### Advice:

- Minimize perforations
  - Perforations through the airtight layer significantly increase the risk of thermal bridges. Try to perforations with the use of installation layers in the construction.
  - In some cases multiple penetrations are more beneficial by enabling better air tightening, analyse the situation to assess what is ideal.
- Make it airtight and insulated
  - The airtightness of the building fabric is a qualification for an energy-efficient building. Any opening must be properly insulated.
- Review and give feedback
  - Adjustment of the installations may greatly influence the energy-efficiency and internal climate.
  - Follow the instructions given from the supplier.
- Use a thermal camera to check for thermal bridges before any renovation work



## About DREEAM

DREEAM (Demonstration of an integrated Renovation approach for Energy Efficiency At the Multi building scale) aims to show that renovating at a larger scale opens the opportunity for better integration of renewable energy and is generally more cost-effective. The project demonstrates a multi-building and single owner renovation approach that can achieve a 75% reduction of total energy demand.

The DREEAM approach is implemented on pilot sites in the UK, Germany and Italy. These demonstration sites are to validate the DREEAM method in different climate, cultural and institutional configurations.



# **INSTALLATIONS**



#### What are installations?

The term *installations* refer to the systems used to produce, transform and distribute electricity, heat and water. Installations are used to distribute the air in the ventilation, but also to take care of sewage and surface water.

To reduce the number of energy losses in a building, the energy-efficient installations needs to be optimized and supply the right amount of energy at the right time. The difference in energy usage between a conventional and energyefficient building can be more than 10 kWh/m2/ year (20 kWh/m2/year and less than 10 kWh/m2/ year respectively).



#### Indoor climate and energy efficiency

The installations help create a good indoor climate. To reach ideal results, the installations need cooperate with each other, the building and the inhabitants. The right choices and installations from start enables optimal usage.

- 1. Energy efficiency components that are energy efficient and are correctly dimensioned
- 2. Choice although pumps, fans and aggregates may have the same capacity their efficiency may vary
- 3. *Execution* non-airtight, disproportioned and/or damaged insulation may cause pressure drops and thermal losses. Follow manufacturing instructions for optimal performance
- 4. Installation choices made during the planning and construction phases of a building is of utter importance. A lack of oversight, in either of these phases, may result in short-circuiting of the ventilation and increased volume levels.

\**Eco-design requirements* — a product needs to reach certain energy and resource efficiency conditions to be used within the EU. Leading to major energy and financial savings for the consumer.



\*\*Energy labels — light fixtures, heat pumps and appliances are some of the products that should be supplied with energy labels displaying their energy consumption.

### The building as a whole

Throughout any building process, it is essential to view the building as a whole and choose solutions that recognize this. A renovation may affect the whole building and result in a need to adjust other elements.

The EU has requirements on the *energy labelling*\* and efficiency via *eco-design requirements*\*\*. To make the replacements of existing components more efficient and cost-effective it is beneficial to do so in combination with other renovations.

To optimize the energy optimization the components are to be chosen based on individual needs for each building. By use of demand-driven installations the energy needs could be reduced further and decrease the risk of e.g. electromagnetic disturbance.

Notable is the exchange of light fixtures. This may result in decreased heat transmission and lower temperatures, and thus increasing the need for heating from external sources or improved building fabric.

#### Insulating installations

Often one might be good to insulate the building fabric, but it is just as important, if not more so, to insulate the installations. The installations are constantly exposed to differences in temperature as opposed to the building fabric.

The insulation of installations is important also from a health perspective. Insulation is used to reduce heat losses from the hot water, but also to prevent the heating of cold water which can cause the growth of legionella.

The difference in energy losses between an insulated and non-insulated installation is illustrated below. The insulation prevents about 90 % of energy losses.

It is particularly important to insulate installations of dissimilar temperatures. In addition, both energy, money and insulation can be saved when pipes of similar temperatures are insulated together.

#### Insulation and seal of penetrations

Where a wall or framing of joints needs to be penetrated, the insulation must be uninterrupted. In case of breakages, condensation and/or heat emissions may occur in the structure.