SUSTAINABLE BUILDING WITH PAUA.

PAUA Architects has been designing sustainable buildings since before it became a buzz-word.

Sustainable design, materials, and technologies typically make a building more energy and resource efficient, reducing ongoing operating costs of a building, such as lighting, heating & cooling, and water usage.

Differences in capital costs between environmentally sustainable design and technologies, and a more traditional, minimum-code building have reduced over time, and when incorporated in a new build from the outset the difference can now be very minor.

More recently, engineered timber technologies such as LVL and CLT have been a catalyst for rethinking commercial construction, enabling us to reduce reliance on steel and concrete for structural elements.

PAUA

Procuta Associates Urban + Architecture

Te Kāhui Whaihanga **Practice 2022**

NZ REGISTERED ARCHITECT

NZGBC TE KAUNIHERA HANGANGA TAUTAIAO Member 2021–2022

Waikato Diocesan School for Girls

SPORTS EDUCATION CENTRE.

This project was commissioned through a design competition amongst five architectural practices. The architecture nestles around a grove of mature trees, creating a sheltered courtyard. PAUA Architects led the project team and provided full architectural design and project management service.

The 1200 square metre, two-storey sports and fitness centre was designed to a 4 Green Star equivalence (the client chose not to seek formal certification) and included a number of environmental strategies in its design and construction. The building incorporates a fitness centre, staff offices, classrooms, a uniform shop, and changing facilities.

Architectural work at the SEC involved careful consideration of the distinctive character of existing school, while creating a suitably modern educational and working environment.

"The Sports Education Centre, as well as being a beautifully designed and well-functioning building, was designed perfectly to best respond to its challenging site. They made the most of its situation to overlook a gully, but also in using the shape of the building to create a beautiful outdoor courtyard with well-established trees at its centre."

Ken Williamson
Chair, Property Planning Group Proprietor's Board
Waikato Diocesan School for Girls

Waikato Diocesan School for Girls

SPORTS EDUCATION CENTRE.

Energy use

- **a building management system** was installed to monitor and manage energy use, CO2 levels, ventilation, heating, lighting, and access/security;
- **energy efficient lighting** with occupant detection and daylight dimming to reduce power consumption and lengthen lamp life;
- **heat pumps** to complement natural ventilation;

Sustainable materials

- **renewable NZ timber** was used extensively, reducing the amount of structural steel required;
- **healthy materials and finishes** including low VOC paints, low emission wall linings, flooring and joinery;
- **fly ash** was used to replace cement in concrete slab floors;
- **waste management plan and environmental management plan** as a tendering requirement, and implemented during construction to reduce waste and emissions, minimise run-off, retain top soil on-site, and recycle building materials.

Natural and sustainable design

- **passive solar design** - polished concrete slab and atrium block walls absorb the sun's heat and slowly release it, passively heating the building;
- **well insulated** building envelope exceeds Building Code requirements;
- **double glazing** was used in windows and skylights;
- **natural ventilation** – temperature/CO2 sensor-controlled window opening;
- **shading** screen on the north façade, as well as the use of roof overhangs and existing trees to provide shade in the summer months;
- **rainwater harvesting** is used to fill toilet cisterns, reducing the use of clean potable water;
- **low flow water fixtures** reduce water use;
- **design provision** of space for recycling collection and sorting.

CLEAN ENERGY CENTRE.

Fusing high energy performance with beautiful craftsmanship, the NZCEC is a showcase for clean energy, industry collaboration, and innovation. The architecture is designed to demonstrate a commitment to low-environmental impact in the construction and life of a building, and to provide a stimulating landmark workplace.

One of the key statements in the design brief was that “the building was to be an iconic landmark building that reflects Taupō’s location as the centre of clean energy research and industries.”

With a purpose intrinsically entwined with the principles of sustainability, Antanas and the team designed the centre to embody green architecture and energy efficiency. It functions as a working laboratory, encompassing a wide range of sustainable features.

CLEAN ENERGY CENTRE.

Clean energy technologies

- **geothermal** in-slab heating;
- **biomass** heating from on-site willow coppicing;
- **on-site wind turbines** provide clean electricity to the building;
- **photovoltaic panels** orientated on the north face generate electricity and shade the building from undesirable summer sun;
- **solar panels** are also located on the building's roof for water heating;
- **energy efficient lighting** with occupant detection and daylight dimming to reduce power consumption and lengthen lamp life.

Sustainable materials

- **renewable NZ timber** was used extensively, and the frond-shaped laminated timber portal legs in the atrium are made from sawmill off-cuts, reducing the amount of structural steel required;
- **straw bale walls** with high insulation value are installed on the coldest side of the building;
- **healthy materials and finishes** including low VOC paints, low emission wall linings, flooring and joinery;
- **fly ash** from Huntly Power Station was used to replace cement in locally supplied pre-cast concrete floors;
- **Waste Management Plan and Environmental Management Plan** implemented during construction to reduce waste and emissions, minimise run-off and recycle building materials.

CLEAN ENERGY CENTRE.

Natural and sustainable design

- **passive solar design** - exposed polished concrete floor absorbs the suns heat and slowly releases it, passively heating the building;
- **well insulated** building envelope exceeding Building Code requirements;
- **natural ventilation** - low level louvres provide cool air supply, and high level louvres remove stale air, creating a natural air movement through the building;
- **large windows** give natural light and control solar gain to the building;
- **skylight** provides natural daylight in the Atrium;
- **shading** positioned to regulate solar exposure to reduce summer overheating and allow winter exposure to solar gain;
- **rainwater collection** is used to fill toilet cisterns, reducing the use of clean potable water;
- **low flow water fixtures** reduce water use;
- **on-site waste water treatment system** irrigation is directed to willows which will be coppiced to provide fuel for future biomass heaters;
- **green balustrade** has “air cleaning” planting to filter chemicals from the air and introduce moisture during the summer months.

THE LIVING ROOM.

One of our first achievements in the area of sustainable design was the ‘Living Room’ for Hukanui Primary School. A truly eco-classroom, the students were involved hands on in the design, discussions about sustainable materials, and even in the construction.

Passive solar design principles were researched and implemented, including the use of a pergola to shade the summer sun. Natural ventilation was provided via high and low level louvres, while a wood burner was installed for winter heat, surrounded by an earthbrick wall.

The floor used three different types of insulation, and monitoring equipment was installed so the children could see which materials performed best.

MASS TIMBER CONSTRUCTION.

New structural timber products enable the use of renewable timber in multi-storey and commercial construction, with obvious sustainability benefits.

Probably the most well-known product, cross laminated timber (CLT) panels are building panels made from layers of solid timber board laminated together, with each layer at right angles to the one above.

Other products include Glulam or GLT, LVL, and PLT, all of which are glued laminated timber, layered in a parallel configuration, either vertically to create an engineered structural beam, or side-by-side to create floor or ceiling panels.

All of these can be used in commercial builds to displace carbon-intensive materials like steel beams and concrete slabs.

As well as sequestering carbon, mass timber construction is well suited to prefabrication and can improve efficiency on-site, while also reducing waste in the construction process.

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