Te Mirumiru: Designing for Cultural Sustainability

CASA

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‘UNESCO is convinced that no development can be sustainable without a strong culture component. Indeed only a human-centred approach to development based on mutual respect and open dialogue among cultures can lead to lasting, inclusive and equitable results. Yet until recently, culture has been missing from the development equation.

At a time when the international community is discussing future development goals beyond 2015, all efforts are focused on putting culture at the heart of the global development agenda.’

http://en.unesco.org/themes/culture-sustainabledevelopment#sthash.XIhW1juTd.puf
Client: Ngāti Hine Health Trust

- Ngāti Hine (descendants of Hineamaru)

- Was established to provide self governance for the local indigenous people of the area.

- Proud but small iwi (tribe), well respected throughout NZ Maori.

- Trust has a long term strategy to ensure the prosperity of their culture and community – a sustainable community.

- Part of strategy is investment in education of their people.
Ngati Hine Culture:

• ‘Ngāti Hine pukepuke rau’ (Upon each of the myriad hills of Ngāti Hine stands a Rangatira).

• Hineamaru is the first recorded Maori woman to have survived a caesarian section birth around 600 years ago.

• Hineamaru successfully cultivated kumara at Waiomio nearby Kawakawa, which led to the settlement of her Whanau in the local valley.

• Waiomio Caves – nearby burial caves. Hineamaru lays somewhere in a secret cave.

• Ngāti Hine chief, Kawiti was described in British military history as a brilliant military engineer and strategist because of his design of underground fortifications at both Ohaeawai and Ruapekapec.
Maori Culture:

- Belief that all life is interconnected – whakapapa
- Rich in symbolism
- Poetic language, historically verbal
- Artistic forms derived from nature
- kaitiakitanga (guardianship of the environment)
- Tradition of connection to land of birthplace: whenua
Te Mirumiru: Passive Environmental Design
SUMMER

PASSIVE COOLING AND VENTILATION

1. High summer sun penetration throughout day minimised by roof overhang - minimising glare and over heating.
2. Over 30% openable glazing, coupled with exposed thermal mass on floor and ceiling allows fresh air to cool the building.
3. Air movement encouraged on still hot days by opening door to circulation space allowing pre-cooled air into classroom.
   Thermal mass of classroom promotes stack effect, thereby mixing cooled air with fresh air from outside.
4. Earth roof and planting absorbs heat from the sun and insulation below blocks heat entering the building.
5. Thermal mass of earth bank and concrete construction on south side keep the circulation space cool. Additional cooling of occupied spaces on the north side can be achieved by simply opening the door to the circulation space.
PASSIVE HEATING AND VENTILATION

1. Low morning, midday, and afternoon sun penetration maximised for solar gain.
2. Double glazed facade minimally open for maximum solar gain and natural ventilation.
3. Air movement minimised by using the thermal mass of the floor and roof to heat the cool winter air. Stack effect will circulate warm air throughout the classrooms.
4. Super-insulation and earth roof / bank keep heat losses to an absolute minimum.
5. Circulation space and earth bank placed on the south side as a thermal buffer to heated rooms on the north.
6. Solar gain absorbed by concrete floor and walls which act as heat stores. Solar gain of floor acts as preheat to underfloor heating when needed.
1. Rainfall on grass/earth roof is retained by planting - no increase in stormwater run-off post development. Any excess water is captured and fed into rainwater tank to flush toilets.

2. Rainfall on paved surfaces is retained in a tank and used to flush toilets.

3. Solar hot water panels on the roof supply hot water and underfloor heating requiring no fossil fuel input - their location is both functional and educational.

4. All water fittings and appliances are WELS 4 star or above, reducing potable water use at source by over 75%.
Energy usage: 14,838 kWh/year
45.52 kWh/m²/year
CO2: 2,670.84 kgCO2/yr
69% reduction compared to similar building.
Building cooling achieved passively through earth bank and exposed concrete.
Classrooms fully daylight via fully glazed doors at front and 2 solatubes at rear
Naturally ventilated, upto 6x better than building code requirement.
Zero VOC / E0 formaldehyde internal products, paints and linings resulting in best possible internal air quality.
Potable water usage reduced by 80% of council allowance (9lpppd vs 45lpppd)
Green travel plan reduces private car usage by estimated 44%
Native NZ local planting makes a significant improvement to the ecological diversity.
FSC certified timber used throughout
Over 80% of steel used was recycled steel.
20% of concrete aggregate is recycled aggregate and 20% cement replaced by fly-ash waste product.
Zero Ozone Depleting substances were used in refrigerants and insulation products.
The buildings passive and active environmental systems are incorporated into the curriculum as a teaching aid.

**PASSIVE COOLING AND VENTILATION**

1. The high summer sun is stopped from coming into our classrooms by the roof that shades the glass. This is like the peak of our summer hats we wear to protect our faces when we are playing outside. This will keep us cool by reducing the amount of sun shining into our classrooms on hot summer days.

2. Our walls, floor and ceiling are made of solid concrete which absorbs the heat from the sun. This will keep us cool like the inside of a cave.

3. Our big doors that open onto the playground, allow fresh air to cool our classrooms.

4. The solid concrete on the roof, floor and walls on the cold side of the building (south side) keep the hallway space cool. When we want more cool air in our classrooms on still hot days we can open the door onto the hallway.

5. The cool, fresh, air from the playground flows through the doors and the four windows in the center of the roof.
Overall 67% reduction in statutory authority infrastructure demand resulting in a $110,000 saving in charges.