The BNZ's new building on the Wellington waterfront has achieved five-star green building status.

Towers of flexibility

The Bank of New Zealand's (BNZ) new state-of-the-art office building is now open for business on the Wellington waterfront. The building, with its distinctive glass and white aluminium panelled exterior, has already become a recognisable landmark in the capital's CBD. Completed in May this year, the BNZ's new home incorporates some ingenious features to cope with the challenges of its site and, in keeping with the times, the building has received a five-star rating from the New Zealand Green Building Council.

The building is part of CentrePort's Harbour Quays development, which will eventually turn 6.5 hectares of waterfront along Waterloo Quay into a "modern business park of international standards". The development is already home to private- and public-sector tenants such as the New Zealand Rugby Union and Statistics New Zealand, and with another 10 commercial sites available it is eventually expected to house 6,000 people.

Architects Jasmax have come up with an innovative design for the BNZ building. It consists of three separate reinforced concrete frame "piers" – each of which is essentially a building in its own right – and is the first design of its kind in New Zealand. The piers are set 13.5 metres apart, creating two open atria within the larger structure. The outermost piers are six stories high, while the central pier has seven stories, providing a total floor area of almost 25,000 square metres and more than 18,000 square metres of office space. The design reflects BNZ's desire for "openness, community and transparency". Each level of the building is entirely open plan, and the main structure is set back from the edge of the building to give an almost structureless appearance. The entire building is wrapped in a glass and aluminium façade, which features design work by artist Stuart Forsythe on the Waterloo Quay side of the building.

These seismic joints allow up to 750 millimetres of movement, which means they can move safely in an earthquake while remaining supported by the piers

The BNZ building in various states of construction. Top: Within the structure, looking toward Wellington Railway Station. Middle: View from the roof of the Wellington Railway Station as the façade is placed on the Southern Wall. Bottom: The completed building.

Underneath its sleek exterior, the structure rests on more than 70 concrete and steel piles, some of which have been driven more than 30 metres into the ground in order to provide a firm footing on the site's reclaimed land. Subcontractors Brian Perry Civil found water seepage to be a major problem, but came up with a solution by using a polymer slurry, which prevents water from collapsing the pile hole. The technique is fairly common overseas, but it is thought to be the first time it has been used in New Zealand. Matthew Lander, an associate from engineering firm Beca says that they, together with geotechnical engineers Tonkin & Taylor, had to plan for the possibility of liquefaction. He explains that the team used a technique called vibro-compaction to install hundreds of 15- to 20-metre-deep gravel columns on the seaward side of the site, forming a dam to help stop the building destabalising in the event of a major earthquake.

The three piers are tied together by a series of pedestrian bridges, which span the two atria at each floor. The bridges were built using 550-millimetre by 550-millimetre steel-box sections, which are the largest to be used in New Zealand. They are connected to the piers with 200-millimetre steel pins, which allow the piers to move independently without damaging the bridges.

During an earthquake the piers move together parallel to the direction of the bridge span, but they are free to move at right angles to the span. These knuckle joints have been deliberately left exposed as an architectural feature in the finished building.

The BNZ had a very clear idea of the type of office space they wanted. "They wanted large, open, free spaces without any columns," says Mr Lander. Given that each floor plate is 17 metres wide (one of the longest office floor spans in the country), this posed some engineering challenges. "The concern was that the longer the floor span, the greater the risk of vibration. We had to do some detailed analysis to make sure the floor would not be too lively." The end result is a clear floor span almost double that of a normal office floor system, with excellent vibration protection.

Also in accordance with this desire for transparency and openness, cantilevered edge slabs allow the concrete frame to be set back from the façade and largely hidden from view, which allows for floor-to-ceiling glazing around the building.

At the ends of the piers, lightweight steel "clip-on" frames contribute to the sense of lightness, as do the wing walls, which stick out on the Waterloo Quay side of the building and appear to almost hang there without any supporting columns. On top of the building, a sawtooth steel structure uses three-metre deep trusses to span the two atria. The roofs over the atria are rigidly connected to the central pier, but have sliding joints where they meet the outer two piers. These seismic joints allow up to 750 millimetres of movement, which means they can move safely in an earthquake while remaining supported by the piers.

The open-plan design has required some quite specific service engineering. "The fire engineering was quite demanding," says Beca's Manager of Wellington Building Services, Stefan

One of the striking internal spaces within the BNZ building.

Waldhauser. "The whole building is one single fire compartment, because all the floors are open to each other. Measures had to be taken to get rid of smoke quickly, and allow people to get out of the building safely." Eight huge 1.8-metre-diameter extraction fans sit on the roof to suck out smoke in the event of a fire and also assist with day-to-day air circulation. Ventilation is controlled using a variable air volume ventilation system, which adjusts the amount of air moving in the building to meet cooling or heating needs.

The two atria and large tracts of glass bring considerable amounts of natural light to the building's occupants. Supplementing this is a Digital Addressable Lighting Interface system (DALI), which automatically adjusts internal lighting based on the amount of daylight available. Power and water usage is carefully monitored by a large number of meters spread throughout the building, allowing any problems to be identified and resolved easily.

The building's excellent green credentials are recognised by the award of a five-star rating under the New Zealand Green Building Council Rating System. Under this system, buildings are evaluated against a number of categories that assess the environmental impact of "site selection, design, construction and maintenance". A good façade, harvesting of rainwater for use in toilet flushing, and the addition of bike storage and showers for cyclists all help to bolster the building's environmental merits. Fletcher Construction also took the green focus on board during construction, with over 70 per cent of waste being reused or recycled.

The enthusiasm of the two Beca engineers for the project is very apparent and it is clear that they have enjoyed working on the building. A key part of this, says Mr Waldhauser, is to have a good working relationship between all the different companies involved. "It helps a lot to put such a fantastic product together if you have a team that is working together superbly and that respects each other."