

1 Blich Street

MAIN CONSTRUCTION COMPANY : Grocon
CLIENT : DEXUS Property Group, DEXUS
Wholesale Property Fund & Cbus Property
COMPLETION : July 2011
SURVEYOR : WT Partnership
ARCHITECTS : Architectus Sydney, Ingenhoven
PROJECT END VALUE : \$270 Million

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GROCON'S GREAT LEAP FORWARD

Nothing like Six Star Green Star project 1 Blich Street has ever been constructed before in Australia. With the extraordinary level of innovation in design, materials and methods, bringing it all to completion for the client, DEXUS Property Group, was an ongoing series of challenges for Grocon and its team.

A major advance in information technology (IT) was key to completing the vision. Custom designed Building Information Management (BIM) software was created for DEXUS by Autodesk, which provided detailed 3D modelling of every aspect of the building, including structure, facade and building services. This gave Grocon a complete and incredibly detailed overall picture of the project, allowing all buildability issues to be resolved before construction commenced, so Grocon and its team could focus their talents on facing the series of challenges ahead.

The BIM also integrated with the site's ACONEX construction communications, was the platform for collation of O&M data, and forms the basis for the whole project's cutting edge BIM system, with an open network communication protocol established via an optic fibre loop throughout the entire building.

"The ongoing complexity of 1 Blich Street was very challenging - we didn't have any easy stages," said Grocon Project Manager, Bruce Jones.

"Exposure to weather was an issue because of the open atrium, the complexity of the roof and the detailing of the roof level. That stage was very slow, as the weather was a constant challenge. Some rectification and rescheduling was required, so we were sometimes undertaking works out of sequence. At one stage there was a backlog of works around the atrium, but it was unavoidable due to safety issues.

"We were at one stage working 24 hour days, five days a week, and moved to seven day weeks closer to completion to mitigate those time pressures caused by weather affecting the program."

At the peak of works, Grocon had up to 150 direct staff on site, including supervisory staff, formworkers, construction staff and labourers. A team of 15 different engineering consultants was on the consultant team, and approximately 80 different subcontractors worked on site, with a peak of 675 persons in the combined daily workforce. Almost two million man hours have been worked to turn the design into reality.

1 Blich Street's unique double skinned facade design was developed further by Grocon into a working facade system, with Grocon having considerable input into the final design specifications for the facade manufacturer. The outside skin of curtain wall was constructed first, then the inner skin of window wall, with the void between the two holding a total of 18,000 venetian blinds for solar glare control. Where normally one subcontractor works the building perimeter, Grocon had three to coordinate – the facade contractor, the waterproofer and the blinds contractor.

The level of detail in this project is intense: where generally a facade system might use around 40 dies, 1 Blich Street's double skin facade system had more than 100 dies for the aluminium profiles.

"It was extraordinarily difficult as Project Manager, keeping track of all the materials and details and the levels of on-shore procurement

and offshore procurement. This project was highly bespoke, there was nothing standard," said Bruce Jones.

"1 Blich Street is another milestone for Grocon, and takes our construction abilities in high rise to a new level. This is the most complicated project we have ever built and it has been built to a very high standard.

"The best achievement for us has been reaching our sustainability goals, while also achieving the design outcomes. This project has scored five out of five innovation points for Green Star, which is very impressive."

Two of the key sustainability innovations are the tri-generation plant and the blackwater treatment system. The tri-generation plant includes solar tubes on the roof, which boost the efficiency of the HVAC system chillers. These will be fully commissioned next summer, and a complete set of seasonal data put into the Building Management System.

The blackwater treatment system forms part of the project's water efficiencies and incorporates eventual harvesting of the CBD sewerage system. This system will also be commissioned post-construction, so the full building sewerage load can be assessed and the blackwater plant seeded with treatment agents. The sewerage harvesting requires an extensive assessment and approval process, including independent building auditing, assessment by IPART and formal Ministerial approval from the New South Wales Government.

Other aspects of construction which scored Green Star points included the exclusive use of FSC Certified timbers; all low VOC paints, floorcoverings, glues, varnishes and fixatives; and an incredibly effective site waste management program which saw over 93 per cent of construction waste, approximately 40,000 tonnes, recycled.

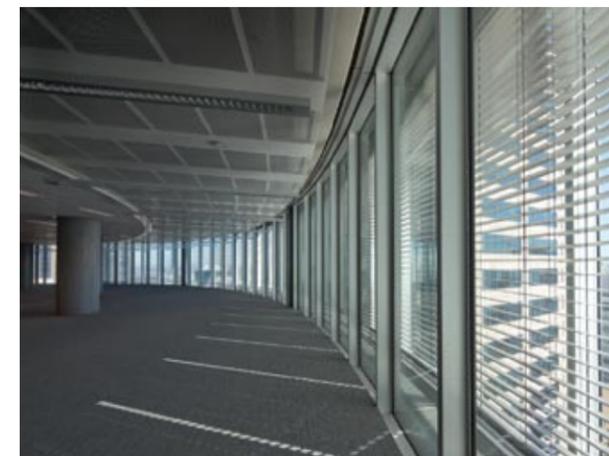
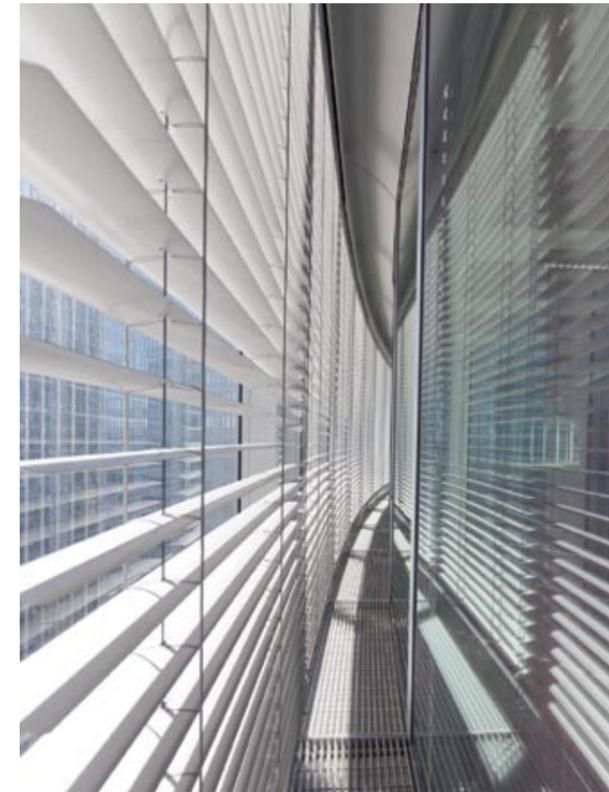
"It was our task to convert the design by Ingenhoven and Architectus into reality, and DEXUS is delighted with the result," said Bruce Jones.

Grocon is currently nearing the end of another very special Sydney project, Common Ground at Camperdown, an environmentally sustainable, affordable housing project to benefit some of Sydney's long term homeless. The company is also currently constructing an office tower at 161 Castlereagh Street.



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In constructing Australia's first double skin ventilated facade tower at 1 Bligh, achieving the Six Green Star outcome, DEXUS and Grocon envisaged thermal and energy efficiency as the key requirements. An integral part of the solution is a leading edge solar control system designed and manufactured by Horiso, which gives the building's skin an ability to dynamically and automatically respond to external conditions.

In their design for 1 Bligh, Architects Ingenhoven and Architectus specified venetian blinds which could provide complete control of sun glare and reduction of thermal load, while still allowing the sweeping views and high natural light levels which make the column free interior spaces of each floor so distinctive. The blinds designed and manufactured by Horiso respond to the exact position of the sun throughout the day, and also facilitate natural airflow through the ventilated facade.

1,774 motorised 80 mm external venetian blind systems are integrated within the custom design ventilated double skin facade, controlled by an advanced system consistent with the unique circular design of the building. The blinds operate automatically within the outer and inner cavities of the ventilated facade.

Horiso's control system for the blinds is based on an intelligent motor controller pre-programmed with all the building's control requirements – including both the geographical location and physical orientation of the building's circular shape. It will operate in conjunction with sun-tracking software that enables individual blinds to react to the variations of the sun's angle of incidence throughout the year. In addition, the blinds will also react to external light levels. This ensures that the blinds are always at their optimum tilt position to meet the client's light penetration and glare control requirements.

The design of the blind pelmets allows airflow from the back of the blind to travel over the custom-curved head section. Airflow between the double layers of glass will assist in maintaining a constant average temperature within the building, dramatically reducing the reliance on HVAC systems to maintain a comfortable working environment.

"The focus is on maximum natural light all year round with performance glazing for controlled admission of natural light into a space through windows to reduce or eliminate electric lighting. To provide a direct link to the dynamic and perpetually evolving patterns of outdoor illumination, 'daylighting' helps create a visually stimulating and productive environment for building occupants while reducing as much as one-third of total building energy costs. It is not merely a mood but the physical effect of wellbeing and calm restored by the effects of being in harmony with the elements," said Horiso General Manager, Bruno Seguin.

"The impetus driving facade innovation is solar control technology. The key objective is to maximise the use of natural daylight without the problems of glare or excessive solar heat gain to optimise the occupants' wellbeing and comfort. This is underpinned by energy saving efficiencies that make environmental as well as economical sense."

"The future path of facade innovation leads to three ground-breaking areas set to become world-class practices in commercial projects: the double skin ventilated facade with external operable and retractable venetian blinds; the double skin ventilated facade with split control external venetian blinds; and the high Visual Light Transmittance glazing facade with a combination of specialty internal shading systems."

Horiso's state of the art integrated technology solar control systems have also recently been installed in two other world-leading Six Green Star projects, the Christchurch Civic Centre and Darling Quarter in Sydney's Darling Park. Their talents are also highly appreciated offshore, with the company working collaboratively on major projects in Europe, North America and Asia.

An Australian owned manufacturer of solar control systems and specialty blinds since 1995, Horiso® creates internal and external solar control solutions for the commercial, hospitality, institutional, and residential sectors. The company's focus is on research, development and manufacture - creating innovative products which can achieve Green Star outcomes and meet any architectural, design and engineering requirement.

ESD EXPERTS GUIDE Blich STREET TRAIL BLAZERS

From the earliest construction stages through to the final commissioning and handover, Norman Disney & Young (NDY) have played a crucial part in ensuring 1 Blich Street lives up to its Six Green Star Office Design V2 rating, and achieves a Six Green Star Office As Built V2 rating. To ensure the applicable credits are identified for the As Built submission, NDY have been engaged as Green Star Expert for the project, to monitor the construction and commissioning phases.

As NDY are committed to adding value for clients, they extended this brief to include firstly carrying out a Peer Review of the assessment of all the Green Star credits compiled by the Green Star Consultant and the Builder's Green Star Representative. Secondly NDY, in association with Grocon, was instrumental in obtaining clarifications from the Green Building Council of Australia (GBCA) on Green Star credits related to categories such as Integrated Fit-out, Shell & Core and Innovations.

Finally, the Green Star expert role includes presentation of a status report to the Project Control Group every quarter. This report is based on a unique Green Evaluation Matrix (GEM) tool developed by NDY. This tool highlights and identifies the status of each Green Star credit point, via a colour coded matrix. Values are assigned for criteria including Design Submission Applicability; As Built Submission Document Status; As Built Documentation Peer Review; and Confidence Rating, which is the expert opinion on achievability based on factors including previous experience.

Once all the evaluations for a credit have been entered, the GEM tool assigns an overall achievability level which is then compiled into the regular quarterly reports.

"The ultimate aim is to have all the credits as dark green coloured points with an average of 9 or 10 in the Achievability Column," explained NDY Director, Richard Pickering.

"A role such as this is a new concept where an independent opinion is sought for work carried out by other professionals in their own rights. There are challenges with any such unusual involvement, which emerge from time to time, and diminish as the role is more defined and accepted by all parties. Then the challenges turn towards some of the common issues such as obtaining clarifications from the Green Building Council. As a result of a high level of cooperation from the Green Building Council these challenges too are being overcome with a positive spirit of cooperation.

"NDY is proud of the opportunity to be part of one of the most exciting and innovative buildings in Australia, and part of a team that is aiming to deliver a truly sustainable building."

On behalf of DEXUS, NDY were also engaged as the Independent Commissioning Agent for the 1 Blich Street project. This role is primarily focused on achieving the level of commissioning and testing required to prove that the services systems are performing as designed, and by doing this, credits are achieved as detailed within Green Star v2 Office Design. With so many innovations such as on-site blackwater harvesting and treatment, cogeneration, a large naturally ventilated internal atrium and underfloor heating in the project, NDY's specialist expertise is invaluable. NDY's holistic approach to the commissioning of Blich Street's building systems ensures that the innovative technologies are integrally commissioned alongside more traditional systems to maximise the effectiveness of these innovative features.

There are also additional commissioning services being carried out by NDY, including reviewing the design and contractor design documentation for commissionability aspects; creating a commissioning plan; directing and coordinating the commissioning process; providing input and feedback on the contractors' commissioning methodologies and commissioning manuals; and regular site witnessing of the commissioning of systems.

NDY's commissioning agents and managers are all members of the Commissioning Specialists Association (CSA) in the United Kingdom. The CSA are involved in educating and promoting the importance of comprehensive and methodical commissioning and are affiliated with the Chartered Institute of Building Services Engineers (CIBSE). Neil Caswell - who leads the Commissioning Management Team nationally for NDY is a Fellow of the CSA and is also a member of the Building Commissioning Association (BCA) in the USA.

Neil has also been instrumental in adapting CIBSE and BSRIA standards for use in the Australian market, and is currently on the AIRAH committee which has developed an Australian guideline for building commissioning.

"One of the great tests for a building such as this is to ensure that the technology that has been incorporated performs to its capabilities and is integrated with the other facets of the building. Thorough commissioning and careful management of this process is one of the key means of ensuring these outcomes," said Neil. "Established commissioning procedures must be adapted to suit alternative developing technologies to see that these systems are adequately tested and demonstrated to perform. NDY is developing as a preferred consultant in the field of commissioning management and our association with major prestigious projects such as 1 Blich Street will help us to lead the construction industry into this new market."

NDY has been engaged as the ICA or commissioning managers on a number of other recent high profile projects including 420 George Street, UTS Broadway, Alan Woods Building (Canberra), Darling Quarter, Goods Shed North Melbourne and fitouts for State Street and CBA.

"An environmentally responsible and commercially viable outcome has been the underpinning ethos of each assignment that NDY has undertaken since its inception in 1959. Conservation and optimization of finite resources such as water, energy and materials continue to remain a major commitment of all our services," said Richard Pickering. "One of the most tangible demonstrations of NDY's commitment to ESD is our own Offices at 115 Batman Street, Melbourne. This ex factory building was recently re-developed by NDY, incorporating a number of leading design features, and has recently achieved the Green Star trifecta, being awarded 5 Star ratings for the Design, As Built and Tenancy fitout."

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CHALLENGING COLUMNS MADE EZY-AS

EzyTube's role in the 1 Bligh Street project kept on growing in both directions: from an initial assignment to solve buildability issues in the foyer with their innovative trademarked column forming tubes, they were then asked to provide further solutions in the basement levels, and column forms for all the upper levels. The brilliant outcome produced is proof they make both the world's simplest column forming tube, and also the most adaptable one. The building's foyer features an impressive and complex shaped concrete ceiling, supported by 9 large oval shaped columns towering 16-18 metres in height. To produce these structures with a clean off-form finish, EzyTube customised the tubes to the exact dimensions required. Everyone was so impressed by the outcome, EzyTube also provided a range of shapes for the basement levels, including large rectangular columns with rounded ends, rectangular columns and large feature columns.

"We manufactured the tubes to order to allow the concreters to cast the shapes, and to meet the high quality requirement for surface finish. For the four basement levels, we trialled an oval column, and tried out different liners for the architect," explained EzyTube Managing Director and Co-Founder, Kevin Adams. "The footings of the big feature columns were going to be sloped to accommodate the stairs. Normally they are flat, and these were very uneven. There were a number of technical issues to resolve, and a lot of development on the run, as we adapted the product to meet what was required on site, working as late as necessary to meet the program."

Further technical developments arose as a smooth off form finish was required on the underside of the first floor concrete slab as this was visible within the impressive ground floor level. A new product, EzyTube Liner System, was invented in order to produce the special shapes and surface finish the architect wanted for the range of exposed concrete surfaces. Various different materials were trialled to establish a liner which could be used between the poured concrete and the ply formwork without either buckling, expanding or contracting.

For the 28 upper levels, each featuring 12 large diameter columns, a new process was used. Column forms up to 1.75 metre diameter were poured using a new, larger diameter EzyTube product for round columns. The tubes were designed for one pour up to 8 metres per column, before the insertion of a join and a second pour to complete each column to full length. As new generation Green star concrete was being used, there were fresh technical issues to consider in terms of the greater wetness and increased pressure applied on the tubes by modified concrete mixes using recycled aggregate.

For many projects, EzyTube simply deliver the products to site, but for 1 Bligh there was a constant presence, including daily site visits by EzyTube's other Director and Co-Founder, Mariano Villaescusa, to survey pours and liaise closely with all on site. It was a great credit to Mariano and our team of up to six EzyTube workers to work closely with the builder, architect and formworkers to ensure all technical matters were promptly addressed, and the demanding construction program deadlines were met on time for the duration of the project.

The ongoing consultation throughout the entire project between Bruce Jones, Mark Savolainen and the formwork team at Grocon, Mark Curzon of Architectus Sydney, and Mariano Villaescusa of EzyTube, was critical to achieving the successful completion of this project with truly world first, Australian developed technologies. EzyTube is extremely grateful to Grocon for their support and confidence in EzyTube's ability to achieve these demanding outcomes.

Many other major projects have incorporated EzyTube's innovative products, such as the Top Ryde Shopping Centre, where Bovis LendLease utilised another new technology, the Multi, which allows for multiple columns poured together with expansion joints between. The new ATP-7 Building at Everleigh in Sydney has as a major structural element being an arcade of 11m high sloping columns which were cast in EzyTube's and feature a perfect, gleaming, off-form finish. A special external support system was developed for the sloped columns on the job, and custom cut foam inserts used to create the capitals at the top of each column.

The EzyTube systems are always developed to be as environmentally friendly as possible – The custom shaped designs utilise high density polystyrene foam inserts incorporated into the round outer EzyTube form. The foam inserts are designed to be re-used many times before being recycled at the end of their useful life. The design possibilities are endless, with any shape made possible by computer aided cutting and a solid technical team including consulting engineers. The standard range includes squares, rectangles, round columns, multiple tubes.

Other major projects include Charlestown Shopping Centre in Newcastle; and the Sydney Airport extension for Bovis, where EzyTube's provided enhanced speed and safety for the single pour 8m high columns. In Brisbane, Energex HQ and the Waterside Project both used their products; in Melbourne the extension to the Melbourne Airport carpark; and in the ACT, Bovis' Section 84 project literally saw the whole works program speed up through the use of a reusable square tube system for the 10 story, 30 pour project.

"Our company is growing rapidly across most states in Australia through new and innovative ways of doing things. We specialise in offering solutions for anything connected with column forms on any size project; solutions which offer both the form and the finish everyone on the specific project wants. Safety, timing and quality are our priorities," said Kevin, who has a background in industrial chemistry, with extensive experience in polyurethane and polystyrene foams, various industrial coatings and plastic technologies.

"We are offering innovations like our Ezy-Strip tape, which is a fibreglass tape system which allows fast and safe stripping from the ground level for round or square tube systems. Our product is lightweight and very strong, and because the outside of the tube takes the stress, the inside can be cut for any shape, without the tube needing additional bracing. We have a flat pack system, a re-useable shaped tube system, and our custom tube system. One project has found we saved them \$16,000 a day on formwork through improved onsite logistics; we also provide the means for engineers and architects to design things that otherwise might not appear do-able."

Multiple worldwide Patents are held or pending for EzyTube's range of products, and the company aims to finalise licensing arrangements for local supply to all major international construction markets by 2012.

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GOVERNOR BLIGH WOULD APPROVE

1 Bligh Street will create a new Australian benchmark for a sustainable commercial building. It will offer an innovative office environment that changes the way people work and engage with a commercial space.

Davis Langdon's Specification and Building Surveying consultancies formed an integral part of the Bligh Street project design and construction team.

Whether it was through the development of new compliance strategies, key stakeholder management and an energy rating that will be in excess of BCA requirements, we're proud to have played our part in the creation of a new Sydney icon.

For more information, please contact
Brett Clabburn – Technical Director or
William Hamlyn-Harris – Associate Director +61 2 8934 0000

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STRUCTURAL ELEGANCE AT BLIGH STREET

enstruct is a specialist structural and civil engineering consultancy working in both the government and private sectors delivering building projects throughout Australia.

Formed in 2000, we proudly point to landmark building projects we have delivered.

- 1 Bligh Street Office Tower, Sydney
- 100 Mount Street Office Tower, North Sydney
- Parramatta Justice Precinct, Parramatta
- Coles Myer Distribution Centre, Eastern Creek, Sydney
- Macquarie Teaching Hospital, Macquarie University
- College of Fine Arts, University of New South Wales
- Darwin Waterfront Residential Development, Darwin
- 140 North Terrace Residential Towers, Adelaide
- Brisbane Square Office Tower, Brisbane
- Trio Residential Towers, Camperdown, Sydney
- Optus Headquarters Building, North Ryde

enstruct has played a key role throughout the life of the 1 Bligh Street Project :

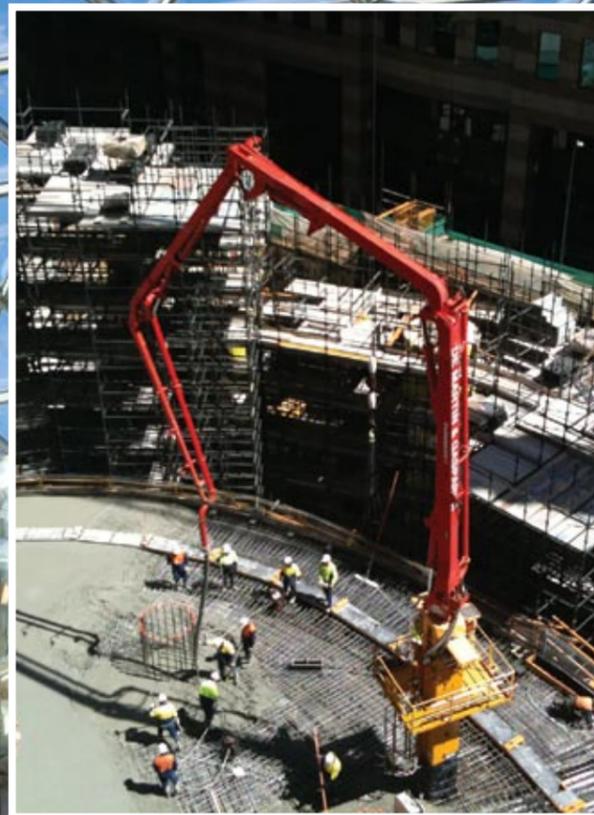
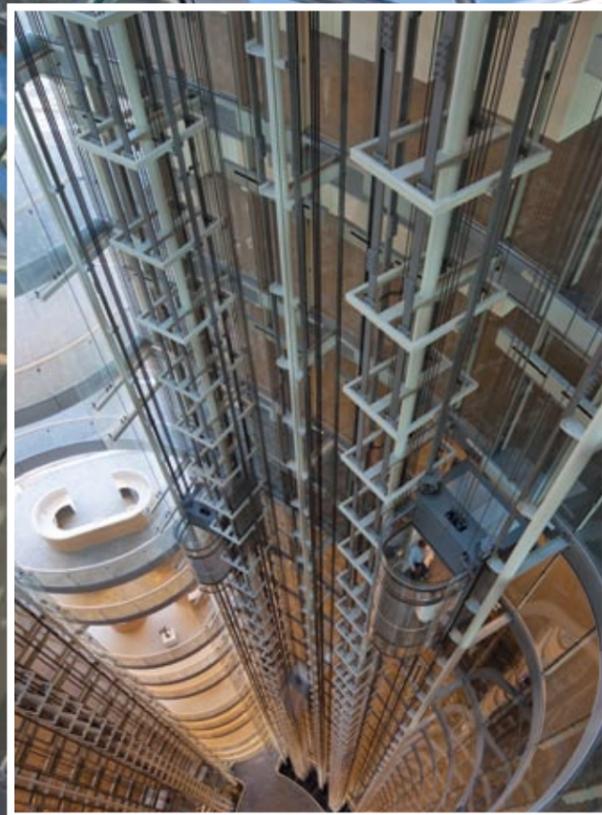
- July 2005 assisting Architectus with Stage 1 DA.
- May 2006 assisting successful Architectus / Ingenhoven Design Competition Bid.
- February 2007 preparing Stage 2 DA and Tender Documentation.
- January 2008 novation to the contractor, to complete design and construction phase services.
- June 2011 practical completion of both design and construction phase commission.

1 Bligh Street, Sydney sets a benchmark for commercial office tower design and has advanced the science of our industry :

- Environmentally sustainable design.
- Commercial office space planning.
- Building Information Modelling.
- Long span floor plate construction.

Enstruct is proud to have been part of a very committed and talented consulting team working under the capable leadership of the building owner Dexus.

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OTIS' EXPERTISE CLEAR TO SEE

In supplying and installing their products for 1 Bligh Street, Otis Elevator Company needed to apply an extraordinary level of engineering ingenuity at every stage, from design through to the extremely challenging installation process.

Two years of preconstruction work including design and development went into the project, followed by sixteen months of onsite works. One of the major issues was the building itself, with the vast amount of glass used in the external facade and inner atrium, and the curved shape of the elevator shaft within the curved atrium void. The lift shafts are fully exposed, and the machine room walls, floors and ceilings are also all glass, so all componentry is visible. Otis' ability to deliver high quality installations was a key factor in gaining this contract.

Some of the unique features of the products designed by Otis for 1 Bligh Street included custom designed colour backed glass clad entrances to suit curved shaft; custom designed glass atrium entrances that are cantilevered into the Atrium; fully customised glass elevator cars; and the development of atrium jump platforms to provide a safe working environment, and working platforms to achieve an efficient installation. Otis provided full 3D computer aided design, which was then imported into the final digital BIM building model.

With the high Green Star aspirations of this project, Otis applied best practice ESD to the design of their products, with features including use of recycled materials; a regenerative drive which allows for lower energy usage during operation; use of certified plantation renewable timber for construction; low VOC solvents and paints; LED lights; and incorporating a stand-by mode for all elevators to reduce energy consumption.

For the installation team, handling and working with glass structural elements presented a unique challenge in work practices and techniques, also the open shaft design meant site-specific safe working practices had to be developed and strictly adhered to. Fully pre-assembled elevator cars and entrances had to be lowered through the atrium, and Otis worked closely with the Atrium steel shaft fabricator to develop the technique to allow the elevator rails to be installed off site into structural steel modules which were then installed on site.

Grocon had a tight installation program which was made even more challenging by the number of trades working concurrently in an open atrium, yet despite these challenges Otis was able to exceed expectations. The Otis team included a Project Manager, a team of ten engineers for design, electrical and mechanical aspects; logistics staff; and a team of 26 onsite installation mechanics. "As a global company, we drew on experience from our affiliates in Hong Kong, China, Japan, NZ, Spain and the USA," said Product Manager, George Petropoulos. "We have the engineering expertise and experience to handle complex designs, the project management to deliver on time, and the product capability this project needed. Working closely with the Grocon project team led by Bruce Jones to ensure the best results possible."

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GIVING 1 Blich GREEN STAR BONES

One of the most respected names in the construction industry gave 1 Bligh Street a strong, green superstructure. De Martin and Gasparini were contracted for the supply, pumping, placement and finishing of all the structural and architectural concrete, amounting to an estimated 32,000m³ of high strength, high performance concrete mixes, all of which had to achieve the maximum three Green Star Credit points under AGR Mat-5.

Among the other challenges, the high profile project and location made excellent logistics critical for coordination of the concrete supply. The structure itself required DMG use an innovative approach to complete the task, which called for an off-form concrete Class 2 finish to the lift cores and columns throughout.

"Concrete placement to the two low and high rise lift cores was achieved using two 21 metre stationary booms fixed to a structural steel portal mounted on formwork jumpform system," explained DMG Construction Manager Nicholas Cal. "Required surface finish was achieved using a series of strategically placed external form vibrators."

"Concrete placing to the tower columns and slabs utilised a 24 metre tower boom. The tower boom was engineered to be erected from base footing to Level 5 with over 50m of tower sections prior to self climbing in order to clear the Level 1 atrium and avoid costly back-propping of the structure.

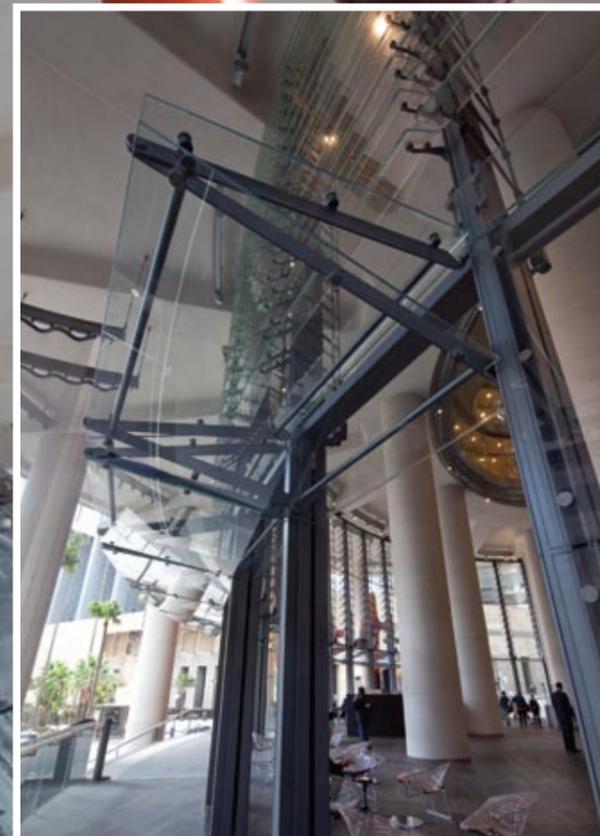
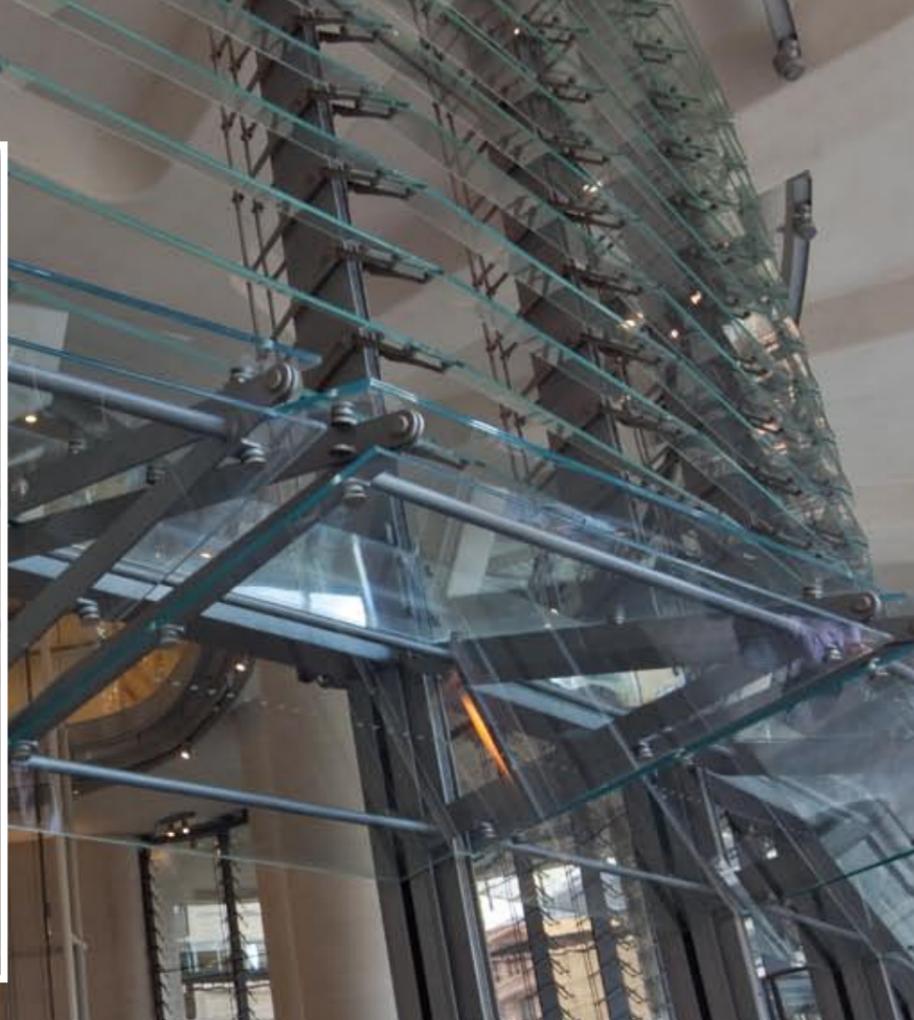
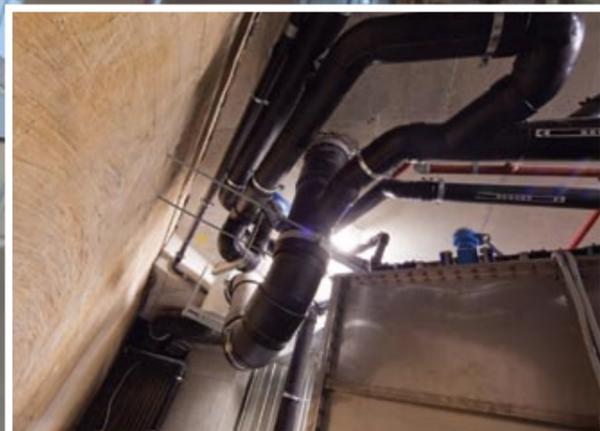
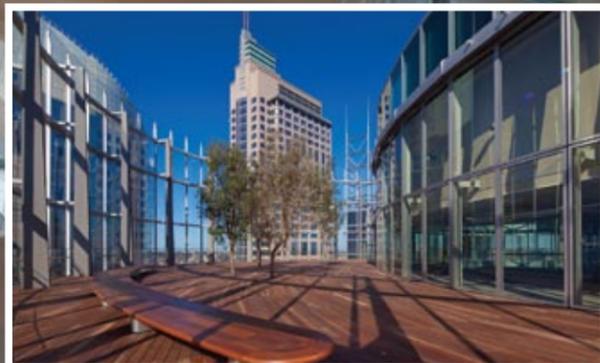
"There were engineering implications associated with installation of a double skin glass facade and its interaction with the reinforced concrete structure, issues such as long term deflection and differential settlement

between the cores and columns. Working closely with our concrete supplier, we undertook significant research, development and testing of concrete properties – strength, shrinkage, creep, modulus of elasticity – associated with Green Star mixes in order to assess long term performance."

With over 60 years in the construction industry, DMG have undertaken supply, placement and finishing of structural, architectural or decorative concrete for projects across the development spectrum. They also provide complete structural packages involving formwork and reinforcement, and as part of Boral Limited, can draw on expertise and products from across the Boral group to deliver complete structural solutions for projects. Having a workforce of almost 200 experienced people allows DMG to allocate crews flexibly to meet the timeframes of multiple major projects concurrently.

Other current major DMG projects include the Westfield Centrepoint Redevelopment, 161 Castlereagh Street in the Sydney CBD, Darling Walk Darling Harbour, Ikea Tempe, 'The Residence' Apartments Hyde Park and One Central Park at Broadway.

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THE BEST CHOICE IN WATER WORKS

As Sydney Water accredited experts in water and sewer infrastructure, Rose Atkins Rimmer Infrastructure (RARI) were the best choice for the design and implementation of 1 Bligh Street's innovative sewer mining system. RARI developed a unique design for the sewer mining offtake from the Sydney Water sewer maintenance hole located in O'Connell St, which directs flows from the sewer into the building's wastewater treatment plant located in the basement. RARI also obtained Sydney water approval for the design, coordinated the construction of the offtake and obtained final approval of the construction by Sydney Water.

Challenges included resolving how to maintain flow in the sewer during construction. This required RARI to prepare a detailed flow management plan including hazard identification and risk assessment for approval by Sydney Water. Additionally, they had to consider how to construct a 5 meter deep pipeline across busy O'Connell St and not disturb the myriad of existing services in the street. The access to the worksite itself was difficult, with the deep maintenance hole located in the roadway. For this reason, all construction work was carried out at night when both traffic and sewerage flows were at their lowest levels.

The pipeline from the Sydney Water Sewer to 1 Bligh's wastewater plant was constructed by underboring the road from inside the maintenance hole, then through the basement wall. The construction of the offtake was carried out by Glenmore Park Plumbing and Drainage who worked closely with RARI to achieve the successful outcome for Grocon, DEXUS and Sydney Water.

RARI has been in business for over a decade, providing clients from the public and private sectors with professional water and sewer related

design and management services including Section 73 Certificate Applications; Water and Sewer Infrastructure Design; Water and Sewer Project Coordination; Building Applications; and Asset Protection Reports (Pegouts). "RARI has enjoyed the challenges presented by this project. We are accredited by Sydney Water for all aspects of water and sewer design and construction certification as well as being licensed by Sydney Water as a Water Servicing Coordinator," said RARI Managing Director, Steve Rimmer, who represents all of the infrastructure designers accredited by Sydney Water on Sydney Water's Quality Council.

RARI operates across Sydney, the Illawarra and the Blue Mountains regions. Other current major projects include the Southern Sydney Freight Line project for Australian Rail Track Corporation; Great Western Highway upgrade in the Blue Mountains for RTA; Lend Lease's Jordan Springs residential development in western Sydney; and Oran Park Town residential estate in south western Sydney for Landcom/Greenfields Developments. The company is SAI Global Quality Accredited to ISO 9001, with a quality management system tailored to ensure client requirements are dependably satisfied through effective planning, uniform approaches to critical work processes and verification of compliance prior to release of jobs.

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BRILLIANT RESULTS BY SHARVAIN

Soaring skywards at the heart of 1 Bligh Street, the 30 level full length naturally ventilated atrium glazing is a spectacular showcase of the design, engineering and fabrication talents of Sharvain Projects.

Sharvain projects are the specialists in delivering results for innovative and challenging designs, offering an integrated service for curtain walls, complex specialised glazing, steel supported canopies, composite cladding and internal curtain walls.

The Sharvain Group's talented design and management team based at the company's head office in Alexandria, Sydney and Hong Kong has provided design and construct solutions for specialized glazing and façade projects across a wide range of market segments.

Fabrication is undertaken at the company's workshops in Dee Why, Silverwater, Brookvale and at a fabrication base in China. These facilities have the capacity to deliver more than 18,000m² of glazing and cladding for multiple concurrent projects per year, to the highest standards of quality and performance. The Sharvain Facades division of the group also manufactures and distributes components and architectural hardware.

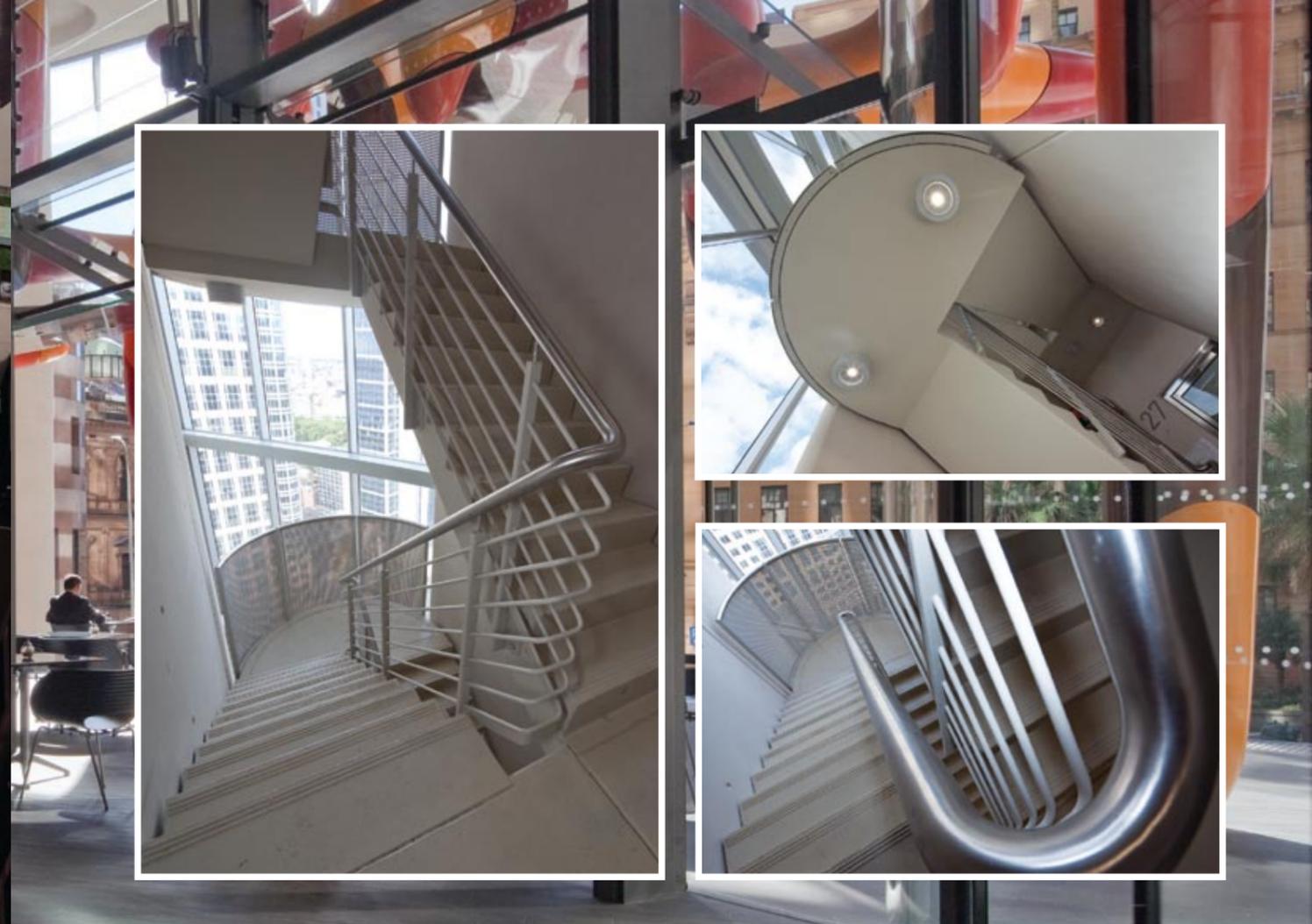
A company's clients are a testament to their abilities, and Sharvain's clients have included Abi Group, Grocon, BHPL, Leighton Contractors, Multiplex, Loral, Buildcorp and Baulderstone. In 2006/2007 Sharvain Projects completed work for 126 Phillip Street, Rhodes Commercial Development, Optus Centre Court, Qantas' Terminal 1 New A380 Departure Hall, Latitude East and the CTI, Pacific Square and SACL Car Park and Sydney international airport. Between 2008 and late 2010

Sharvain also completed Sydney University - Law building, KSW Site 1 - Macquarie Bank Project, Darling Island Stage 3 - Google building, The Totem Development and the Dixon glazing project and Long Bay Gaol project. The excellence of Sharvain's abilities has also been with a short listing in the Architectural and Engineering Innovation Awards for their work on Westpac Place Tenant Staircase. This steel and glass staircase links 27 floors of the Kent Street Tower, and displays beauty and innovation in both design and execution.

In 2011 Sharvain completed Energy Australia, Chatswood Civic Place and 1 Bligh Street. Current projects include The Kinghorn Cancer Centre, Project Star and Shell Harbour.

Sharvain provides their innovative and creative design outcomes in a manner which gives clients a single point of contact for services from early design stages through to final installation on site by Sharvain's highly skilled and safety conscious teams. This integrated service also benefits builders by enabling the company to program work stages to meet demanding timeframes, streamlining the process and avoiding potential delays. Their results, as seen at 1 Bligh Street, are sheer genius.

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COXGOMYL - WORLDWIDE LEADERS

You may be impressed by Grocon's new office tower at No.1 Bligh Street in Sydney, and you may have even spotted a cradle halfway down the side of the facade with two facade installers fitting a window during construction. But what was holding those guys up there?

The CoxGomyl Building Maintenance Unit (BMU), mounted to a lower roof slab, provides its operators with hands-on access to all of the tower facades.

The Materials Hoist incorporated into its design lets them pick and position glass panels or other materials to or from the facade and roof areas. Should a window break, using the Materials Hoist on the BMU to replace it is much safer, faster and cheaper than using a temporary suspension rig, and eliminates the need to carry glass through the offices.

But perhaps this machine's best features are its telescoping jib and pedestal. The machine can 'shrink' into a small area for parking out of sight from nearby office towers and the public roof area.

The BMU is a fully-integrated part of the building design, tailor made to match the architect's intent. CoxGomyl specialise in providing such solutions to facade access challenges.

The 1 Bligh St BMU was designed and built in Melbourne, to the strict Australian Standards, but CoxGomyl is a global organisation.

They can manufacture, supply and install the complete range of equipment, from something as simple as a Fall-Arrest system, right up to a complete, custom solution package, and everything in between.

Their equipment is used to clean the Burj Khalifa tower in Dubai (828 metres), for example.

Check out their website, at www.coxgomyl.com to see their standard range, and more of their innovative solutions. Give them a call to see how they can help you with your project.



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CREATIVE PRE-CAST CAN-DO

There's been few multi-storey projects as customised as 1 Bligh Street. Multiple curves of the structure meant Waeger Group needed to apply their engineering and design skills to precast stairs and landings for the fire stairs and various other items.

Using a Green Star approved concrete mix in keeping with the high ESD aspirations of the project, Waeger Group supplied their products over a 14 month time frame, responsively scheduling design, casting and delivery according to the requirements of the site works program.

Along with the curvature of the building, the various stair flight configurations were challenging.

"We utilised our adjustable stair mould, which allows us to accommodate the various different rise and run configurations of the stairs needed for this project," said Waeger Group Project Manager, Michael Waeger. "Our company specialises in custom precasting of many different items, ranging from small landscaping / architectural products to large structural members. Our approach is to be flexible to meet the client's requirements, working in collaboration with the clients to overcome problems which may arise."

Waeger Group have been in business since 1987, and have been designing and supplying precast concrete items since the 1990s. In addition to building projects and architectural features, the company also undertakes design and construct bridgeworks, and has completed projects across both civil and building construction across New South Wales.

The workforce of over 25 people includes two Engineers, a full time Precast Manager, full time QA officer and full time Drafts person, experienced tradespeople and skilled labour. Waeger Group also has a reliable network of experienced subcontractors to supply supplementary services when required. The company's workshop equipment includes 50t and 10t capacity overhead cranes; 20tonne, 5t and 3t forklifts; and 8t & 6t Chamberlain yard crane. This ensures large structural elements such as precast bridge beams can be effectively handled.

1 Bligh Street is another example of how Waeger Group's skills and experience can precast concrete elements for highly unique and creative project designs. This inspired approach was also shown in their design and construction work on the Red Bluff Boardwalk on Lake Macquarie for Lake Macquarie Council, and the supply of precast items for the landscaping surrounding the new Commonwealth Bank Headquarters at Darling Harbour, including the outstanding 4,000m² water play area.



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EXPERT GUIDES FOR CRITICAL PATHS

A complex project can really benefit from an independent coach and umpire. Tracey Brunstrom Hammond (TBH) have decades of experience in providing project management services, and brought their skills to the 1 Bligh Street project to smooth the programming path for Grocon and their multitude of subcontractors.

TBH was involved on the 1 Bligh St project primarily to provide construction programming and planning services, and independent progress monitoring and reporting services. Their involvement commenced from the pre-tender stage and continued through almost to completion and handover.

“At the pre-tender stages we were involved in producing construction methodologies, site staging and establishment variations, indicative costing and cashflows, and eventually of the tender programmes that assisted Grocon in winning the job to begin with,” explained TBH Senior Consultant Scott Bertoni. “Once Grocon had commenced on the job we assisted them in producing both contract programmes and target programmes for the project. These were fully resourced programmes that allowed us to both forecast potential man-power estimates and track against actual on-site performance of individual trades.

“As the project progressed we maintained a monitoring role, reporting back to Grocon with upcoming issues that had the potential to cause delays to the project in a timely matter, allowing Grocon to manage these issues before they became critical. “The most important features of our work were both the collaborative relationship we had with Grocon in the construction planning phases of the project, and the value that our programming services added to the project. The fact that we are an independent consultancy is of great value, as we are able to better inform our clients without the bias or agenda that may sometimes occur if these roles are performed in-house.”

The most challenging part of the programming task was the staging and construction logistics of the unique double-skinned facade and full length atrium. TBH needed to factor in how individual complex elements affected each other, and the program as a whole.

TBH has been in business in Australia since 1965, founded with the skills and experience of Richard Tracey and Gerald Brunstrom, who had been providing services to the US Defence and Aerospace industries from their office in Seattle since 1955. The first TBH project in Australia was managed from an office in Perth, and was for the US Navy, who constructed the Harold Holt Communications Station on the Western Australia coast. In 1966 a Sydney office was opened, facilitating projects including upgrades of the Sydney and Melbourne airports, hospitals and high rise constructions.

TBH expanded into Brisbane in 1980 and Canberra in 1990, and also has offices in Melbourne and Perth. For almost 30 years TBH was providing their skills to projects in Asia and the Middle East from the Australian Offices, and in 2008 TBH joined forces with Confluence to form Confluence TBH, a Singapore-based venture which provides specialist services throughout Asia, Oceania, the Middle East and Europe, with offices in Singapore, Hong Kong, Abu Dhabi, and Dubai.

This is a company that takes the quality of their service seriously, with accreditation by Lloyds Register Quality Assurance. TBH are an AIPM member, and were 2009 State Winner for Project Management Achievement Award for Deer Park Bypass, Melbourne. TBH's ability to manage complexity, finesse details and provide Expert Witness services has proved invaluable for projects including railways, civil infrastructure, all types of construction, ICT, natural resources, hospitality, airports, Defence, health and education.

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CUBIC GOES CURVILINEAR

Delivering fitout which meets the needs of a discerning corporate client and works within curved spaces is a challenging task - the kind Cubic Group excel at. They designed and constructed the wall systems, suspended ceilings, doors and partitions for floors 13, 14 and 15 of 1 Bligh Street, which will be the client 'meet and greet' floors for prestigious legal firm Clayton Utz.

The major geometric puzzle was the numerous curves in the building design. Cubic resolved the constructability aspects of the wall systems and partitions using CAD technology, and installed curving plasterboard walls with a first class paintable finish and custom-designed partitions, creating free-flowing spaces.

Acoustic quality in the spaces is of paramount importance. Two kinds of suspended ceiling were supplied and installed, a flush plasterboard ceiling system and an aluminium tubeline system which has a distinct visual aesthetic. Both deliver excellent acoustic performance, providing both noise and reverberation control.

“We are very proud to have been part of this iconic building in the CBD. There were a large number of door systems we designed and installed, including glazed doors, polyurethane doors, doors with engraved lettering, and meeting and conference room doors,” said Cubic Group Managing Director, Robert Migliorino.

“There were a multitude of finishes used on the walls and partitions on this project, and a lot of curves involved. It was a very challenging project, all the fitout set out was done with GPS.”

Cubic had up to 40 people working on the 1 Bligh project for six months from design through to final installation works. In keeping with the high environmental standards of the project all timber, adhesives and finishes are low VOC.

Cubic Group has a substantial project management track record designing and delivering outstanding results for complex, high-end fitout requirements. Currently the company are working on Tyree, the University of New South Wales Energy and Technology Building being constructed by Brookfield Multiplex. Cubic are also at work on the other side of the country on the Perth City Square project, a 50 storey commercial development which will be the new Western Australia headquarters for BHP's engineering division.

Cubic has offices in Sydney, Canberra and Perth and are also building a presence in Melbourne and Brisbane.



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CUTTING EDGE SITE COMMUNICATIONS

With work sites above a 30 level void, and cranes working for both internal and external lifting on an extremely complex construction task, communication was critical for safety on the 1 Bligh Street site. BTW Communications supplied state of the art Motorola digital 2-way radio systems for the site, ensuring an effective flow of vital information across the project. As specialists in crane installations, BTW's technicians installed equipment for Grocon in both tower cranes and climbing cranes.

BTW have been designing and supplying Motorola systems for major projects for twenty years. As an authorised premier dealer for Motorola, they have access to the latest digital and analogue compatible radio technologies and Motorola's advanced R&D and technical teams.

Part of BTW's digital profile includes on site digital first aid call buttons, lift call buttons and independently powered communications points. BTW also provide clients with onsite maintenance, on-call technical

assistance, fast turnaround on orders and a range of specialised accessories. "Customer service is key. Nothing is more important than understanding our customer needs and meeting them. We will do all that we can to provide our customers with a personalised, honest and professional service," said Grocon Account Manager, Linda McRae.

As specialists in two-way radio hire, sales, support and system design, BTW have provided reliable products and consistent service to projects across Commercial Construction, Security, Manufacturing, Mining & Resources, Hospitality and Retail. Their team's can-do attitude ensures effective and customised solutions for every client's communication needs.

BTW COMMUNICATIONS
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SPECIALISTS IN WATER SAVING SOLUTIONS

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PRACTICAL ACOUSTIC SOLUTIONS

Acoustic Logic specialise in designing practical solutions for challenging acoustic issues, such as the need to prevent noise and vibration from the tri-generation plant on 1 Bligh Street's roof affecting the acoustic environment of the office levels below it.

The acoustic design they developed for the base building plant and equipment included the design of the major supply and exhaust air equipment, air handling units and other, smaller equipment. The tri-generation plant incorporated three installed generators and one provisional generator to provide a backup power source. Treatment of this plant included vibration isolation of the plant using an isolated, floating plant room slab to ensure noise and vibration does not impact on the surrounding office areas.

Other unique requirements of the acoustic design included ensuring noise from the internal pods within the atrium do not impact the atrium (or visa versa) and the acoustic design of plant rooms constructed of glass.

Acoustic Logic was also involved in managing the noise and vibration impact from demolition and construction works on the site and managing the interface between the builder, council and surrounding receivers.

Acoustic Logic focuses on working with client needs and expectations to deliver timely solutions within budget. Acoustic Logic has been involved with projects for developers, councils, architects, service consultants, builders and infrastructure projects around Australia, and also in NZ, Singapore, UAE, Saudi Arabia and the UK. The company are now building on their 17 years experience with a new business division, Audio Systems Logic, providing audio visual services.

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Aquacell set the benchmark for water recycling, with two landmark achievements at 1 Bligh Street; installing the first blackwater recycling system in a commercial high rise in the Sydney CBD, and negotiating the first combined private network and retailer's licence for water recycling under the Water Industry Competition Act 2006 (WICA).

The blackwater treatment system will recycle 100,000 litres of water a day, sourced from the building waste water and water harvested from the underground ocean outfall sewerage system which adjoins 1 Bligh on O'Connell Street. This water is treated by a number of processes including a membrane bio-reactor, in a system engineered by Aquacell using proprietary technology, to deliver Class A recycled water which meets NSW Health standards. This will be used for toilet flushing and cooling towers, saving the equivalent of an Olympic Swimming pool worth of water every fortnight.

The blackwater plant is located in dedicated plant rooms in the underground basement of 1 Bligh, as are the storage tanks for non-potable recycled water, a 25,000L for toilet flushing and 75,000L for cooling tower make up water. All the engineering of the Aquacell system was done in-house, and construction was undertaken partly at Aquacell's factory, and partly on-site.

From design through to commissioning has been a three year process, and Aquacell will in the long term also maintain remote monitoring of the system, and provide regular, specialist maintenance to ensure the constant delivery of class A treated water.

A multidisciplinary Aquacell team delivered this project, including business development engineers, design and process engineers, regulatory engineers, project managers, specialist plumbers and electricians and

commissioning process engineers. Expertise from across the company contributed to the detailed and comprehensive WICA application which was essential to the project.

"Aquacell has been through a rigorous process to gain the first private water licence of its kind, through IPART and the Dept of Water. We were able to satisfy the Minister for Water that Aquacell has the technical, organisational and financial capability to build and operate a recycled water scheme. Essentially we are operating as a private utility. IPART will regulate Aquacell's activities, just as they regulate Sydney Water's activities. This ensures a level playing field regardless of whether the water is provided by public or private operators," said Aquacell CEO, Colin Fisher.

"Only organisations that meet the highest government standards can be granted such a licence. The WICA licence will speed up the delivery of infrastructure where it is needed. Properties that currently don't have access to sewer or recycled water can approach Aquacell, rather than wait for the local water utility or council to provide it. This means properties can be developed more quickly and sustainably in a "local" way, reducing pressure on water and energy."

Aquacell has extensive experience in the regulatory requirements, design, manufacture, installation and on-going management of wastewater for on-site re-use. Their water recycling systems offer long-term cost savings, and can be incorporated into the design of new buildings and developments, or retro-fitted into many existing buildings. Aquacell specialises in systems for commercial and government buildings and multi-dwelling housing developments, enabling developers and builders to contribute directly to future water security.

With the need to transport men and materials for the construction and fit out works, D&G Verticon were an extremely safe choice for the supply of lifting equipment. D&G are Australia's largest Hoist and Tower Crane rental company, providing the full spectrum of lifting equipment and related products for projects across the nation.

D&G's fleet exceeds more than 140 construction hoists sourced from four different manufacturers and approximately 110 tower cranes from six leading manufacturers. The range of tower cranes includes hammerhead, luffing, recovery cranes and self-erecting cranes. D&G also hire Grove, Tadano, Dmag and Franna mobile cranes; Preston Platforms; and 200, 400 and 800kva Generator sets for operating cranes and hoists on sites where power is unavailable.

D&G also offer a complete range of auxiliary equipment required to maximize the abilities of their cranes, including brick cages, man boxes, stretcher cages, kibbles, slings, chains and spreader bars.

Safety is paramount in every aspect of D&G's operations, with accredited Quality Management systems to AS/NZS ISO 9001, OH&S Management systems to AS/NZS 4801 and Environmental Management systems to AS/NZS ISO 14001; all third party certified by Davis Langdon.

D&G Verticon have offices and depots in Western Australia, Victoria, Queensland and Sydney, servicing projects across all industry sectors.

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D&G VERTICON RAISES EXPECTATIONS



EXPERTS AT RESOURCE RECOVERY



The company name might be Dial A Dump Industries (DADI), but what goes into their industrial skip bins at a site like 1 Bligh rarely gets dumped. Instead of the thousands of tonnes of construction waste going to landfill a very large proportion of the waste received by DADI is recovered and recycled and subsequently some of it has returned to Bligh Street for use as aggregates, bedding sands and other construction materials. DADI are members of the GBCA and provide monthly Green Star reports to Grocon. This Company maintains an integrated approach to resource management, with services including bin and skip hire and waste removal, recycling and landfill disposal. Their Collections Division can resolve the most confounding site access issues, and their specialised Recycling Consultants provide innovative management solutions for demolition, construction and industrial waste. The Dial A Product Division recovers or recycles approximately 90 percent of incoming 'waste' material for re-use as landscaping and construction products, including road base, bedding sands and aggregates, all tested to NSW EPA standards.

DADI have invested \$300 Million in their new state of the art recycling facility at Eastern Creek which has been six years in the making and is due to open shortly. This will further extend and enhance Dial A Dump's green credentials as the most technically advanced and innovative waste management service across Australia. Combine this with the opening of Sydney's newest and largest landfill allowing DADI Group to deal efficiently with contaminated soils and asbestos and Dial A Dump is unbeatable in the construction game.

**DIAL A DUMP
INDUSTRIES PTY LTD**
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1 Bligh Street has a significant history. The Bennelong Stormwater Channel c1857 and Bondi Ocean Outfall Sewer c1889, cross the site in the south-western corner. The Bennelong Sewer was one of the five original sewers built and it still operates today. In 2008 GML prepared an Archaeological Research Design report and undertook archaeological monitoring during excavation to ensure the in-situ conservation of the sewers. An Archaeological Excavation report was subsequently prepared for Grocon Constructors Pty Ltd. GML also developed an interpretive strategy for the site which is acknowledged as the traditional country of the Cadigal people. Since European settlement, the site has evolved from a collection of small blocks with mainly family-run businesses, to a 'superblock' occupied by a Green Star rated high rise building.

"A number of small circular stainless steel plaques interpreting different historical phases have been installed in the footpath near the corner of Bent and O'Connell Streets. The plaques help convey the historic evolution and transformation of the city's streetscapes and urban fabric. They add a layer of detail and interest at pedestrian scale that contributes to the experience of being in the city," explained Godden Mackay Logan partner, Sharon Veale.

GML is a leading heritage consultancy that offers a comprehensive range of heritage services including heritage advice, historical and Aboriginal archaeology, conservation planning and management and the interpretation of heritage places both in Australia and overseas. Other recent major projects include the award winning Sydney Harbour YHA, Cumberland Street, The Rocks, the Common Ground housing project in Camperdown, Legion House in Castlereagh Street and the new Ikea site in Tempe.

KEEPING OUR HERITAGE

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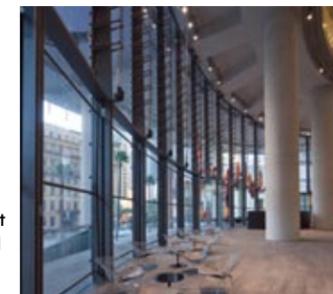
CUNDALL RAISES THE GREEN BAR

Specialist ESD consultant Cundall was engaged in the pre-design phase to develop a vision for 1 Bligh Street that would meet the aspirations of all stakeholders: the building owner, leasing agents, tenants, planning authorities and the public; while positioning the building at the forefront of sustainable development in Australia.

While 1 Bligh Street would be benchmarked against established rating tools including Green Star and NABERS, Cundall also tested each design decision against the project team's priorities, which were to deliver exceptional indoor environmental quality for tenants in a building with extremely low operational energy and water consumption.

With key innovations such as the double-skin facade with automated, sun-tracking blinds, a full height naturally ventilated atrium, gas fired trigeneration system with solar cooling and sewer mining for toilet flushing and cooling towers, Cundall effectively shaped this next generation project to raise the bar in sustainable development to a new height.

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Grocon's 1 Bligh Street, NSW