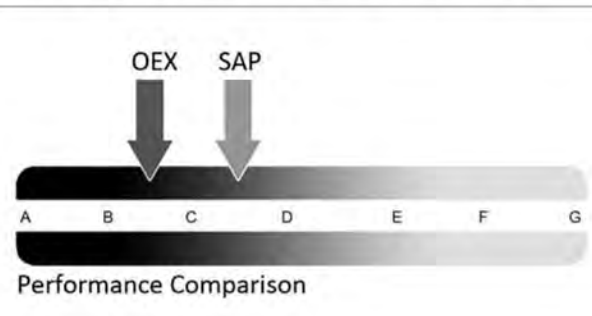
Eco-Refurbishment with Low Energy Extension - Oxford, England

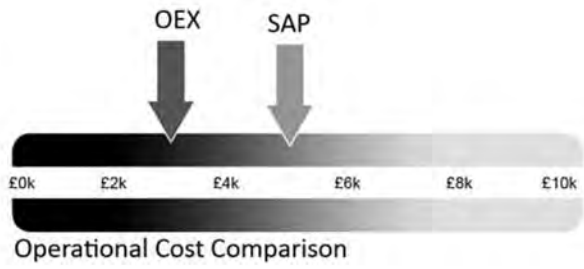
This project is comprised of an eco-refurbishment to an existing semi-detached house with a proposed new extension. The refurbishment vastly improved the thermal performance of the current building, while the new extension was designed to a very high standard of thermal performance that utilised some passive strategies, and minimised heat loss and uncontrolled air movement, to greatly reduce primary energy use. The project won the Observer Ethical Award.

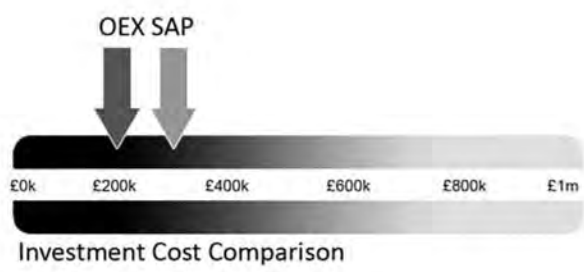
The building sits in a suburban setting amongst a number of similar types of property. It is a 1950s 2-storey semi-detached house constructed with brick cavity walls and a clay tile roof. The original windows were timber frame, with only single glazing. There is a small south-facing front garden, while the large rear garden, although north-facing, receives a substantial amount of sunlight. The original house was acquired in a generally poor state.

The whole house was refurbished to a much improved standard of environmental and thermal performance. This was achieved through significantly insulating the roof, floor and cavity walls; and using a range of natural materials and finishes. The new extension was designed using timber construction to create a light and attractive finish that complements the existing house, with a minimal environmental impact. It creates a welcome addition to the house and garden, transforming it into a larger and more family-friendly home. An extended kitchen and dining area, and additional facilities, offer a much improved versatility in the use of space.

OEx Process - Cost Effectiveness







Solar hot water - integrated flat plate collector

Rainwater harvesting system

A-rated appliances

Solar flat plate collector

A 4m² solar thermal flat plate collector is installed on the south-facing roof to generate solar hot water for the underfloor heating and for general domestic hot water use. The collector is subtly integrated into the roof tiles.

Use of rainwater

A rainwater harvesting system is installed (large underground tank) to reduce the water demand by at least 50%. It is for non-potable use, such as for WC, washing machine and watering the garden.

Timber construction

The whole of the extension is constructed out of timber in various forms. The timber frame structure is clad with Western Red Cedar weatherboarding and the roof with Western Red Cedar shingles. This provides a natural finish from a renewable source, that is robust and carries very little embodied energy.

Air tightness

Reducing the amount of uncontrolled air passing through the structure of the new extension via air tight construction helps to minimise heat loss through the building fabric. Sealing the fireplace and replacing existing, poor thermally-performing windows helps to reduce uncontrolled air passing through the existing structure.

Super insulation

The new extension and the existing building employs high levels of sheepswool and mineral wool insulation, to reduce heat loss through walls, roof and floor (U-value of new extension 0.16 to 0.2 W/m²K).

Advanced windows

Double-pane insulated glazing with timber window frames are installed in the new extension and replace the existing windows.

Thermal mass

Some internal thermal mass is incorporated to reduce summer peak temperatures, maintain stable winter temperatures, and prevent possible over-heating in spring or autumn before normal solar shading becomes effective.

Lighting and electrical appliances

To minimise the total energy consumption and reduce the amount of waste energy produced, low-energy lighting (such as LED or compact fluorescent lamps) and high-efficiency electrical appliances (A++ rating) are used.

Sustainable materials

Use of environmentally friendly materials such as timber, natural stone and sheepswool minimises the impact on the environment and helps to reduce the CO_2 emissions resulting from construction as much as possible.