Manaaki Whenua
Landcare Research

Energy savings

The goal is to maximise passive climate control in keeping the warmth in but excess heat or cold out so that pleasant working conditions are maintained throughout the buildings irrespective of the weather outside. Inside temperatures are expected to range from 17–25°C for offices and laboratories (winter / summer) when external temperatures will be between 6–27 °C.

The energy consumption target is100 kw hrs/m^2/yr averaged over offices, collection spaces and laboratories, the latter being notoriously energy intensive. A conventional office building would consume approximately 200 kw hrs/m^2/yr, and a building with laboratories would use closer to 300 kw hrs/m^2/yr. Limiting energy consumption will be achieved through design features that reduce the need for heating and cooling (minimising direct energy consumption), and by recovering and reusing waste heat. Some of the design features are outlined below.

Building materials

The external shell of the building is multi-layered to limit heat gains from or losses to the outside. The inner-most layer is concrete block wall (keeping the thermal mass on the inside), then a thick layer of rigid fibreglass insulation, a ventilated cavity, a vapour seal layer and finally timber or metal cladding on the outside.

Internally, exposed concrete has been used extensively to increase the thermal storage capacity of the building. During the initial decision-making design stages, innovative energy modelling software was used to optimise placement of windows and window shades, and the building fabric options. The software assessed natural lighting, heating and ventilation for various times of the day, every day of the year.

Insulated walls and roof

Expenditure and performance has been focussed around areas where it is needed most:

- high-performance insulation has been used for the roof, walls and floors around the collections (the outer metal cladding; then R4 fibreglass batts in walls and floors with R5 in the roof; then the innermost precast or block concrete walls, floors and ceilings)
- mid-level insulation (R4 fibreglass batts, which is several times that recommended by EECA guidelines) has been used around the atrium and office façades
- low-level insulation has been used internally between air-conditioned and non air-conditioned areas.

(A typical office loses 28–30 watts of heat per m^2 of uninsulated wall. With insulated walls this drops to 8 watts.)

Windows

Windows are double-glazed with opening frames for fresh air. Windows will need to be closed at night and during temperature extremes to help maintain the reasonably constant inside temperatures.
(A typical office loses 100 W of heat per 1 m^2 window. With double-glazing, this drops to 56 W.)

Heat recovery

'ECO-AIR units' that incorporate heat exchangers recover waste from the refrigerator/freezer systems, the air-conditioning / dehumidifying systems, and some of the fume cupboards. The building has 11 fume cupboards, and the energy associated with their operation (including replacing the air that they suck out) is the greatest single energy use for the whole building. The refrigeration system serving the freezers and collections space dehumidification system provides heat to a skirting radiator system throughout the offices.

Gas fired booster system

A gas fired booster system has been installed to supplement, if needed, the recovered heat and solar heating systems.

Solar panels

Two solar panels on the roof provide the energy needed for the hot water usage throughout the laboratory systems. The cafeteria has a separate solar hot water storage system that is independent of the laboratory systems.

Wind powered generator

A small (400w) wind powered generator by the glasshouses provides sufficient power to pump rainwater from the storage tanks (by the glasshouses) back up to the roof tanks that supply water for flushing urinals and ground floor toilets.

Wind is a 'sustainable' form of energy and incorporating a windmill generator contributes to the overall sustainability of the stormwater management on site and further reduces energy consumption from the national grid.

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