

Zero Carbon Building



The Construction Industry Council, in partnership with Hong Kong's Development Bureau, has built Hong Kong's first building to completely offset its carbon footprint using renewable energy. Situated in Kowloon East, the site of a government initiative to create a new business district, the Zero Carbon Building utilizes over 90 energy-conserving features to promote sustainability and environmental awareness to the general public. Consisting of a three-story building and open space, the project has received the Hong Kong Green Building Council's Grand Award and aims to obtain a Platinum rating for its Building Environmental Assessment Method-plus (BEAM) certification.

GREEN FEATURES AND SUSTAINABLE TECHNOLOGIES

ECO-FRIENDLY CONSTRUCTION

Life Cycle Analysis was incorporated during the initial site design to reduce overall energy consumption by 40%. During construction of the Zero Carbon Building, building information modeling technology minimized construction material waste, Forest Stewardship Council lumber promoted responsible timber harvesting, and

concrete made from pulverized fuel ash (a waste product from coal power stations) helped maintain the project's commitment to sustainability. The site reduced waste produced during demolition by recycling debris for use in a gabion planter wall and by using soil displaced by construction in the native urban woodland area. Balanced cut-and-fill techniques were also used during construction of the basement and urban native woodland.

EXHIBITION AND EDUCATION CENTERS

These centers show guests the building's green design and advanced technologies to reduce carbon emissions. Showcasing a 50-person eco-office and eco-home, the public is exposed to everyday sustainability procedures. The eco-home includes efficient appliances and water fixtures. It also a low thermal transfer value, and a centralized display to manage overall energy consumption.

LANDSCAPED SPACE

Covering over 50% of the site, landscaped outdoor space surrounds the main building and features an eco-plaza, eco-terrace, eco-garden, outdoor exhibition area, and Hong Kong's first urban native woodland. The woodland area houses more than

PROJECT DETAILS

LOCATION

Hong Kong

NAME

Zero-Carbon Building

DEVELOPER

Construction Industry Council

MANAGEMENT CONTRACTOR

Gammon Construction Ltd.

ARCHITECT

Ronald Lu and Partners

ENGINEER

Ove Arup & Partners

SIZE

14,700 m² (total site area)

4,600 m² (total GFA)

1,400 m² (total building area)

TYPE

Public

BUILDING DETAILS

3-story building

50-person eco-office

Urban native woodland (first of its kind in Hong Kong)

Showrooms, exhibition and education centers, eco-plaza, eco-terrace, showcase eco-home, and outdoor exhibition center

RATINGS

Platinum rating for Building Environmental Assessment Method (BEAM) Plus certification (target)

Grand Award from Hong Kong Green Building Council (HKGBC)

United Kingdom Green Building Council (UKGBC) Type 2 zero-carbon building

COMPLETION

Q2 2012

MEASURABLE RESULTS

NUMBER OF ENERGY SAVING FACILITIES

90

ENERGY CONSUMPTION

116 MWh/year (building only)

15 MWh/year (landscaped area)

SOURCE ENERGY UTILIZED

70% (typically 40% for other buildings)

CARBON DIOXIDE REDUCTION

7,100 tons (estimated over 50 years using on-site renewable energy)

ELECTRICAL ENERGY PRODUCED FROM BIODIESEL

143 MWh/year (supplies 70% of energy needs)

ELECTRICAL ENERGY PRODUCED FROM SOLAR PANELS

87 MWh/year (supplies 30% of energy needs)

TOTAL ELECTRICAL ENERGY PRODUCED

230 MWh/year (a net surplus of 99 MWh/year)

BUILDING ENVELOPE'S OVERALL THERMAL TRANSFER VALUE (OTTV)

11W/m² (80% below the highest figure allowed for a building)

40 native tree species and a variety of other plant life. In addition to protecting endemic biodiversity and preserving local plant life, this green space improves the local micro-climate by lessening the building's heat island effect and absorbing at least 8,500kg of carbon dioxide per year. The air temperature in the landscaped area can be as much as 1°C cooler than the surrounding environment.

NET ENERGY SURPLUS

The site generates more renewable energy than it consumes and feeds this net surplus back into the local power grid. A biodiesel tri-generation system, incorporating waste cooking oil, accounts for 70% of energy needs, while photovoltaic solar panels (poly-crystalline, building-integrated thin-film, and cylindrical copper indium gallium selenide) produce the remaining 30% of required energy. Various measures were also taken to reduce overall power consumed by the building's cooling processes. While high volume low speed fans, desiccant humidifiers, and under-floor displacement cooling all reduce dependence on air conditioning, ECO-MAX absorption chillers convert building waste heat to produce energy for the remaining refrigeration and air conditioning needs.

OTHER NOTABLE GREEN INNOVATIONS

- Building Management System monitors site operations, including automatically adjusting the building's windows to optimize ventilation
- Building Environment Performance Assessment Dashboard allows for evaluation of overall energy consumption
- Modern building envelope mitigates the absorption of external thermal energy
- Grey/black water is recycled and storm water is collected