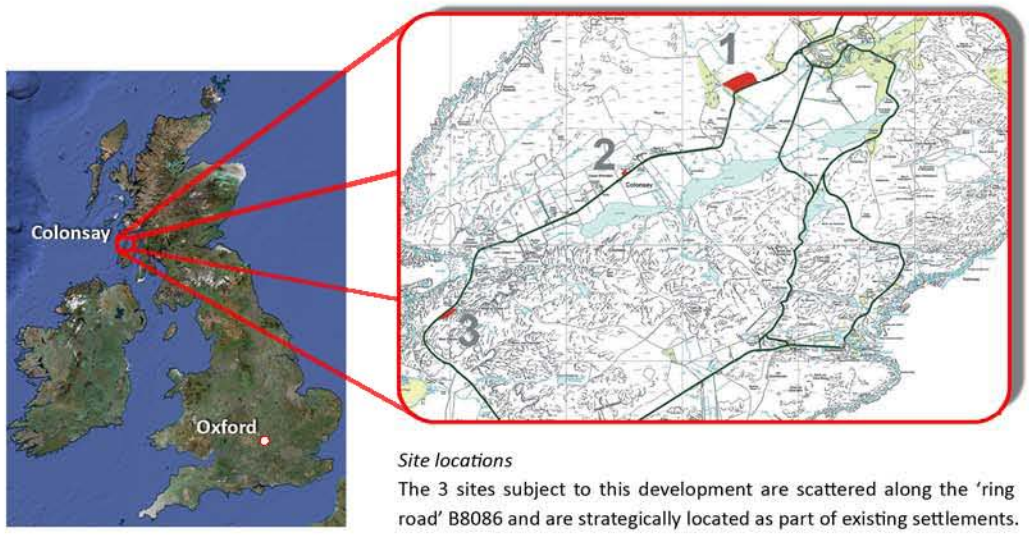
Zero Carbon Houses - Colonsay, Scotland

This project comprises 7 new zero carbon dwellings on the Scottish island of Colonsay, which have been designed primarily for permanent occupation with the facility for home working, but with an equal suitability for use as self-catering letting properties. This will be the first carbon neutral proposal for this island and is therefore an important step towards sustainable development for the future in such a remote community.

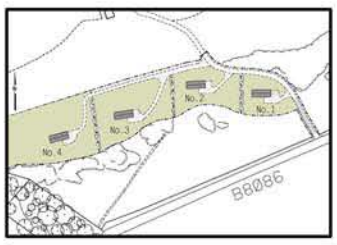


Site locations

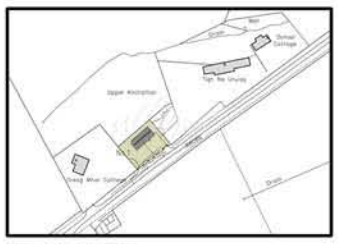
The 3 sites subject to this development are scattered along the 'ring road' B8086 and are strategically located as part of existing settlements.

In a rich natural habitat such as Colonsay, the landscape features are diverse; a mixture of ancient and cultivated woodlands, moorlands, meadows, rough pastures, peat bogs and gorse, as well as cultivated farmland, make up the the onshore island scenery.

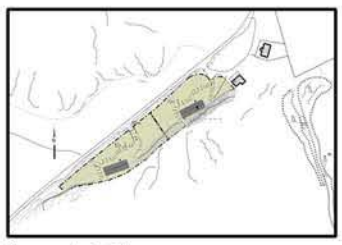
Traditionally for the region, the siting characteristics of most vernacular buildings are drawn from local knowledge on climate, materials and landscape; including design features such as shelter belts of trees, siting in the lee of hills etc. Local vernacular buildings show two predominant external finish materials in white render and grey slate.



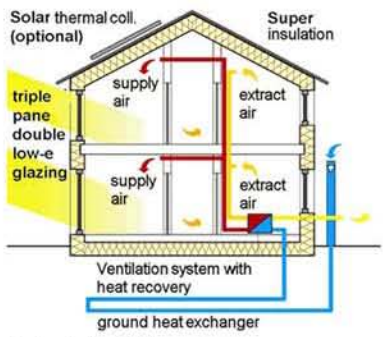
Proposed site01



Proposed site02



Proposed site03



Mechanical ventilation system

The proposed building is based on a pre-fabrication design. This is due to the high cost of importing materials on the ferry, as well as the expensive travel cost and impracticality of importing specialist labour from the mainland. The aim is to fabricate the houses (subdivided in 4/5 transportable modules) off-site, helping to achieve greater economy and higher standards of detailed specification and air tightness.

Sheepswool insulation

Timber-frame windows

Photo-Voltaic roof system

'Rheinzink –Quick step' roof system

Timber cladding

Super insulation
The building will employ sheepswool insulation to reduce heat loss through walls, roof and floor (U-value 0.1 - 0.15 W/m²K).

Air tightness
Reducing the amount of uncontrolled air passing through the structure (<0.4 1/h) will help to minimise heat loss through the building fabric.

Advanced windows
Triple-pane insulated glazing with air seals and thermally broken timber window frames (U-value 0.85 - 0.70 W/m²K for entire window incl. frame).

Thermal mass
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.

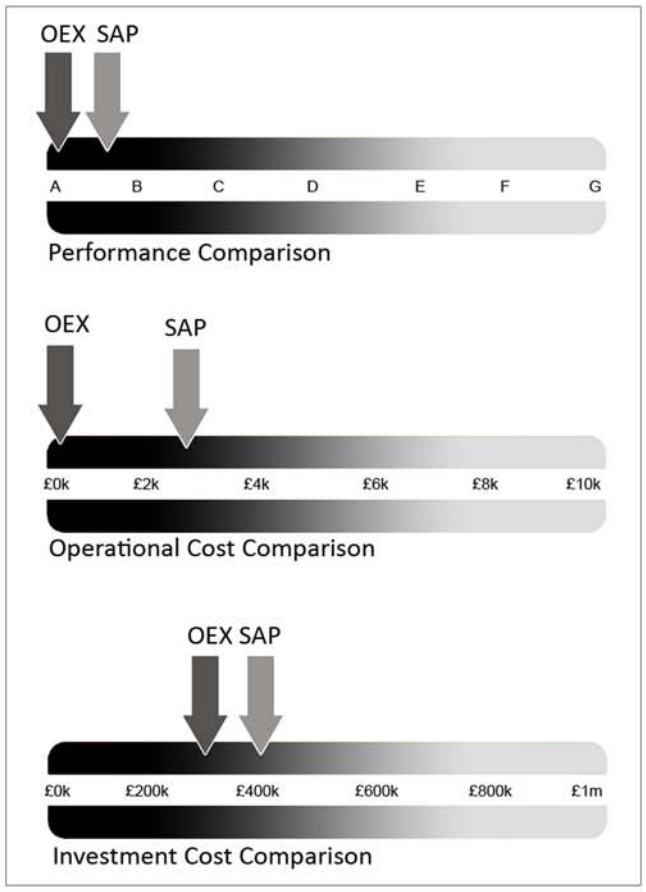
Solar roof: Photo-Voltaic & solar thermal
The roof will be a whole-roof system, incorporating PV panels that will be installed on the south side, which would produce enough electricity to supply the electrical needs of the house. Solar thermal elements will also be installed on the south-facing roof to generate solar hot water.

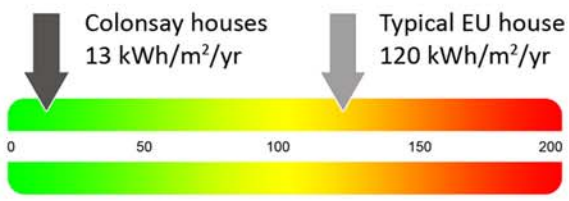
Lighting and electrical appliances
To minimise the total energy consumption and reduce the amount of waste energy produced, low-energy lighting (such as LED or compact fluorescent lamps) and high-efficiency electrical appliances (A++ rating) will be used.

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.

Use of rainwater
A rainwater harvesting system will be installed

OEx Process - Cost Effectiveness





Building form & passive solar design
The building form is compact in shape to reduce surface area, with windows orientated towards the south to utilise solar energy, to provide some of the space heating and lighting required in buildings and to assist natural ventilation. It differs from renewable energy producing technologies in that it aims from the outset to avoid the need for some of the conventional energy used in buildings.

Pre-fabricated timber construction, highly insulated