Landcare Research leading the way with sustainable design

Manaaki Whenua Landcare Research is one of New Zealand's foremost research organisations dedicated to the sustainability of our environment so when they decided to relocate from their Mount Albert premises in Auckland to a new building on the edge of the Tamaki Campus at Auckland University they felt they should put their beliefs into practice.

■ **Exterior view of collection spaces and laboratories.**

When Landcare Research commissioned Chow:Hill and their design team they clearly stated their vision for their new building was to create a world class leading example of an environmentally sustainable design.

The client's aim was to demonstrate that a building could meet the functional needs of the building users and be constructed at a commercial cost that would be inspirational to other developers and builders.

Total Design

The design was a collaborative approach across a range of disciplines and expertise involving the client's project group, Chow:Hill's design team of architects, interior designers and laboratory designers; Connell Mott MacDonald as building engineers and Hawkins Construction added their practical experience during the construction stage.

The process required an active response to an ever emerging and detailed operational brief coupled with sustainable issues and the real parameters of cost and programme.

Building Design

The building is a series of research laboratories with different containment standards, museum quality collection spaces for 6.5 million insects and 600,000 fungi specimens, glasshouses for the propagation of plants, staff offices and spaces for social and administrative needs.

The building has a floor dedicated to MAF National Plant Pest Reference laboratory and their associated offices and support areas.

The plan has a narrow footprint around open courtyards allowing for maximum use of natural light and ventilation to offices, with mechanically ventilated or air conditioned laboratories located near the northern road side of the site to act as an acoustic and solar barrier.

The collection spaces are on upper floors within concrete bunker type construction to help with the temperature and humidity control. The courtyards and internal open spaces act as pedestrian routes between the building blocks and areas for casual interaction by staff or display areas.

The external look of the buildings are divided into three defined forms and materials of metal, timber and glass. Metal for the laboratories and collection spaces, timber for the social and administrative and glass for the propagation areas. The collection spaces are expressed as a precious resource wrapped within a protective basket weave structure.

Sustainable Design

A significant amount of research was carried out on building systems selection rather than consideration of isolated elements or materials only with respect of energy use, buildability and cost in use.

■ **Exterior view of main entrance.**

Manaaki Whenua
Landcare Research

The result of this approach was to use materials in their least processed form and in an exposed state. When considering the building services, Connell Mott MacDonald used the same principles to minimise building services rather than add to any system design or to use low energy fittings for lighting.

Internal floor and wall coverings were kept to a minimum with exposed aggregate concrete for walls and floors in corridors and ground floor reception.

Also, the Ceilings in noncontainment areas were omitted and the services exposed and carefully coordinated to create their own design aesthetic.

The library and meeting rooms have been carpeted using a range of synthetic carpet tiles from Interface which have a recycled post-industrial waste content and are from several 'end-of-line' ranges making a lively pattern.

The laboratories have a marmoleum floor finish made from jute and natural resins which can be composted at the end of its useful life.

Design features

The design allows for a range of internal temperatures – 17 to 25 deg C – rather than the 20 to 23 deg C that would normally apply for buildings of this nature.

This approach would reduce energy needs by using passive climate control keeping the warmth in but excluding excess heat and cold from the building.

The goal was to use only 100 Kw/hr/sqm/year instead of the usual 200 for an office and 300 for a much more conventional laboratory building saving approximately $70,000 per year in energy costs alone.

High performance insulation has been used to reduce heat loss while the dense concrete inner wall helps with thermal mass and thermal storage. Windows were designed to be closed during the night and during extremes of weather to maintain the temperatures in the internal spaces. Windows are double glazed to reduce heat loss with opening lights to allow for ventilation in the non-containment areas. Specialised units recover waste heat from the refrigeration, air conditioning and the fume cupboards and reuses it to fuel a skirting radiator system in the offices.

Coupled with the waste recovery systems solar panels have been installed to heat water for the laboratories while a separated system provides hot water to the general areas.

A bottled gas fired boiler has been installed as a back up system if required. The ground floor has low water-use flush toilets while upper floors have composting toilets connected to two Clivus Multrum tanks located on the north side of the building to keep the tanks warm.

This system was chosen to lower the impact that a building of this type creates on the sewage systems. Since human waste is rich in carbon and nitrogen it can help soil condition when composted in the correct way.

The system and the storage of waste conforms to Australian and New Zealand standards, therefore the resulting compost when emptied every six months can be used on the gardens surrounding the building.

Even though this type of composting toilet system has been used in rural areas such as camping sites, it has been proven that these systems can be used in urban settings.

Liquid toilet waste urinals and washbasin water runs into the sewer system while the wastewater from laboratories goes to the sewer via a 1000 litre detention/ dilution tank since the urban site area is not large enough to dispose of grey water. Stormwater from carpark areas is reticulated via vegetated swales to 'wet gardens' and onsite soakage. Roof stormwater flows via a siphonic drainage system to collection tanks, used for plant irragation and toilat flushing, with any balance returned to on-site soakage.

A wind powered generator adjacent to the glasshouses provides 400 watts of power to pump rainwater from the storage tanks back to the roof supply tanks to be used in the toilet systems and to flush urinals.

This helps to reduce the need for water used on the site and reduces running costs. The roof acts as a collecting area for 300 cubic metres collected during a typical storm and stored in the 25,000 litre tank.

When the tanks are full the overflow will go into the rain garden or the soak pit that penetrates the basalt rock below the garden.

Any further overflow will go into the sewer. Reverse osmosis (RO) water is piped to the laboratories to be used for slide preparation and rinsing glassware.

The system uses a large amount of water but only a small proportion of water flowing through the machine is used. Therefore the reject water is collected for re-use in urinals and for garden irrigation.

If the RO system uses the rainwater off the roof it will prolong the life of the filter since rainwater has less dissolved salts than the mains supply.

In the long-run the building will be a research tool in its own right. It will be monitored and performance made public to assess against Landcare's ideals and affirm Chow: Hill's approach to producing a sustainable design.

Bob Jones, Laboratory designer working within Chow: Hill's Total Design team bob@chowhill.co.nz

■ **View of a typical laboratory configuration.**

■ **View of main reception and waiting area.**

Landcare siteplan