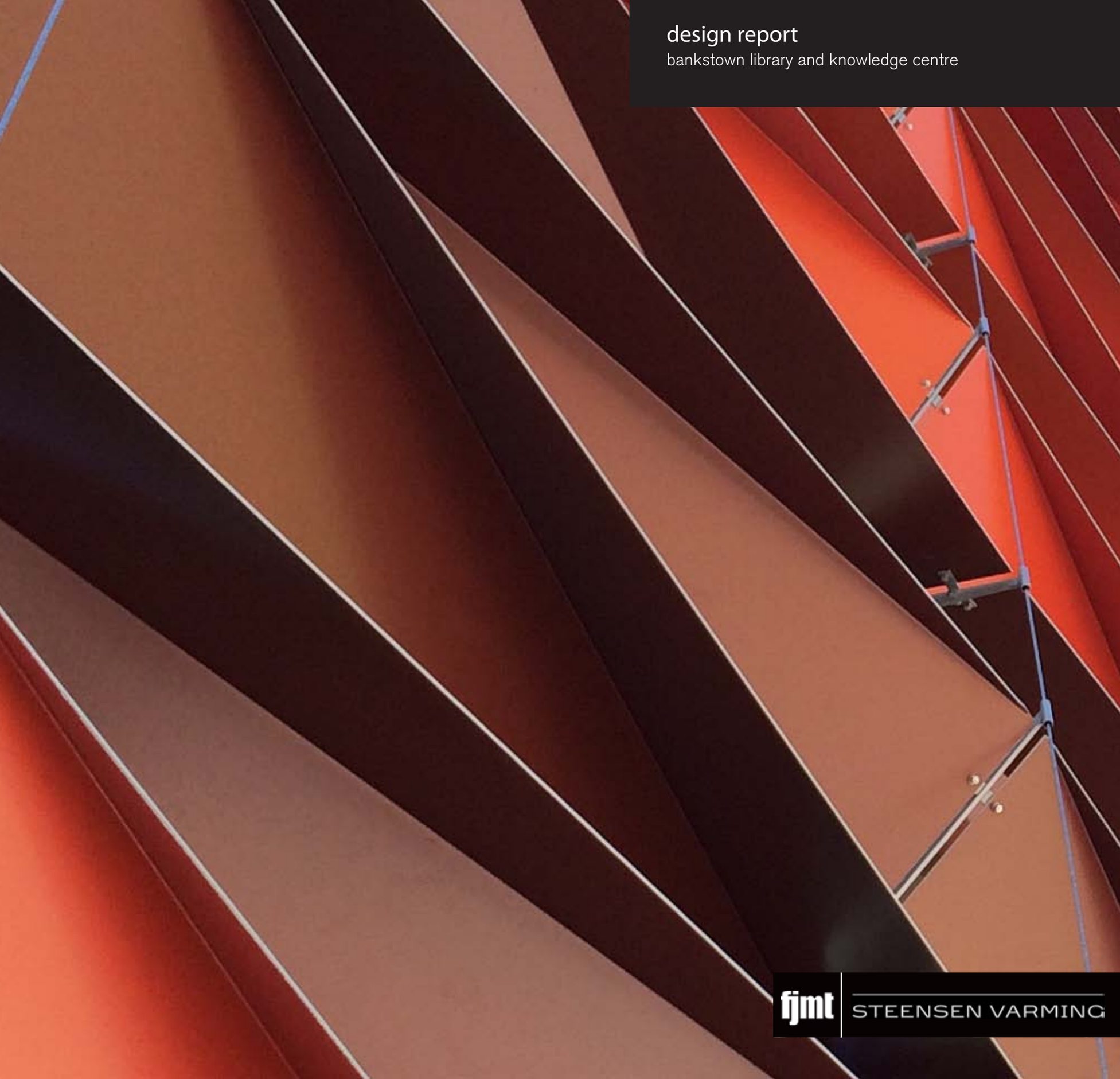
design report

bankstown library and knowledge centre



fjmt | STEENSEN VARMING

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bankstown library and learning centre

Auckland Art Gallery Toi o Tāmaki

Commissioned by Bankstown City Council (BCC) and designed by Francis-Jones Morehen Thorp (fjmt), the Bankstown Library and Knowledge Centre (BLaKC) sets a new benchmark in sustainable design through the adaptive reuse, salvage, recycling and renovation of the existing Bankstown Town Hall.

Located in the heart of Bankstown, the development serves to revitalise a dislocated site and create a rich spatial experience for community members and visitors.

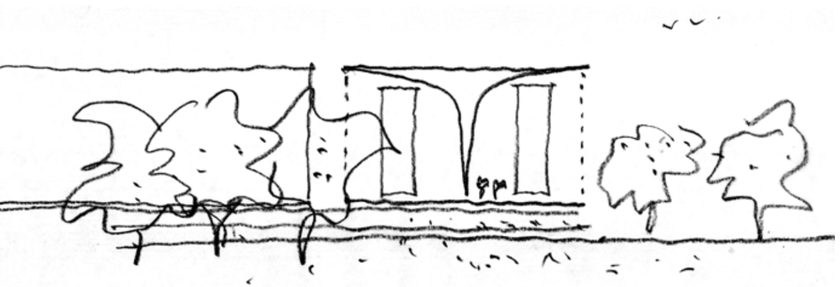
Three core concepts underpin the development; adopting a hybrid approach to connect the new with the existing, creating a contemporary sense of place within the Bankstown civic precinct and implementing the sustainable adaptive reuse of the existing Bankstown Town Hall (through a material salvage and reuse regime).

The project brief called for a high quality, sustainable building of distinctive architectural character and a landscaped public space to foster a sense of community within the Bankstown civic precinct. Two options emerged in response to the brief; an adaptive reuse of the existing building or a complete demolish and rebuild. After analysing the associated risks and benefits a third option became apparent; a hybrid approach. Adopting this approach led to the existing building being sensitively modified with materials salvaged and realigned to meet new requirements. The existing auditorium and related podium were demolished and the new library volume shifted forward, to define the public domain and create a sense of place within the podium forecourt. Extending the boundaries and implementing a reuse strategy ensured the project brief, objectives and budget were all successfully satisfied.

Sustainable design principles and innovative high performance environmental systems informed all design decisions to create an integrated, flexible, state-of-the-art community hub. The BLaKC imparts a certain monumentality, significance and dignity to this significant public place.

architects statement

bankstown library and knowledge centre



The design of the new extension and adaptive reuse of Bankstown Town Hall to become the new Bankstown Library and Knowledge Centre has emerged from a detailed analysis of this important site, streetscape and urban form. The design brief was to create a high quality sustainable and iconic building of distinctive architectural character within the Bankstown Civic Precinct, together with a new and inviting landscaped public open space sequence to promote new opportunities for through site public connections.

The development includes a new library over 3 stories, 300 seat theatre, community conference facilities, new cafe, interactive community information wall, Public domain improvements including the redevelopment of Paul Keating Park, new aquatic sculpture garden, new street trees and landscape, upgraded and new accessible amenities, upgraded off street parking for 64 cars, with all weather accessible bus drop-off zone, bicycle parking.

Our inspiration for the design concept was the natural landscape and the adjacent parkland, we wanted to make an open and inviting new library that is a little like gathering under the canopy of two great trees, with the folded patterning of red and aluminium sunscreens similar to the shade given by the patchwork of leaves. The design seeks to establish a contemporary sense of place (both building and open space) that will provide an open and inviting “public” (community) facility with strong connection to its setting.

The new library pavilion is carefully located upon the elevated podium, to identify with its new locale and complement the physical scale and modulation of the existing Town Hall building and precinct. The resulting architectural response has a significance and dignity within this important civic precinct and reflects the community values it embodies. Restructuring of the podium arrangement provided clear articulation and activation along the northern and southern edges of the building, whilst providing a “new” form to engage with its context.

The finely detailed podium aligns with the adjoining building scales to create a human level to both the site link and Paul Keating Park relationships. The existing podium is raised up and set forward to the north to create generous and inviting scented outdoor reading garden and to create a sense of invitation along the shared way pedestrian connection. The library position and height is determined to minimise environmental effects such as overshadowing on public open spaces and sits comfortably with the adjoining building form.

The new through site link will be a shared way to facilitate vehicle access and pedestrian movement. The link space is landscaped with a combination of low level native shrubs and lightly scented native feature trees to assist in reducing the olfactory impact of vehicular emissions and to act as a permeable buffer to the adjoining development site.

The innovative custom designed external sunshade system provides shade and privacy whilst geometrically connecting the new with the existing and giving the architecture of the new building a distinctive and unique character. The new building is both the architectural complement and contrast to the existing, this interrelation is extended into the recycling and transformation of the actual material of the original hall. Equal care and attention is paid to the detailing of each element of the architecture including elements of the landscaped public open space such as the reflection pool sculpture garden and landscaped northern reading garden.

There was a unique opportunity to utilise and repurpose the high quality materials of the existing building (Tallowwood, Tasmanian Oak, Blackbutt timbers, Precast concrete, Aluminium and Stainless Steel) through salvage and reuse. Our strategy focused on applying the “found” materials to areas of the project where they would be most suitable and to maintain a consistency in their application, that is, salvaged floor boards used as new flooring or salvaged timber wall joinery reused in new joinery.

In developing our reuse strategy, we undertook a series of studies to identify the suitability and potential application of materials for reuse, and the resources that may be expended in their salvage. These findings were then assessed within the construct of the clients material performance brief, quality objectives and budget, whereby we identified a rare opportunity for a development of this type to embark upon an extensive salvage and reuse program which will set a benchmark for the use recycled materials in future public building projects.

In turn this approach delivered real and measurable savings in the “energy use” (embodied and power) of the development. The salvage and reuse of all internal timber floors/linings, structural timber, existing precast concrete facade, stainless steel joinery, reuse of the existing feature fibreglass ceiling systems and largest of all being the renovation, reuse and repurposing of over 80% of the floor area of the existing development.

Based on energy modelling, the annual energy demand of the new building was estimated to be 265 MWh (954,000 MJ) per annum. By evaluation, it is observed that the embodied energy of the salvaged materials is almost equivalent to 15 years annual energy demand of the new Library building or the equivalent of taking 1365 cars off the road.

Integrated sustainable design systems have been utilised in all aspects of the building services design. The mechanical services have a massive concrete Thermal Labyrinth, utilising the space of the redundant orchestra pit of the old auditorium, to passively cool and filter the outside air path, before it enters the low energy displacement mixed mode ventilation system for distribution onto the general floor areas. The return air system features an integrated “green lung” to filter contaminates from the building during the day using the natural characteristics of specially selected plants to passively filter, refresh and rejuvenate the building air supply.

The air conditioning system also features a Geothermal Bore Array consisting of 15 interconnected 100m deep bores. This system uses the “coolth” (temperature) of the earth (approximately 18º) to passively cool or warm the air-conditioning system hot water from 35º down to 21º. This passive cooling system minimises equipment footprints and theefore building area as well as being an energy neutral draw on the buildings services systems

To minimise power use, the facility features a 260m2 Photo-voltaic array for on-site power generation, this subsidises and offsets the draw from the Geothermal Bore pumps and Green Wall lighting. This combined a high performance double glazed facade system and skylights to maximise natural day-lighting and with the specification of super high efficiency light fixtures and zoning systems to minimise the power draw of the new facility. This combined with the integrated custom designed louvred facade to minimise solar gain and glare, insulates the building and users from direct solar gains to minimise air-conditioning requirements.

Finishes and materials featuring low levels of Volatile Organic Compounds (VOC) and formaldehyde content were prioritised, such as low paints, 100% wool carpets, adhesives, furniture, fabrics and reconstituted wood products, were all selected and or specified for the project. Post-tensioned structural system to reduce use of concrete, and maximised the recycled content in structural concrete to minimise the embodied energy and resource depletion.

Water sensitive design has also been prioritised with a 220,000L water storage tank integrated into precinct landscaping, where water is stored for the treatment & re-use in flushing toilets and building landscape irrigation, as well as supplying water for the PKP landscape irrigation. The new aquatic sculpture garden helps to purify and aerate the water by filtering the recycled and filtered water through its system before being treated. Water consumption is sub-metered and monitored by the Building Management Control System and 5A rated fixtures and electronic tap-ware have been utilised throughout.

The architecture is conceived as simple forms in a symbiotic relation with both the urban framework and the geometry proportions spaces and material of the existing building. While the architecture is inviting and transparent, it is also to a degree ‘silent’, such that it offers a contrasting environment to the ‘noise’ of its urban context.

sustainable design overview

Bankstown Library and Knowledge Centre is unique in its design philosophy by combining beauty and functionalism without highlighting the environmental initiatives. The environmental systems are intrinsic and multifunctional within the very fabric of the envelop, in this way the building design is a reflection of the next level of maturity in environmentally sensitive architecture.

The Design Team have approached the building design process by using a “Resource Hierarchy” to inform the selection of building systems, materiality, and to support the salvage/reuse decisions.

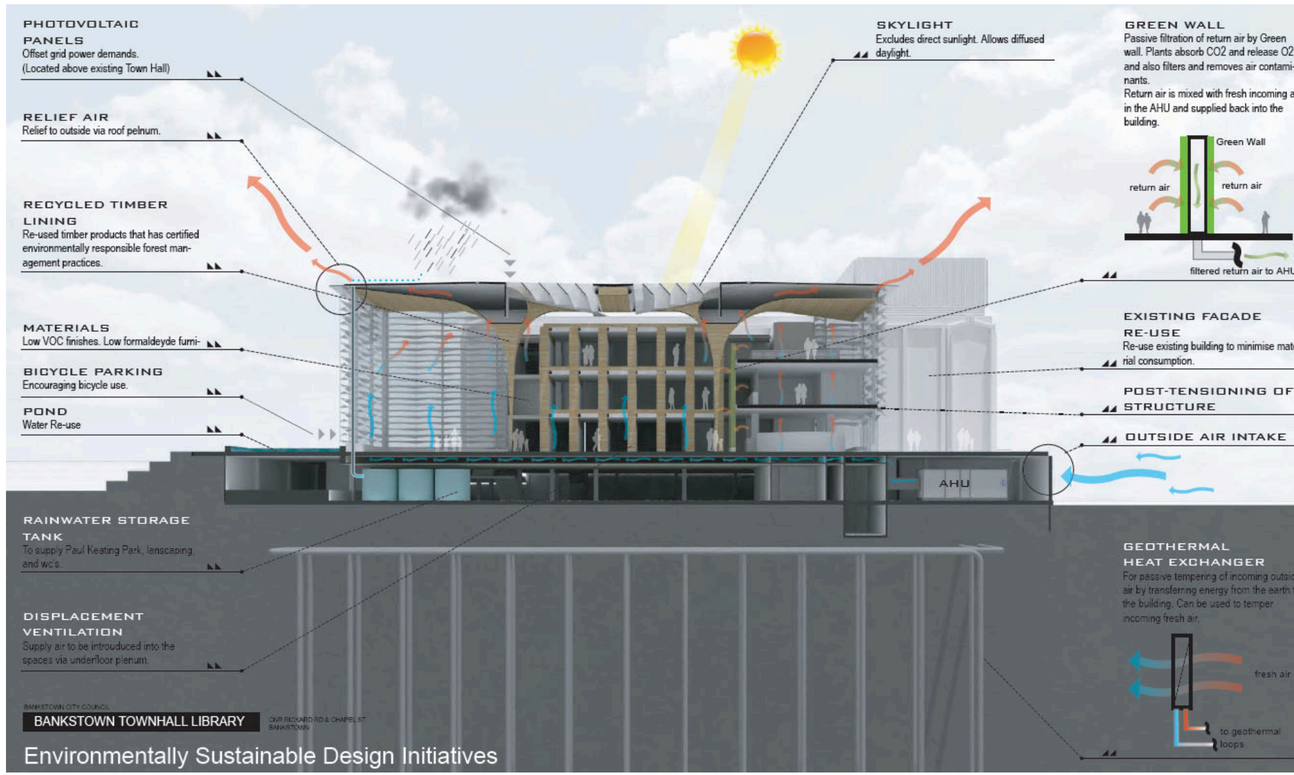
Material salvage and re-use played a key role in the design development of the building. For the Bankstown Library, the design team have evaluated the impacts and benefits of new versus re-used materials, in terms of raw material extraction, embodied energy, emissions and waste disposal.

Opportunities to reduce the adverse impact of material re-use and waste disposal have been identified and successfully implemented. A very significant quantum of material has been diverted from the waste stream, by effectively implementing the traditional resource hierarchy of reduce, reuse and recycle.

Supplementing the salvage and re-use of materials in the sustaiinable design philiosophy has been a suite of integrated ESD initiatives and systems, which include;

- Salvage of all internal timber floors, linings and structural timber members.
- Salvage of existing precast concrete facade panels
- Salvage of stainless steel joinery
- Salvage of bespoke ceiling systems
- Air purification wall for passive filtering of air
- Thermal Labyrinth to passively cool and filter air
- Geothermal Cooling Bores to passively temper water and air
- Displacement Mixed-mode ventilation
- Photo-voltaic Array for on-site generation of power
- Double Glazed high performance facade systems
- Bespoke louvred facade designed to minimise solar gain and glare and to insulate the building from direct solar gain;
- High efficiency light fixtures and zoning systems.
- Post-tensioned structural system to reduce use of concrete;
- Maximised recycled content in structural concrete to minimise the embodied energy and resource depletion;
- Finishes that have low Volatile Organic Compounds (VOC) and formaldehyde content. Such as low VOC paints, carpets, adhesives, furniture and reconstituted wood products;
- Timber products sourced from sustainable forests. Only reused timber products or timber that has certified environmentally responsible forest management practices was employed in the development.
- 220,000L water storage tank integrated into green link landscaping;
- Treatment & re-use of rainwater for flushing toilets and landscape irrigation;
- Treatment & re-use of rainwater for PKP landscape irrigation;
- Water consumption is sub-metered and monitored by the Building Management Control System.
- 5A rated fixtures and electronic tap-ware;

This strategy has assisted in minimising resource depletion, energy and emissions impacts associated with material production.



sustainable design analysis
introduction

The ESD approach for the new Bankstown Library and Knowledge Centre has been generated from a number of design principles established through an understanding of the urban context and the functional brief.
The building uses a suite of both passive and active ESD initiatives which deliver measurable and identifiable benefits to the buildings performance. These initiatives can be categorised under 2 sub-headings;

PASSIVE SUSTAINABLE DESIGN INITIATIVES
Focuses on areas such as the;

- material recycling and building re-use
- fixed solar shading
- green wall air filtering
- thermal labyrinth air tempering
- water capture and re-use
- VOC and PVC minimisation

ACTIVE SUSTAINABLE DESIGN INITIATIVES
Focuses on areas such as the;

- mixed mode environmental control
- displacement air conditioning
- photovoltaic solar array
- geothermal heat exchange
- material specification

The design proposal for the new facility represents a “Best Practice” integrated approach to environmental design, and utilises, where possible, sound planning strategies that assist with heating, cooling, day lighting and natural ventilation.

The holistic and comprehensive approach to the design of the environmental initiatives has been undertaken to take into account;

- Project and Construction Management
- Indoor Environmental Quality and Control
- Energy
- Transport
- Water Sensitive Design
- Sustainable Material selection
- Land Use and Ecology, and
- Emissions

sustainable design analysis

01 energy hierarchy

The Energy Hierarchy has five priorities, seeking to reduce energy use before meeting remaining demand by the cleanest means possible.

ENERGY CONSERVATION

The reduction or elimination of unnecessary energy use. Conservation is often achieved through behavioural changes such as switching appliances off when they are not being used. Engineering solutions such as smart meters and real-time displays all have an important role to play here.

ENERGY EFFIECIENCY

Efficiency improvements, ranging from improving the efficiency of a television through to that of a coal-fired power station, are usually achieved through the application of engineering principles. Combined Heat and Power systems fall into this category.

EXPLOITATION OF RENEWABLE + SUSTAINABLE RESOURCES

As well as resource availability, effective and sustainable energy provision must also embrace wider issues such as affordability, societal acceptability and environmental impact.

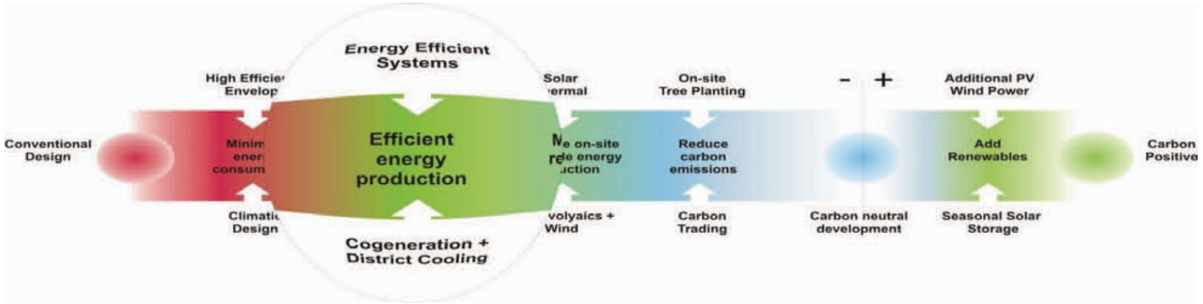
EXPLOITATION OF NON-SUSTAINABLE RESOURCES

Using low-carbon technologies. We are reliant upon finite natural resources such as oil, coal, gas and uranium that a transition to a fully renewable energy system will take time. In the interim, it would be prudent to make these more efficient and less damaging to the environment.

EXPLOITATION OF CONVENTIONAL RESOURCES

Fossil fuels are so locked into current energy systems that efforts will continue to be made to perpetuate the current approach. Oil companies look for new sources of oil and gas. Developing nations naturally favour cheap, proven, reliable sources of new energy. While these approaches may be understandable from an economic perspective, they have unsustainable local and global impacts, hence their lowly position in the Energy Hierarchy.

Adaptive Re-use and recycling of the existing building and materials will be the baseline of the ESD strategy for the proposed redevelopment of the Bankstown Town Hall, could be a low-embodied energy design, because majority of the structure is refurbished and redeveloped.



sustainable design overview

02 material salvage and reuse

As a public building, a durability-focused approach has been taken to material selection to ensure longevity, reduce maintenance and material replacement throughout the building's life cycle.

The existing building envelop offered material

Waste management strategies and recycling were adopted during demolition, construction and occupation, where a centralised collection and sorting facility was included.

Sustainable material initiatives and uses include;

Salvage of all internal timber floors, linings and structural timber members from BTH for reuse in the joinery, flooring and feature stairs of the BLaKC.

Salvage of existing precast concrete facade panels from demolished BTH Auditorium for reuse in new facades of The BLaKC

Salvage of stainless steel joinery from BTH for reuse in library sorting benches and kitchens of The BLaKC

Salvage of bespoke ceiling systems from the BTH for renovation and re-use

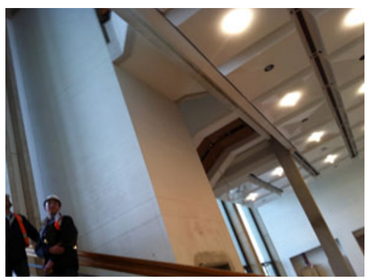
Post-tensioned structural system to reduce use of concrete;

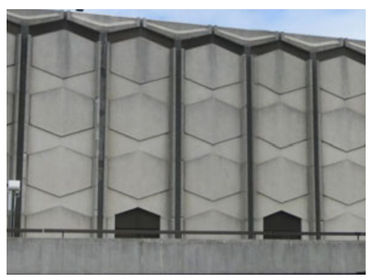
Maximised recycled content in structural concrete to minimise the embodied energy and resource depletion;

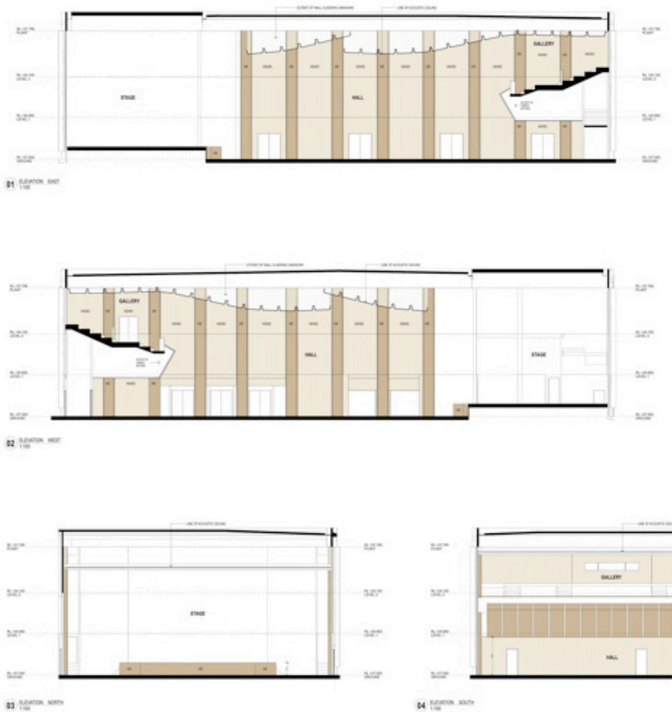
PVC minimisation through alternate materials for plumbing and electrical services;

Finishes that have low Volatile Organic Compounds (VOC) and formaldehyde content. Such as low VOC paints, carpets, adhesives, furniture and reconstituted wood products;

Timber products sourced from sustainable forests. Only reused timber products or timber that has certified environmentally responsible forest management practices was employed in the development.







sustainable design overview

03 embodied energy

Material use plays a key role in designing buildings for a high environmental outcome. For the New Bankstown Library and Knowledge Centre, the design team have evaluated the impacts and benefits of new versus reused materials, in terms of raw material extraction, embodied energy, emissions and waste disposal.

The Energy Hierarchy is a classification of energy options, prioritised to assist progress towards a more sustainable energy system. It is a similar approach to the waste hierarchy for minimising resource depletion. The highest priorities cover the prevention of unnecessary energy usage both through eliminating waste and improving energy efficiency. The sustainable production of energy resources is the next priority. Depletive and waste-producing energy generation options are the lowest priority.

For an energy system to be sustainable: the resources applied to producing the energy must be capable of lasting indefinitely; energy conversion should produce no harmful by-products, including net emissions, nor wastes which cannot be fully recycled; and it must be capable of meeting reasonable energy demands.

Unlike the typical new public building development, this project provided the opportunity to exploit the materiality of the existing building by the detailed salvage and reuse of its materials. This strategy focused on applying the clients limited resources to elements of the old building which would realise identifiable results in the “whole” of the new development.

The salvage, recycling and adaptive re-use of the existing Town Hall building and its materials was carefully considered, with a series of detailed studies undertaken to establish the optimum strategies to deliver the client performance brief, project quality objectives and budget which also offered a rare opportunity to set an example to others in how existing buildings may be redeveloped in the future.

Opportunities to reduce the adverse impact of material usage and waste disposal have been identified and successfully implemented.

This has been defined in 3 ways;

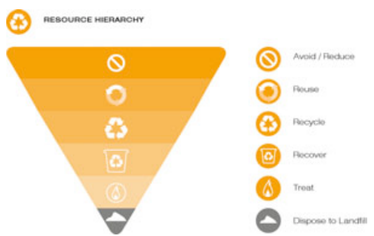
- Insitu re-used materials
- Salvage material and re-use
- repurposing existing spaces

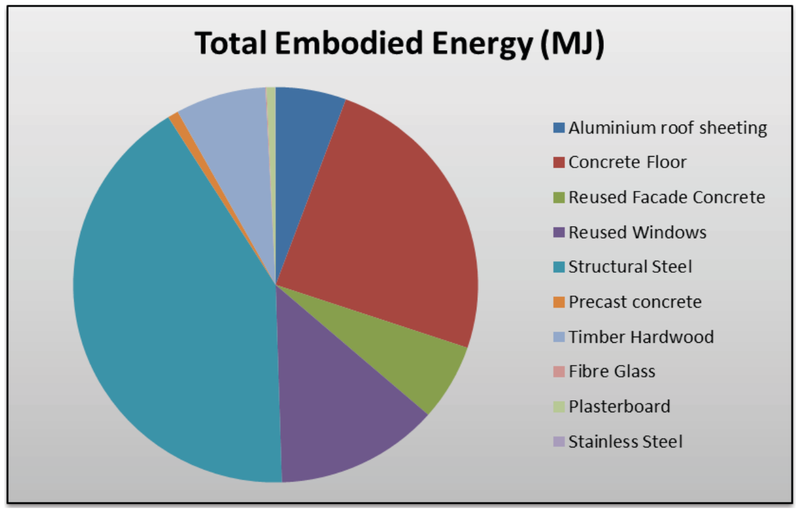
A significant quantum of materials has been diverted from the construction waste stream, by effectively implementing the traditional resource hierarchy of reduce, reuse and recycle.

On-site re-use of salvaged materials has assisted in reducing the demand for virgin materials. This strategy has assisted in minimising resource depletion, energy and emissions impacts associated with material production.

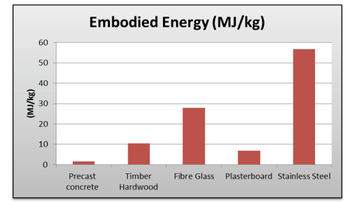
Based on energy modelling, the annual energy demand of the new building was estimated to be 265 MWh (954,000 MJ) per annum. By evaluation, it is observed that the embodied energy of the salvaged amount is almost equivalent to 15 years annual energy demand of the new Library building. Also equivalent to taking 1365 cars off the road.

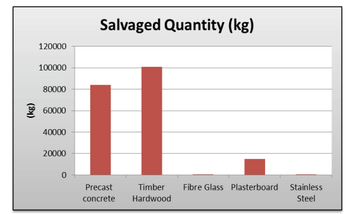
This evaluation is based on cradle-to-gate data.
This means it only considers the energy impact from extraction to factory gate. If we were to include the transportation impacts, then the energy savings would be sufficient to power the building for greater than 16 years.

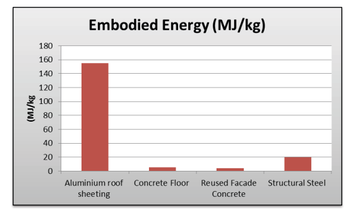


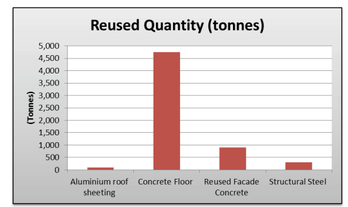


	Embodied Energy		Total Embodied Energy
Material Description	EE-MJ/kg*	Quantity (kg)	EE-MJ
Precast concrete	1.5	84,000	126,000
Timber (hardwood) 155m³	10.4	100,750	1,047,800
Fibre Glass	28	414	11,581
Plasterboard	6.75	15,000	101,250
Stainless Steel	56.7	70	3,937
Aluminium roof sheeting	155	5,280	818,400
Concrete Floor (reused)	0.75	4,740,000	3,555,000
Reused Façade (Concrete)	0.72	905,760	905,760
Reused Windows (Aluminium Frame + Glass)	3798MJ/sqm	500 sqm	1,899,305
Structural Steel	21	300,000	6,030,000
		Total Embodied Energy	**14,499,076MJ**









fjmt | francis-jones morehen thorp

sustainable design overview

04 indoor air quality

Achieving measurable increases in the quality of the Indoor Environment is a primary objective of the project. This is achieved through an integrated filtration, treatment, cooling/heating and circulation system composed of roof mounted mechanical plant, elevated outside air intakes, air purification wall using bio-filtration, Thermal Labyrinth and 7 layers of both passive and active air filtering.

Air is drawn in at the top of the building to maximise access to clean air and is then circulated downward through the thermal labyrinth for passive tempering, which is made up of a series of high thermal mass Gabions. The air then returns to the air handling units for further treatment and distribution to the displacement air plenums.

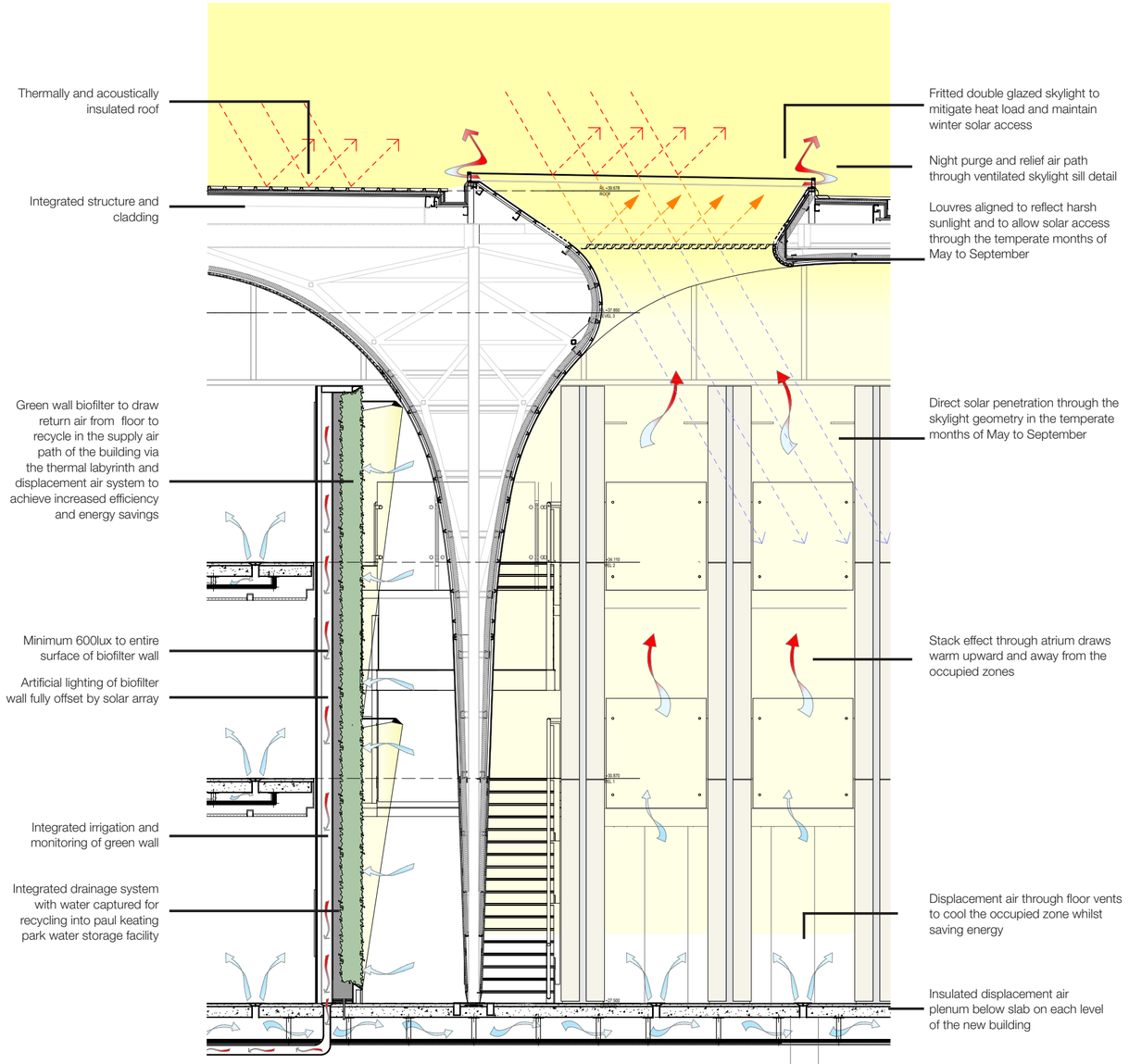
The air then returns through the air purification wall where specially selected plants help to filter the air.

Given the experimental nature of the system the BCC and Design Team have identified an opportunity to provide the industry with real time results from the project. The client and design team have committed to test various aspects of the indoor air quality over a long period of time, varying the plants and conditions to assess and quantify the benefits of such a system. The system has specifically integrated;

Air Purification Wall using plants to filter fresh air providing 150% more fresh air than is required under the relevant standards;

Thermal Labyrinth for cooling filtered fresh air using a series of high thermal mass Gabions within a disused orchestra pit in the basement;

Mixed mode displacement ventilation system, reducing the need for conditioned air by 50%.



sustainable design overview
05 green wall

Achieving measurable increases in the quality of the Indoor Environment is a primary objective of this initiative. This is achieved through an integrated filtration, treatment, cooling/heating and circulation system composed of basement mounted mechanical plant, elevated outside air intakes, “green wall” with bio-filtration with up to 6 layers of both passive and active air filtering.

Air is drawn through the green wall across its elevation from all levels of the building strata. The air is then filtered through the wall and circulated downward into the thermal labyrinth, where it is added to the outside fresh air path, filtered and tempered before being redistributed to the building via the displacement air conditioning plenums.

The return air path is concealed within the green wall to take advantage of the filtering properties of the specially selected plants, which help to filter the air, prior to its return to the system.

Given the somewhat experimental nature of this system Bankstown City Council has an opportunity to provide the industry with real time results from the project. The design team are committed to assist the client in testing various aspects of the indoor air quality over a long period of time, varying the plants and conditions to assess and quantify the benefits of such a system.

ADVANTAGES

- Increased air quality
- Increased productivity
- Visible initiative
- Internalised landscape
- User education initiative≠≠
- Part of water reuse strategy

DESIGN STRATEGY

Most green walls are vertical hydroponic systems where the plants are grown in an inert soil-less media. These systems maybe environmentally damaging as the soluble nutrients that are used to feed the plants may be released into the sewerage system with the waste water.

The key to a successful green wall installation is to make sure the right plants and watering regime is carefully chosen for each particular site and that a comprehensive maintenance plan is included. The recent developments in the green wall systems have also enabled growing vertical gardens in indoor environments. These systems run in essentially the same manner as the outdoor systems but will often require supplemental lighting.

The green wall allows a large number of plants to occupy the office environment without taking up precious space. Green walls look fantastic and with correct installation and maintenance will provide a long lasting, constantly changing work of art that brings the natural environment to what might have otherwise been a barren, uninteresting wall. Green walls can also be applied to growing herbs and leafy vegetables in nontraditional areas such as the dividing walls in apartments or courtyard walls.

MAINTENANCE

Industry input through the Green Wall specialist (Junglefy) was sought during the design development phase to ensure the successful design, buildability, operation and maintenance of the wall.

Every type of Green Roof or Green Wall system requires maintenance in some form or another. Initially for a period following the installation of the plants, and ongoing maintenance to keep the green roof/wall flourishing.

A well composed design ensuring foilage overshadowing is minimised and plant species are suitable has ensured maintenance is kept to a minimum, whilst enhancing the aesthetic impact of the system.

The wall has a fully automated irrigation system, powered via dedicated solar panels on the plant room roof.

The wall features;

- Planting Densities: 25 – 42 plants per sqm
- Light Fixtures: 16 x 70w
- Maintenance: monthly
- Water: integrated irrigation using recycled water
- Control System: INtegrated within BMCS for offsite monitoring of condition and alarms
- 80% Natural day-lighting

sustainable design overview

06 energy + water efficiency

ENERGY EFFICIENCY

The energy systems of the BlaKC have been designed to achieve significant savings in mains power requirements. This has been achieved through the use of independent energy generation, passive systems and an integrated response to the primary power draws of air-conditioning and lighting. Systems to save energy include;

- Air purification wall for passive filtering of air
- Thermal Labyrinth to passively cool and filter air
- Geothermal Cooling Bores to passively temper water and air
- Displacement Mixed-mode ventilation to maximise use of fresh air
- Photo-voltaic Array for on-site generation of power
- Double Glazed high performance facade systems
- Bespoke louvred facade designed to minimise solar gain and glare and to insulate the building from direct solar gain;
- High efficiency light fixtures and zoning systems.
- The Design Team undertook detailed energy modelling for the building which suggested the building will perform at a 30% improvement over equivalent BCA 2012 Part J requirements.

WATER EFFICIENCY

The project includes significant rainwater harvesting, storage, treatment and re-use systems by re-using existing plant where possible and water-efficient environmental control systems to significantly reduce water use. Potentially saving 2,000,000L of water per year. Systems include;

- 220,000L water storage tank integrated into green link landscaping;
- Treatment & re-use of rainwater for flushing toilets and landscape irrigation;
- Treatment & re-use of rainwater for PKP landscape irrigation;
- Water consumption is sub-metered and monitored by the Building Management Control System.
- 5A rated fixtures and electronic tap-ware.

team

Client

Bankstown City Council
City Assests, City Planning and Environment, City Services

Design Team

Francis-Jones Morehen Thorp (fjmt) Architect, Landscape Architect, Interior Architect

(Richard Francis-Jones, Jeff Morehen, Simon Barr, Laura Vallentine, Johnathon Redman, Annis Lee, Katherine Tracey, Karina Mason, Adriano Pupilli, Eric Lee, Prudence Ho, Sam Hodgkinson, Robert Asher, Zuzana Piackova, Richard Tripolone, Chris Roberts-Brewer, Matthew Todd)

Consultant Team

Steensen Varming ESD, mechanical, electrical + lift services, lighting design

Arup facade + fire engineering

Taylor Thomson Whitting structural + civil engineering

Warren Smith and Partners hydraulic + fire services engineering

Acoustic Studio acoustic engineer

Accessibility Solutions accessibility solutions

Group DLA BCA consultant

Project Statistics

Start Dates	Design commenced July 2010 DA approved March 2011 Construction commenced August 2012
Completion Date	Construction completed in March 2014
Value ($AUD)	$21,000,000 ($2,900/sqm)
GFA (m2)	7,235sqm

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