

Prepared by
**Brookfield Multiplex Constructions Pty
Limited**

2010 ACAA Awards

One Shelley Street, King Street Wharf

**Australian Construction Achievement
Award**

Awards No. AS021

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2010 ACAA Entry Form	3
Project Summary	4
Outcomes achieved against planned targets for key project parameters.	5
Environment.....	5
Energy Air Conditioning.....	5
Lighting	5
Water Management	6
Quality.....	6
Safety.....	6
Complexity, difficulty and optimisation of the construction task.	7
Leadership and management of the project delivery.....	8
Relationship: Client & consultants	8
On Site Project Team	8
Principal consultant's details	10
Principal subcontractors.....	11
Images	13

2010 ACAA Entry Form

Details of Entrant

Name of Organisation: Brookfield Multiplex Constructions Pty Ltd

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Project Details

Project Title: One Shelley Street

Location: 1 Shelley Street, King Street Wharf, Sydney NSW 2000

**Summary of Scope of work
(Maximum of 50 words please):**

One Shelley Street, at King Street Wharf, is a 35,000m eleven storey building consisting of one level of retail and ten levels of A-grade commercial office space. Featuring a state of the art external diagrid structure and internal atrium, the building is a remarkable visual landmark in Sydney's CBD.

Contract Value: \$185m Contract Type: Develop, Design & Construction, Manage

Contract Period: 1 May 2007 – 14 April 2009 Date of Substantial Completion: 26 February 2009

Purpose of Project: To provide a purpose-designed and built 6 star Green Star commercial office for Macquarie Group

Name of Client/Principal: Brookfield Multiplex Developments Pty Ltd. Purpose-designed for Tenant, Macquarie Group

Address: Level 1, 1 Kent Street Sydney 2000

Contact Name: Tony Short, Macquarie Group Title: Project Management

Telephone: (02) 8232 4373 Facsimile:

Project Summary

One Shelley Street, at King Street Wharf, is a striking combination of form, function and sustainability. Featuring a state of the art external diagrid structure and internal atrium, the building is a remarkable visual landmark in Sydney's CBD.

The 35,000m eleven storey building consists of one level of retail and ten levels of A-grade commercial office space. The striking external diagonal steel grid structural system sits beyond the building's sleek glass façade, eliminating the need for perimeter columns and maximising the flexibility of the internal floor space. A regular diagrid pattern was nominated by the architect, while the simple internal steelwork comprises standard universal beams with regular penetrations for services.

The full height atrium is linked at a number of levels by bridges, stairs and open floor levels, with meeting-room pods projecting into the atrium space.

Taking these features into account, a full fire engineered strategy was developed to address issues such as smoke control, fire resistance and egress in all parts of the floors at atrium. Featuring a range of innovative environmentally sustainable development initiatives, including passive chilled beams, the building now sets new benchmarks in environmental sustainability. It has achieved a 6 Star Green Star rating from the Green Building Council of Australia (GBCA), demonstrating world leadership standards.

Construction commenced in June 2007 and was completed in February 2009.

Outcomes achieved against planned targets for key project parameters.

A weight of 40% is attributed to this category and the entrant would be expected to have met or exceed expectations in all key result areas (KRAs) and demonstrate initiatives and achievements that have contributed to building the future of the construction industry. KRAs include safety, time, cost, quality, environment, sustainability and stakeholder satisfaction as a minimum

The One Shelley Street Project was one of the most dynamic projects constructed by Brookfield Multiplex. The initial construction value of \$122m versus a final construction value of \$185m is indicative of the substantial changes accommodated by the Team during the 20 month construction period.

KRAs were set initially and continually updated as the project developed and evolved.

Environment

Brookfield Multiplex committed to a 5 Star Office Design and Office As-Built Green Building Rating at the commencement of the project. Mid way through construction the Client and Tenant requested the Building be upgraded to 6 Star Design and As-built, and this was achieved. Some of the environmental issues / innovations implemented on One Shelley Street are listed below. The design team held a weekly Green Star meeting to monitor the integration of these and other items in the design.

At this meeting the design team prepared a tracking sheet to monitor responsibilities at the Green Star meeting and the Project Manager presented this tracking sheet to the Client and Design Manager, discussing any issues being experienced at the time.

Recommendation was made to the design team that an external consultant be engaged to carry out a peer review on the Green Star submission, this was agreed and proved to be a very beneficial process, with our Green Star submission being awarded the highest Green Star points to date on a round one submission.

Air Conditioning

- Passive chilled beam HVAC system to create energy efficient space cooling.
- More than double the volume of fresh air over Australian Standards and a single pass air system means indoor air quality is of the highest possible standard with no recycled air in the building.
- Harbour heat rejection to reduce water consumption through elimination of cooling towers.

Lighting

- Natural daylight penetrates well into the work floors.
- Lighting controls dynamically adjust artificial lighting to conserve energy by sensing amount of natural light
- Energy efficient T5 lighting system uses lamps held by high frequency ballast reducing flicker.

Outcomes Achieved Against Planned Targets for Key Project Parameters

Water Management

- Inclusion of harbour water heat rejection means no base building water demand other than the sanitary fixtures.
- Specification of low flow water fixtures including toilets, taps and showers.
- Installation of waterless urinals.
- Fitting of dual pipework to allow for future grey and black water recycling.

Quality

One Shelley Street stands as a testament to Brookfield Multiplex's commitment to quality.

Industry colleagues and potential clients have described the building as being of "outstanding" standard on an international level.

Of the three construction principles cost, quality and time, we consider quality to be of upmost importance as this is what the client experiences every day for the life of the building. With that in mind our aim was to exceed the client's requirements in selecting superior products and finishes complementary to the prevailing conditions and environment.

The design team was diligent in selecting appropriate products and in clearly understanding the product warranties and limitations. No substitution of materials was made unless a thorough comparison of the products ensured that it was equivalent or better than that specified.

Where necessary we spent money on testing materials independently to verify the technical data prior to procurement.

During the construction period and at every new work face, a "benchmark area" was constructed that was inspected for defects and design compliance by the Client, Brookfield Multiplex and the consultants. Once the benchmark level was agreed, construction proceeded.

This process proved to be very effective in understanding the Client's expectations and in realising the end product.

Numerous audits, factory inspections, site tests, ITPs etc were conducted in line with our quality protocols.

Safety

Brookfield Multiplex is committed to providing safe environments for its employees and subcontractors at all times. One Shelley Street was another project with an exceptionally low Lost Time Injuries (LTIs) rate. Right from the beginning of the project, "safety in design and construction" was included in the design and site meetings agenda and was discussed weekly at each design and site meeting.

We also created a CHAIR report (Construction Hazard Assessment Implication Review) as outlined by work cover. The process involved setting up a committee to review the entire building design and identify potential safety hazards during the construction process and ongoing maintenance and repairs. The committee provided recommendations which included changes to the design to negate risks.

The committee included Brookfield Multiplex Constructions, Brookfield Multiplex Developments and Brookfield Multiplex Services the consultant team and external OH&S consultants.

Complexity, difficulty and optimisation of the construction task.

A weight of 30% is attributed to this category and the entrant would be expected to address construction complexity (eg logistics, interface, constraints, community, environment, heritage etc) and the unique risk that had to be managed to deliver an award winning project.

One Shelley Street had compounding levels of complexities:

- an existing basement (built for an alternate structure),
- a diagrid structure
- a 1600 m² atrium extending 10 stories high,
- targeted 6 Star Office Design Rating
- an integrated fitout over 33,000m².

One Shelley Street is Australia's first diagrid building. This presented a huge challenge to the design team and the Australian subcontractors and suppliers, as none of the project team had been involved in a project of this kind before.

While other diagrids are integrated into the building's curtain wall, so that the diagrid is installed and then the holes infilled with curtain wall panels, the diagrid at One Shelley Street is set off the façade, with a 150mm gap between the glass and the inside edge of the diagrid. The diagrid penetrates the façade at every intersection/node through the curtain wall to the floor beams which then support the concrete floor. This presented a potential issue with waterproofing, so every sub penetration was specifically designed, engineered and tested to avoid leaking.

The column layout in the atrium could not fully extend into the basements as two columns would land in the access ramp to the coach parking facility. Therefore a steel truss in the diagrid was engineered and constructed and used to "hang" the column nine floors above the atrium hence eliminating the need for the columns to go through the ramp and down to footings.

To overcome the complexities and difficulties of the diagrid the following was implemented.

- With the occurrence of fine tolerance and unpredictable settlements a unique survey regime was developed to regularly review and monitor the diagrid as it was installed.
- A detailed settlement analysis was completed by the Engineer. Significant surveying of the Node points was undertaken following installation of structural steel, again following placement of concrete, then on removal of backpropping and again on completion of the structure to ensure installation and construction was within tolerance.
- As we could not wait for the building to be constructed before designing the façade system the façade also had to be designed to cater for the potential movement and unknown deflections of this building form. A subsill drainage system was developed capable of taking movements of up to 35mm in each direction to allow for the installation tolerances and settlements of the diagrid.

The Diagrid was one challenge, the atrium was another. 100m long by 16m wide, the atrium includes 26 cantilevered meeting rooms and bridges intersecting the low and high rise buildings. An additional challenge was that these cantilevered meeting rooms were a late design change proposed by the Client.

Leadership and management of the project delivery.

A weight of 30% is attributed to this category and the entrant would be expected to address leadership and management aspects that have delivered a project worthy of the Award. These may include project team relationships; innovations generating a legacy of the construction industry; entrant's contribution in the design process; planning and control of the design and construction operations; occupational health and safety; environment; industrial relations; project finance and project initiation; use and development of new technologies; training and development initiatives. Consideration will be given to the legacy beyond the contract obligations that have optimised the use of scarce resources and left enduring social benefits for the community.

The journey of One Shelley Street was an unforgettable experience for all who were fortunate enough to partake. The successful delivery of this iconic project was a direct result of a collaborative effort between all stakeholders, including the client, tenant and project team and the leadership and management of the project delivery.

Relationship: Client & consultants

Effective, regular and open communication was the keystone to building these relationships. A series of design meetings and design and construction presentations were scheduled, samples and prototypes were provided and numerous factory inspections were conducted.

The client Brookfield Multiplex Developments, the tenant Macquarie Group Limited, project manager and the consultant team were all present at meetings, and their approval was required before we were able to proceed.

This process gained us the trust of the client and consultants and reinforced our aim of delivering an outstanding product for the end user and a landmark building in the CBD.

The integrated fitout required us to work very closely with Macquarie Group's consultant team to ensure the end users needs were integrated into the building. This process involved numerous design meeting and exchange of documents between the base building design team and the fitout design team.

On Site Project Team

The project team involved in One Shelley Street totalled in excess of 35 staff and 15 construction workers and over 2 years duration.

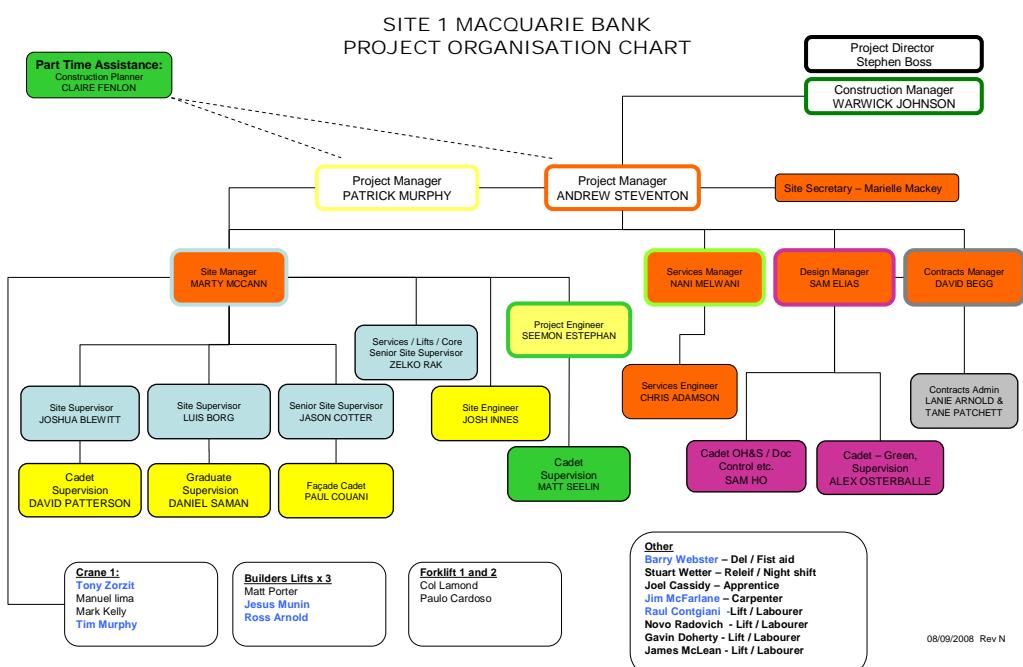
Because of the long hours endured on building sites we also had to ensure we provide a fun and pleasant working environment to allow each individual to do their best. We recognised that building strong personal and working relationships between colleagues is the best recipe for a successful project of this size.

We constantly took the opportunity for team building sessions - celebrating key project milestones and recognising all who contributed to a particular milestone such as topping out structure, watertight building, 6 Green Star Award, etc..

We also took the opportunity of engaging the team in a weekly boot camp program. This program provided a healthy and much needed life style balance as it allowed us to put the pens and tools down at 5pm and engage in physical exercise.

We held a formal weekly team meeting which was well structured and covered all facets of the project including safety, design, administration, client issues, program, variations and construction. All management staff were required to attend. The meeting was aimed at providing an insight to staff in areas in which they would normally not be involved, such as client issues, feedback from clients, up and coming client variations etc. By being open with the team we gained trust and allowed relationships to develop between the team, for example a design manager would request assistance from a foreman to review a set of documents from a buildability view point and provide comments to be included in the final set of for construction documents.

Head Contractor	Brookfield Multiplex Constructions
Client name:	Brookfield Multiplex Developments Australia Pty Ltd
Tenant	Macquarie Group Limited
Initial Cost	\$122 million (Base building)
Final cost:	\$185 million (Base and fitout)
Contract form:	AS4300-1995 amended



Principal consultant's details

Consultant 1:	Fitzpatrick + Partners
- Role:	Architects
Consultant 2:	Lincolne Scott
- Role:	Services Engineers
Consultant 3:	Arup
- Role:	Structural Engineers
Consultant 4:	Robert Bird Group
- Role:	Structural Engineers
Consultant 5:	Connell Wagner Facade
- Role:	Façade Engineers
Consultant 6:	City Plan Services
- Role:	Private certifier
Consultant 7:	Advanced Environmental
- Role:	Environmental Engineers
Consultant 8:	Windtech Australia
- Role:	Wind Engineers
Consultant 9:	Morris Goding accessibility consulting
- Role:	Access consultants
Consultant 10:	Acoustic logic
- Role:	Acoustic Engineers
Consultant 11:	EDAW
- Role:	Landscape Architects
Consultant 12:	Steve Alexander & associates
- Role:	Water proofing consultant
Consultant 13:	Arup
- Role:	Fire Engineering consultants
Consultant 14:	Norman Disney & Young
- Role:	Lifts & Escalator consultants
Consultant 15:	JBA

- Role:	Urban Planners
Consultant 16:	Clive Wilkinson & Associates
- Role:	Interior Design
Contractor 17:	Vision
- Role:	Speciality lighting

Principal subcontractors

Contractor 1:	Lysaghts Design & Construct
- Role:	Supply & install of Structural Steel to Diagrid & Floors
Contractor 2:	Heyday electrics
- Role:	Electrical and security
Contractor 3:	G James Australia
- Role:	Façade, shopfronts and Diagrid cladding
Contractor 4:	Andec Fire
- Role:	Fire services
Contractor 5:	Hastie Australia
- Role:	Mechanical services
Contractor 6:	Schindler
- Role:	Lifts & Escalators
Contractor 7:	Batoma Joinery
- Role:	Joinery
Contractor 8:	Team Members
- Role:	Tiling & Stone
Contractor 9:	Ajax
- Role:	Hydraulic services
Contractor 10:	Allmen
- Role:	Supply & install of Structural Steel Atrium & Plantroom
Contractor 11:	Peter Kelly Flooring

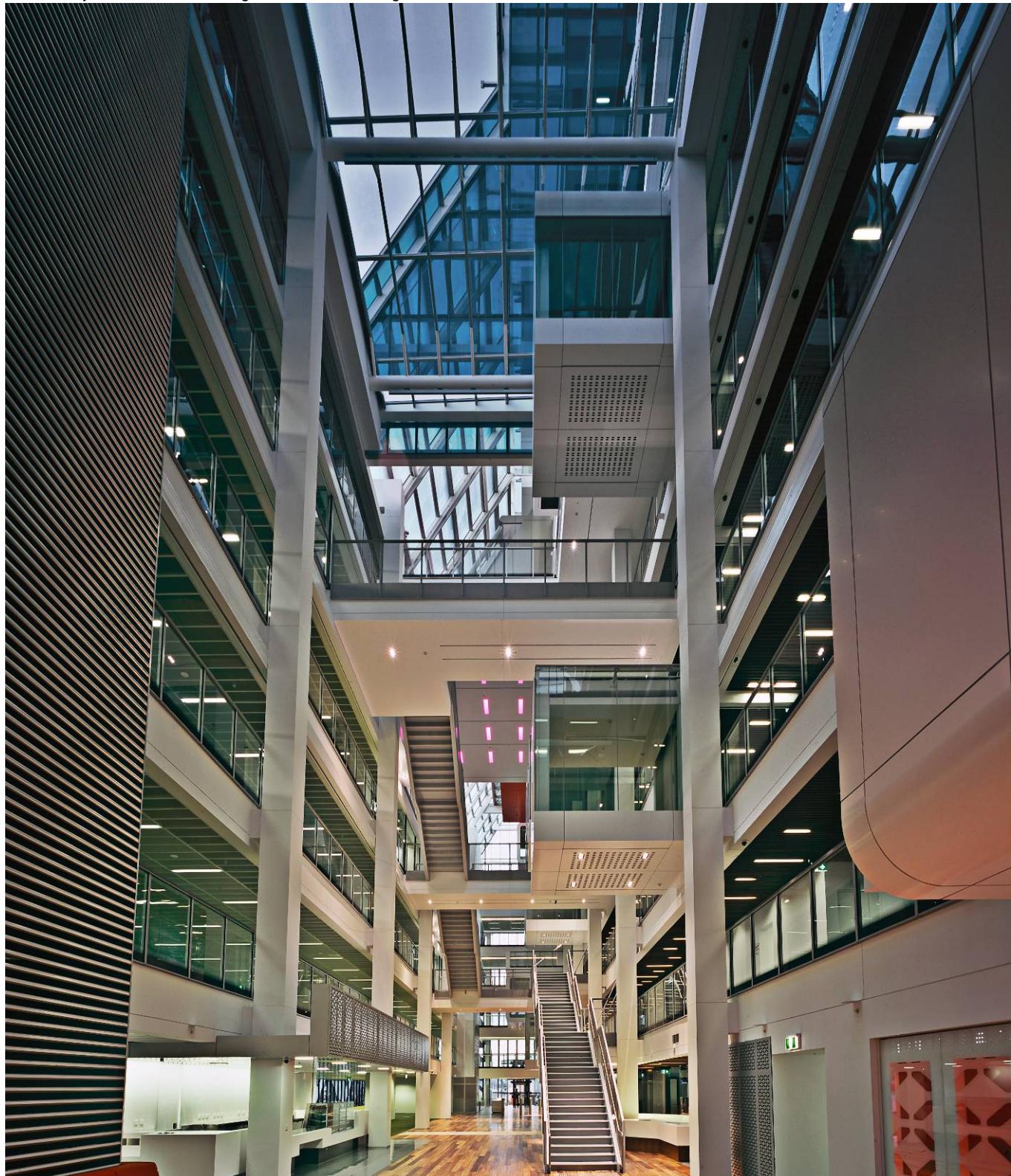
- Role:	Resilient flooring
Contractor 12:	Universe Carpets
- Role:	Carpet flooring
Contractor 13:	Yap Engineering
- Role:	Balustrade
Contractor 14:	Sharvain
- Role:	Feature Glazing
Contractor 15:	Cubic Interiors
- Role:	Pod Cladding
Contractor 16:	Brighton Australia
- Role:	Ceilings & Partitions
Contractor 17:	Tam Terrazo
- Role:	Landscape feature walls
Contractor 18:	AYZ Landscaping
- Role:	Hard and soft landscape
Contractor 19:	Tasman
- Role:	Access floor
Contractor 20:	TPI
- Role:	Wet area fitout
Contractor 21:	Demartin & Gasparini
- Role:	Supply & install concrete
Contractor 22:	Trazmat
- Role:	Formwok

Images

South West corner of One Shelley Street



One Shelley Street Atrium showing cantilevered meeting rooms



One Shelley Street under construction

