment projects

It has been amply demonstrated in practice that applying energy-efficient criteria in refurbishment projects brings considerable gains in insulation and thermal inertia values plus greatly improved overall energy consumption and resource use efficiency.

It is estimated that around 35-45% of the energy used and carbon dioxide produced during construction corresponds to the erection of the foundation and structure, both of which can remain virtually untouched during building refurbishments. Another 10% of the total energy and emissions correspond to the roofing and enclosure. Although these need to be worked on during energy-efficient refurbishments, at least 50% of what is already there can be reused.

## What happens during energy-efficient refurbishments?

Each refurbishment project obviously has its own idiosyncrasies, determining factors and special characteristics. However, as is also the case with new builds, we always apply the following criteria:

- Ensure energy demand (and therefore energy consumption) is kept to a minimum.
- Ensure that the maximum percentage of that reduced energy demand is derived from renewables (wind energy, solar thermal or photovoltaic energies, biomass and geothermal energies, etc.)
- Refurbishment costs must be kept to a minimum, by maintaining whatever elements of the building that can be reused.

How do we achieve this?

- Optimum insulation needs to be ensured, minimising thermal bridging, creating an enclosure comprised of the walls, roof and contact with the site of the building which seals completely and reduces losses owing to thermal transmittance.
- Additionally, windows, sliding doors and other openings need to be fitted with the latest technologies, such as energy-efficient glazing (moderately more expensive than conventional glass, but much better at achieving lower transmittance values), and carpentry work, forming a thermal break. In addition, any losses owing to air filtration from outside need to be minimised.
- Energy-efficient climate control systems are installed which are suited to the characteristics of each specific project, such as aerothermal heating or biomass heating systems. Whenever high levels of thermal insulation are possible, heating systems can be practically eliminated.
- Ventilation and air renewal systems are installed that allow for heat recovery, in such a way that the heat of exiting air exchanges with incoming air.
- Natural climatic control systems are installed which enable cross ventilation. South-facing openings capture winter sunlight and achieve heat gain. Blinds, shutters and latticework are installed to protect from excess summer sunlight.
- Renewable energy systems are added to the existing building as much as possible (solar panels, aerogenerators, geothermal energy, etc.) as well as systems dedicated to the recovery and reuse of greywater and rainwater, etc.
- Materials that have a low environmental footprint are used as much as possible, ones which are sourced locally and produced using the least harmful chemicals, volatile organic compounds and other potentially harmful products.
- Most importantly, build awareness (doing the best we can as architects) of how our attitude as building users can be much more beneficial than any architectural intervention. This is due to the fact that around 65% of total energy consumption over the building's lifespan corresponds to its use and maintenance phases.

## European framework

Refurbishment has been a cornerstone of the building sector in other European countries for many years and represents the majority of undertakings. In Germany for example, recent figures highlight that 62% of construction is taken up by the refurbishment sector, while only 38% by new builds. In Spain the number of refurbishment projects has barely reached 25% in recent years. It is therefore a field with huge growth potential that allows for the preservation and boosting of built-up areas and existing urban fabric, as opposed to the unnecessary erecting of new infrastructure that requires excessive financial investment in both construction and maintenance.

In addition, it is the case unfortunately that current legislation on renewable energy, as well as the ideology that contributes to it, seems to be moving in the opposite direction than other European countries. For example, in Germany, one of the pioneering countries in the implementation of renewable energy, 10% of the population (approximately 8 million people) are self-sufficient in their energy needs via small photovoltaic systems. It is estimated that 50% of the total installed potential of photovoltaic energy is made up by systems such as these.

Building awareness that energy costs have risen considerably in recent years and will continue to do so is of utmost importance. Therefore any renewable source of energy that can be installed in the same building where it is consumed (wind, solar, geothermal etc.) represents a clear commitment to a more energy-efficient future with less dependence on other non-renewable sources that need to be found thousands of kilometres away.

