



Manaaki Whenua  
Landcare Research

Landcare Research's new facilities at the University of Auckland's Tamaki Campus.

## Protecting the biological collections

The arthropod, fungal and plant microbe collections have been designated as 'Nationally Significant'. The arthropod collection contains about 6 million specimens of insects, spiders and related invertebrates; the fungal collection contains 72,000 specimens and is one of only a few sizeable collections in the Southern Hemisphere; and the ICMP contains 12,000 strains of bacteria and plant pathogens. These collections are irreplaceable and require utmost care — including maintaining the right 'climatic' conditions for long-term curation of specimens, and appropriate protection from potentially devastating fires or earthquakes.

### 'Climate'— the right temperature and humidity

#### Cool and dry

The fungi and 1 million pinned arthropod specimens are maintained in constant cool, dry conditions (18 °C, 45 % relative humidity). This is achieved through a combination of smart design, and an energy- efficient environmentally-friendly air conditioning system.

Design features include locating the windowless vaults on the south façade of the building to minimise heat gain, and a multi-layered roof and wall construction to insulate against external temperature extremes. The layers include concrete floors, walls and ceilings (hence keeping the greatest thermal mass on the inside of the building), then a thick layer of fibreglass batts (with an R rating several times greater than EECa guidelines), then a vapour barrier or moisture seal layer, and finally the outermost skin of profiled long run metal.

#### Pickled in the cold and dark

About 5 million delicate or soft-bodied arthropod specimens are stored in 70 % ethanol in a special vault outside the main building. Because specimens in ethanol will deteriorate if exposed to normal light and temperatures, this vault is maintained at 10–12 °C and is kept dark unless someone is working in there.

Because of the potential fire risk from the ethanol, this vault is constructed to the same specifications as a dangerous goods store but with the same level of fibreglass insulation as the main building.

### Fire protection

#### Argonite gas flooding system

Conventional fire protection systems cannot be used in the vaults containing dried collections as water, powder and foam would severely damage the specimens. Because of this, we have installed a centralised argonite gas flooding system to suppress any fire that might occur in the vaults.

Argonite is a mix of 50% argon and 50% nitrogen, which is an environmentally friendly, economic alternative to halon gas (also used in fire suppression systems for high value areas).



When argonite is released into a room, both the argon and nitrogen displace oxygen, with argon helping to achieve a specific gravity almost equal to that of ordinary air.

The gas mixture is stored under pressure in cylinders that are connected to the vaults via a system of dedicated pipes and nozzles. When the system is triggered, automatically or manually, gas floods the affected vault. The oxygen concentration drops from the normal 20.9% to 12.5% — rapidly smothering the fire. (Almost all fires in enclosed spaces will extinguish in <60 seconds when the oxygen concentration falls below 15%.) In accordance with international standards, this level is acceptable for human exposure for short periods.

Argonite is completely inactive so does not produce any toxic fission products as it extinguishes the fire, nor does it leave residues coating surfaces. Hence the argonite does not damage the stored specimens, and staff can return to the vault as soon as the room has been ventilated.

### **Walls and doors**

All the collection vaults are contained within concrete fire-walls. These have a four-hour fire rating, and the doors have a two-hour rating. Should a fire occur outside the vaults, these fire walls and doors provide added security against heat and smoke, as well as protection from the flames.

The corridor doors that are part of PC2 biological containment requirements also have the additional function of containing smoke.

## **Earthquake protection**

### **Designed to withstand a ‘one-in 600 year’ earthquake**

Because of the value of the collections, the building has been designed to withstand a ‘one-in 600 year’ earthquake. ‘One-in-450 years’ is more commonly used in normal building design.

The structural mass and sheer weight of the collection vaults on all floors presented a challenge for ensuring this degree of resilience. During a severe earthquake, the vaults could sway with considerable force and magnitude, potentially shaking the rest of the building to pieces.

### **Seismic joint across the building provides elasticity**

To overcome this, the two wings of the main building have been split and seismically isolated by a movement joint right across the building. (This joint, a gap of about 100 mm covered by a steel plate, is easily seen on the level 1 & 2 landings near the stairs.) In effect, the two wings become independent structures that are reasonably symmetrical with regular framing, and which will move fairly uniformly. The configuration allows reasonably controlled, even movement that will dissipate the earthquake’s energy before it damages the building structure. This type of design exhibits considerably more earthquake resistance than buildings of an irregular nature, which can result in very uneven stresses in inelastic construction materials.

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