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THE BUILDING ECONOMIST

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AUSTRALIA AND NEW ZEALAND BIM BEST PRACTICE GUIDELINES

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AUSTRALIAN INSTITUTE OF QUANTITY SURVEYORS

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THE CONSTRUCTION COST SPECIALISTS

THE BUILDING ECONOMIST

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FOREWORD

Diversity and inclusion, off-site construction, construction financing, compliance, BIM and product innovation are topics that are headlining discussions amongst construction cost professionals and the broader construction industry.

Recently, AIQS released the 'Construction Financing Reports' Guidance Note. AIQS found that there were several different approaches being taken by a Quantity Surveyor to develop construction financing reports for financial institutions. Standardising the approach, was the next step for the industry. Accordingly, the AIQS Banking and Finance Committee, in consultation with the finance industry, developed and launched the Guidance Note to create a uniform scope of service and clarify the Quantity Surveyor's role in providing construction cost management services to both financiers and developers. We have included the full Guidance Note in this edition of The Building Economist. AIQS will deliver several guidance notes and best practice guidelines over the coming years to ensure that industry standards remain relevant and up to date.

Some of the brightest minds in our industry have come together for a Q & A feature on diversity and inclusion. We also highlight the how Sophie Ly MAIQS, CQS is responding to the changing needs of contemporary female leaders and their organisations.

The construction industry continues to further explore offsite construction. In this edition of The Building Economist, Peter Wong and Charles Zwar delve into the impact of the greater use of off-site construction on project management practice. Their research outlines nine impacts that off-site construction has on the project management practice. Whilst the builder and developer are most commonly driving offsite construction, the Quantity Surveyor can also play a crucial role from cost management and project management perspectives.

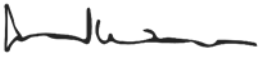
November 2018 saw the release of the 'Australian Construction Market Report' by The Australian Construction Industry Forum (ACIF). The Report states that building and construction activity now accounts for 14% of GDP and construction sector jobs account for nearly 10% of total employment. The overall construction market is forecast to shrink by less than 1% over the next year which considers a surging infrastructure sector. Interestingly, it is projected that by 2061 up to 15.7 million Australians will live in our capital cities.

In order to reduce construction waste, front-end strategies are required. Peter G. Rundle, together with Alireza Bahadori and Ken Doust, have completed research that can help guide the construction industry. This research is detailed in this edition of The Building Economist.

We also explore the how a QS firm helped deliver the award-winning new Australian Embassy in Thailand; the cost of using steel; and a legal-related article focused on quantification of damages for defective works.

We trust that you will benefit from the knowledge you gain by reading The Building Economist.

Regards



Grant Warner
CEO
Australian Institute of Quantity Surveyors

LEADERS ON DIVERSITY AND INCLUSION

WHAT DO YOU THINK ARE THE BIGGEST CHALLENGES FOR THE FUTURE OF QUANTITY SURVEYING IN THE NEXT FIVE YEARS?

Alison Mirams: "I think one of the biggest challenges facing quantity surveying over the next five years is addressing the inherent disconnect between how clients calculate risk and how building contractors calculate and mitigate it. Risk is often underestimated or assigned in a way which increases cost but doesn't provide the best solution for the project. Additionally, attracting new talent and making sure we are keeping ahead of the technology curve will be as much a task for the QS community as other parts of the construction sector."

Ziqi Chen: "In my opinion, in the near future, quantity surveyors will face the challenges from the development of software and technology such as BIM, which have the potential of extraction of quantities, or at least simplifying the measurement process. This might mean as QSes, our focus will need to shift from quantity measuring to offering more advisory services such as market testing, cost analysis, VM initiatives or even model clash detection and risk modelling and analysis to remain competitive in the market.

Irena Kuzman: "The biggest challenge for our future is trying to survive the impending automation of almost every discipline in our industry. It will require a lot of reinvention and almost a reincarnation of the entire profession into a more diverse and creative service provider, from the lineal technicians that we are today. This concerns me greatly because the QS folk are a very complacent creature, and we sometimes fight change to our own detriment. But I have faith in the up-n-coming QS leaders who have embraced digital technology and are actively trying to disrupt the profession for the better."

Louise Vlatko: "One of the biggest challenges for our future is survival itself. Other construction and property-related organisations (i.e. project managers, property firms) believe and openly state that they can do our job better than we can. Engineering conglomerates have bought out large independent QS practices (Davis Langdon, Currie & Brown, Cyril Sweett etc) to gain market share, and non-construction organisations such as the "Big Four" accounting/consultancy firms are playing in our space - again, looking at our enviable rate of returns.

We need to adapt more quickly to threats and changes to our environment. Albert Einstein is broadly credited with exclaiming 'The definition of insanity is doing the same thing over and over again but expecting different results.'

We as a profession and vocation need to work together to fend off these challengers for our rightful place, whether it be in construction, property, engineering, aviation, oil and gas, and major events.

The other big challenge is the rhetoric I hear from most QS's. Whilst some say they are all for collaboration, innovation etc - nothing could be farther from the truth. All the QS's I have spoken with about collaboration, sharing etc believe smaller, boutique organisations (such as Xmirus) should be sharing their IP, rather than supporting the smaller, more nimble and innovative firms to create unique relationships with clients (in futureproofing the QS place in the sun) which the whole profession could benefit. Incredibly frustrating to say the least."

Sarah Slattery: "Finding the right people to look after our clients. Australia is experiencing a lack of people to build our cities, and this is going to get worse with the current restrictions on immigration and population growth driving demand.

A challenge is always an opportunity, so at Slattery we are focusing on attracting and retaining the best of the best through student programs, flexible individual arrangements to suit an ageing and caring population and offering exciting projects that give our staff a sense of purpose.

As Managing Director at Slattery, I'm constantly aware of how quickly technology is changing our industry. Our challenge here is to ensure we are evolving as problem solvers, continually adding to our service offering and stretching ourselves to guide clients in more effective and efficient ways.

Jude Tsai: "The biggest challenges for the future of Quantity Surveying are as follows. Attracting (and retaining) qualified QS / estimators. Maintaining presence in a constantly evolving industry and world where people are looking for instant gratification and one stop shop solutions. Retaining qualified / mature age staff. Developing a pathway to integrate differing generations within the field to facilitate the prolongation of our trade, particularly when there are minimal QS courses on offer. Maximising the benefits of technological advancement without compromising the technical skills required."

WHAT WOULD YOUR SALES PITCH BE TO A YEAR 12 STUDENT TO ENCOURAGE THEM TO TAKE UP QUANTITY SURVEYING AS A PROFESSION?

Alison Mirams: "In 2017, I wrote to more than 40 girls' schools offering my time to talk about the opportunities offered

by a career in construction. About a quarter of the schools took me up on the offer. I use the talks to share my career story and broaden their consideration set when thinking about career possibilities. Selling careers in construction is often about selling the satisfaction you receive when you are watching a building come out of the earth, contributing to the community and leaving a legacy.

Starting out as a QS cadet gives you an excellent foundation in understanding how to manage costs and the commercial aspects of running a project – and ultimately a business. Both my counterpart at Roberts Constructions in the Middle East, Graeme Robson, and I started out as cadet Quantity Surveyors."

Ziqi Chen: "Quantity Surveying is an exciting profession where you will be challenged with various tasks during the life of a construction project. You will be able to participate in projects across all different sectors and enjoy the sense of achievement being part of the process of them being built."

Irena Kuzman: "By being a QS, you almost get best of ALL worlds in the construction industry. You are there from conception to completion and everything in-between, you must comprehend almost every element of the project as well as everyone's deliverables, all in order to manage the cost of a project.

And contrary to popular belief, a good QS must have a creative streak, otherwise she cannot cost the elements that are no yet documented and the unknows that are yet to be discovered. She will pretty much build the building in her mind and then translate it into numbers to derive the project cost."

Louise Vlatko: "We are problem-solvers in the construction, property, engineering, aviation, oil and gas and major events, and with our technical skills, why limit ourselves to only construction and property? QS technical training and education teaches us to thing logically and laterally. This can be applied to so many different aspects of a projects life-cycle. I am fortunate enough to have worked on some interesting high-profile projects internationally - and only because I am a QS. Currently, I am consulting on the FIFA World Cup in Qatar on a USD1B portion of the works.

I entered the profession because of the flexibility and opportunities that being a QS could bring and I enjoy meeting and working with people with a range of skills, backgrounds, ages and environments."

Sarah Slattery: "Who wouldn't want to work in a profession that makes a real difference in how we build our communities and infrastructure? Quantity Surveyors contribute to the spaces where we work, live, learn and play. We are involved in the planning, design, construction and operating of those spaces. Our clients rely on us to help them solve problems.

Having the ability to drive beautiful and functional outcomes for the community through the built environment makes for an exciting career. No one day is the same!"

Jude Tsai: "The QS role is the hidden gem of the property and construction industry. The QS is involved in projects from the onset, working closely with the developer or client, the architect, the engineer and the project manager to steward the project to ensure the best possible design outcome for budget. It is a very rewarding career working with fantastic diverse people every day as well as engaging with a variety of industries."

HOW DO YOU SEE YOURSELF AS AN ENABLER FOR CHANGE IN TERMS OF DIVERSITY?

Alison Mirams: "From what I see, the issue with diversity in construction doesn't stem from the demand side. The sector has evolved and now most companies will hire and support candidates who are underrepresented in the workforce. The actual problem which needs to be urgently addressed is on the supply side.

There simply aren't enough graduates from underrepresented groups with the qualifications we require to make a real dent in overall sector demographics, so that is where I focus my efforts - sponsoring scholarships, giving my time to talk to students, and generally promoting careers in the construction sector."

Ziqi Chen: "As a former international student, I understand how the cultural and language background could be a barrier in both study and work. These could be a great asset at the same time. I would able to relate myself with students and young professionals who came from a different background and encourage initiatives and promote diversity for the QS profession."

Irena Kuzman: "You cannot be what you cannot see, so like any female in our industry, simply by being here I enable change for diversity. I am female, migrant, public-school educated and English is my second language. But I recognise that I still am more privileged then so many females, POC, LGBTQ and other minorities.

I was able to get help and support from some of the most amazing female leaders in the QS world, and that is why I now try and do the same for the younger professionals in the QS community. I

make myself as visible as possible to those who may benefit from my help such as students and cadets, and I make sure to be available and accommodating to any young professional that needs my support to progress in their career. It's the least I can do."

Louise Vlatko: "I entered the profession 30 years ago (1988) and had absolutely no connection to construction at the time - no one in my family, nor any of my friends were in construction. As a female, coming from a non-english speaking, co-ed public school, blue-collar background, and landing in an organization (Rider Hunt) as a Cadet where the professional staff were Anglo Saxon, I found, whilst challenging, it was very rewarding to be treated the same as my peers.

Moreover, I implemented 20 years ago (1998) a "remote working" policy into the organisation (I had my first child in 1998) as Rider Hunt didn't even have a maternity leave policy and I wanted to continue my career. The policy is still in place today.

It is important to note that there was no internet then, and the idea of flexible working was perhaps in its infancy in the more socially sophisticated countries like France and Sweden. The policy also wasn't designed just for women it was designed for all those individuals that wanted flexibility in their professional career.

I became the 2nd female in Rider Hunt (now RLB) history to become an Associate Director in the entire Rider Hunt (Australasian) group. This was hard-earned, but I can safely say my promotion at that time (2004) has facilitated and made life much easier for the minority groups within RLB and the profession to promote to senior management roles.

Finally, I am a Co-Founder and Director of Xmirus which has 6 staff of which the Managing Director is the only male - a minority group in a leadership position!"

Sarah Slattery: "Calling out bias where we see it, valuing people's strengths and characteristics, challenging each other to think differently – diversity of thought creates better outcomes.

At Slattery, we celebrate diversity every day. With almost 100 staff around Australia, 40 per cent are female (including five Directors). Employees range in age from 19 to 73, identify with 23 different cultural backgrounds, practice 13 different religions and at least five per cent identify as members of the LGBTIQ community. By celebrating our success, we hope other firms will follow our lead."

Jude Tsai: "Through active participation in industry events and being visible. Being bold and challenging industry norms and stereotypes."

THE IMPACT OF THE GREATER USE OF OFF-SITE CONSTRUCTION ON PROJECT MANAGEMENT PRACTICE

BY
PETER S.P. WONG, ASSOCIATE DEAN, ASSOCIATE PROFESSOR, PROPERTY CONSTRUCTION AND PROJECT MANAGEMENT, RMIT UNIVERSITY CHARLES ZWAR, PROJECT ENGINEER, BUILT.

OFF-SITE CONSTRUCTION

Off-site construction (OSC) can be defined as the completion of substantial parts of 'construction' works prior to their installation on-site (Blismas et al. 2006). It is a construction technique which adoption can be traced back to the seventeenth and eighteenth centuries (Vokes and Brennan, 2013).

Throughout the twentieth century, off-site construction, in the form of precast concrete panels and structural steel, was utilised during situations that demanded rapid urban development, including, the post World War II reconstruction in 1950s, slum clearances and housing booms in 1980s (Vokes and Brennan, 2013).

Whilst there has been a resurgent use of prefabricated structural and building envelope elements, industry professionals have commonly used prefabricated components throughout the fitting out stage of projects in the form of factory made joinery and metalwork items.

In the past few decades, OSC was mainly applied in producing precast concrete components like facades, staircases, partition walls and slabs (Gibb, 1999). This situation did not change until recent years when the market conditions including: skilled labour shortage, increasing labour costs, increasing sustainability standards and clients demanding a higher quality product delivered in tighter programs have prompted builders to further explore OSC methodologies (Wong et al., 2017).

The advancement of building information modelling, 3-dimensional printing and volumetric preassembly technologies have unleashed the potential of a more extensive use of prefabrication in construction projects (Pan et al., 2012).

Consequently, prefabricated systems in the form of windows, doors, cladding and frames can now be incorporated into projects with less risk of failure. This greatly reduces on-site assembly time as compared to conventional 'stick' build construction methods.

Fully manufactured building facilities including; bathroom pods, kitchen pods, modular units and some even more complicated structures are now possible to be manufactured off-site (Jaillon and Poon, 2014, Wong et al. 2017).

In more radical methods, completely finished modular buildings can be factory made and, once complete, transported to site for installation on a developed substructure.

The aforementioned methods vastly reduce the requirements for skilled on-site labour associated with in-situ construction.

Recently published data by the Australian Bureau of Statistics reported a skills shortage in the trades: bricklaying, roofing, tiling and plastering. Whilst the previously mentioned trades experienced a reduction in employee numbers, in the same period the value of construction work done rose by 6.5 per cent (ABS, 2014). This suggests that the industry will need to adapt to developing social conditions to cope with less tradesman whilst maintaining current and projected output levels.

In conjunction, the above reported studies and data reveal that the uptake of off-site construction might have been gradually changing the construction project environment.

THE RESEARCH OBJECTIVE

However, have the construction project organisations (CPOs) prepared well for such change? In this study, construction project organisations can be defined as the organisations collaborating in a construction project. This includes the architect, engineering and surveying consultants employed by the developers, the main contractors and subcontractors

(Wong and Lam 2012).

In his critical review on research into the management of prefabricated construction, Li (2014), concluded that research within the sector has predominantly focused on the following five research topics:

[1] Industry prospect which comprises of the benefits, barriers and future opportunities for the precast industry (Blismas et al., 2006, Tam et al., 2007)

[2] Development and application covers case experience analysis and the evolution of OSC. The findings within this topic displayed the lack of research on the uptake of OSC within private enterprises and the residential sector (Jaillon and Poon, 2014, Tam et al., 2007)

[3] Performance evaluation, encompassing environmental, economic and social performance. Some scholars identified that stakeholders must receive first hand, the actual benefits associated with technology to facilitate its adoption (Pan et al., 2012, Pons and Wadel, 2011).

[4] Environment for technology application, consisting of policies, stakeholder attitudes, industry perspectives and stakeholder relationships. Past studies within this topic identified that previous failures of precast technologies has led to stakeholder's negative perceptions within housing (Edge et al., 2002) and other construction sectors (Pan et al., 2004). Whilst previous studies have identified stakeholder interrelationships and their attitudes towards OSC, little has been done to quantify the influence of stakeholders attitudes towards an increased use of OSC (Li et al., 2014).

[5] Design, production, transport and assembly strategies that consist of; production control, transportation, design, assembly technologies and information processing. Through examining current research on the above subtopics, some scholars argued that in order to develop an understanding of the complexities of managing OSC, the underlying interrelationship of these areas is needed (Li et al., 2014, Pan).

The above brief review indicates that previous studies mainly focused on the emergent use of OSC in conjunction with the drivers behind its uptake for construction project organisations.

Nevertheless, little research has focused on how OSC may change the landscape of the construction project management.

This paper reports a study that aims to investigate the impact of the greater use of OSC on the project management practice.

THE RESEARCH METHODOLOGY

This study was conducted in two phases.

Phase I involves a systematic literature review that helped identify the impact of using OSC on project management practice. In particular, the changes to the CPOs operational focus and inter-organisational collaborations needed for adapting to the greater use of OSC were identified.

In Phase II, semi-structured interviews were conducted to identify strategies that help integrate organisational changes into the construction project management practice. Interviewees with project management experience in building projects with prefabrication work were targeted by this research. The interviewees were assembled from two major sources.

Firstly, the registered contractors list, maintained by the Master Builders Association of Victoria, was adopted. Master Builders is a major building and construction industry association in Australia, and its members represent 95% of all sectors of the Australian building industry.

Secondly, potential respondents were searched from general browsing on the official webpages of professional institutes including the Australian Institute of Builders, Australian Institute of Architects, Engineers Australia, and Australian Institute of Quantity Surveyors.

50 target respondents from different companies were randomly selected from the above pools of potential respondents. Of the 50 target respondents initially contacted, 24 respondents agreed to be interviewed. All respondents confirmed that they have relevant experience in managing building projects with prefabrication work.

Due to time and research budget constraints, the interviews were only conducted in greater Melbourne region. However, the sample was considered a fair representation of the industry's views. Within the research population, 75% had more than 10 years' experience in construction projects.

The creditability of the responses is also strengthened for the fact that 54% of the research population has more than 20 years of project management experience. The interviewee profiles are displayed in Table 1.

OFF-SITE CONSTRUCTION

TABLE 1 INTERVIEWEES' PROFILE

Interviewee	Working organisation	Role in the organisation	Work Experience (Years)
A1	Large construction company (commercial, residential and infrastructure)	Founding Director - Construction Manager	31-35
A2	Large construction company (commercial, residential and infrastructure)	Director - Construction Manager	11-15
A3	Large construction company (commercial, residential and infrastructure)	Founding Director - Construction Manager	26-30
A4	Large construction company (commercial, residential and infrastructure)	Ditto	21-25
A5	Large construction company (commercial, residential and infrastructure)	Director - Project Manager	16-20
A6	Medium construction company (commercial and residential)	Director - Construction Manager	31-35
A7	Medium construction company (commercial and residential)	Director - Construction Manager	21-25
A8	Medium construction company (commercial and residential)	Director - Construction Manager	21-25
A9	Medium construction company (commercial and residential)	Director - Project Manager	16-20
A10	Small construction company (residential only)	Director - Construction Manager	20-25
A11	Small construction company (residential only)	Project site manager	11-15
A12	Small construction company (residential only)	Project coordinator	6-10
A13	Small construction company (residential only)	Project quality engineer	6-10
B1	Large developers (commercial, residential and infrastructure)	Design Manager	15-20
B2	Large developers (commercial, residential and infrastructure)	Project Manager	20-25
B3	Government City Council	Project Manager	6-10
B4	Engineering consultant (commercial and residential)	Project Manager	16-20
B5	Engineering consultant (commercial and residential)	Project Manager	21-25
B6	Engineering consultant (commercial and residential)	Project Manager	25-30
B7	Architecture consultant	Design Manager	6-10
B8	Architecture consultant	Director	25-30
B9	Architecture consultant	Design Manager	6-10
B10	Cost consultant	Director	25-30
B11	Cost consultant	Contract Administrator	6-10

FINDINGS AND DISCUSSIONS

Literature suggests that the greater use of OSC in construction projects might bring some impacts on the project management practice. The impacts are outlined below.

1) MORE COMPLICATED TRANSPORT AND LOGISTICS

Transportation logistics was identified by (Jaillon and Poon, 2014, Lu, 2007) as one of the main barriers to the adoption of OSC. This is largely due to the selected transportation method that ultimately imposes restrictions on size, weight, height and width of the prefabricated element. Hence, the method of transport and transport routes must be carefully considered when seeking to implement OSC into a construction project.
In addition to the aforementioned restrictions, the increased reliance on supply chain management and potential manufacturing delays presents further resistance to the acceptance of off-site construction. Additional constraints include hook time availability in which in depth feasibility studies are required (Blismas et al., 2006). Transport and logistics must be carefully examined in feasibility studies when importing prefabricated elements from off-shore.

2) MORE COMPLICATED DESIGN AND CONSTRUCT COORDINATION

An increased reliance on prefabrication, preassembly and modularisation creates a heavier reliance on project planning and coordination throughout the project. As a result, design must be completed and tested prior to fabrication during the pre-project planning stage (Lu, 2007).

This suggests that of elements design must be frozen and specifications completed at an earlier stage of the project than traditionally.

3) LIMITED CHOICE OF SUPPLIERS

It has been reported that CPOs are unwilling to commit to single point suppliers due to manufacturing delays and associated risk. This inhibitor is further enlarged due to the limited choice of supplier and supplier capacities (Nadim and Goulding, 2010). The risk that a supplier could go into liquidation can have disastrous consequences on construction projects.

4) HIGHER UPFRONT COSTS

The use of OSC requires largely different payment terms and cash-flow arrangements to traditional methods due to upfront costs in the form of a deposit required for the design and development of prefabricated components (Blismas et al., 2006). This presents itself as an inhibitor to CPOs without the capacity to support such large capital expenditure (Nadim and Goulding, 2010). Lu (2007) reported that architects and engineers believe that financial institution restrictions are one of the main challenges of using OSC. New payment terms may need to be negotiated between financial institutions, clients, manufacturers and main contractors in order to overcome such barriers.

5) CONSTRAINED BY PROCUREMENT METHOD

In the traditional design-bid-build procurement, the design team and build team act in isolation of one and other. Consequently, without any input from the main contractor, key decisions made early in the design phase may hinder the use of OSC (Nadim and Goulding, 2010).

In contrast, under design and construct procurement, the main contractor is employed by the client to both design and build the project. Similar to design and construct procurement, early contractor involvement allows the contractor to have input to design, creating the potential to use OSC due to the collaborative overlap of the design and construction phases.

This suggests that clients need to branch away from traditional methods of procurement to deliver long lead times and design freedom required by OSC.

6) LACK OF EXPERTISE

Gibb (1999) reported that a perceived barrier for clients when considering the use of OSC was the lack of experience possessed by contractors. Blismas et al (2006) reaffirmed the above, maintaining that limited previous experience was a strong hindrance towards the uptake of OSC.

Further, scholars have identified that labour retraining towards an installation focus on-site may be required to facilitate a shift towards OSC (Li et al., 2014).

7) NEGATIVE INDUSTRY PERCEPTIONS

Many scholars reported the negative perception on the use of OSC as one of the most significant challenges to its adoption (Lu, 2007). This is largely due to the past failures of products and the lack of codes and standards as regulation of the OSC sector (Blismas et al., 2006). Further, the attitudes of key project stakeholders such as the developer, architect and contractors can influence the use of OSC due to the input they over decision making in the project (Pan et al. 2012).

8) CONSTRAINED BY ECONOMIES OF SCALE

A significant barrier to the uptake of OSC within the residential sector is the inability to apply economies of scale, which offsets the perceived benefit of

reduced construction cost. This suggests that only large CPOs which participate in projects requiring mass production and repetition are positioned to receive the myriad of benefits presented by OSC, due to their ability to achieve the volume of work required unless residential developments become standardised (Pan et al. 2007).

9) REDUCED FLEXIBILITY

Finally, the inability to make alterations to prefabricated elements on-site during construction has been reported to inhibit general contractors from implementing OSC (Nadim and Goulding, 2010). This displays the increased reliance of design coordination and quality control procedures required to push general contractors towards the uptake of OSC. In addition, the use of volumetric units is seen to reduce overall design options due to constraints in the shape and size of the units (Lu, 2007).

Despite the widely documented benefits of OSC, the uptake of such methods is limited. The greater reliance of prefabrication work also brings in challenges like transportation, facilities and resources management, higher upfront cost and manufacturing-related disruptions (Wong et al. 2017).

These challenges identified above in conjunction with "negative sentiments from past failures", "a low level of expertise" and "immense changes to existing processes" (Blismas et al. 2006), act as the foremost constraints to the uptake of OSC.

The impacts of using OSC as identified by previous literature are summarised in Table 2.

TABLE 2 IMPACTS OF USING OFF-SITE CONSTRUCTION (OSC)

Impacts of using OSC	References					
	A	B	C	D	E	F
1. More complicated logistics and transport ▪ Site access and layout ▪ Size and weight of prefabricated element	●	●	●	●	●	●
2. More complicated design and construct coordination ▪ Unable to freeze design early in project ▪ Incorporation of prefabricated element	●	●	●	●	●	●
3. Limited choice of suppliers ▪ Limited capacity of suppliers ▪ Unwilling to commit to single supplier	●			●	●	●
4. Higher upfront cost ▪ Deposits required for securing products	●		●	●	●	
5. Constrained by procurement methods ▪ Decisions made early in project inhibit OSC ▪ Expertise not utilised early in project ▪ Type of contract may inhibit OSC	●			●		●
6. Lack of expertise ▪ Key project personnel lack experience	●	●	●		●	●
7. Negative industry perceptions ▪ Client against the use of OSC ▪ Negative sentiments from past failure	●	●	●	●	●	
8. Constrained by economies of scales ▪ Can't be achieved in certain types of construction			●		●	●
9. Reduced Flexibility ▪ Inability to make changes on-site ▪ Less design freedom for architect	●	●		●		

References: (A) Blismas et al. (2006) (B) Lu, (2007) (C) Pan, et al. (2012); (D) Nadim and Goulding, (2010); (E) Gibb (1999); (F) Wong et al. (2017)

INDUSTRY VIEWS ABOUT THE IMPACT OF USING OSC

Stage II of this study focused on confirming the impacts of OSC on project management practice as identified in the literature review.

Interviewees were presented with Table 2 and asked to confirm if the identified attributes are impacting the project practice. The results are presented in Table 3. Interviewees generally verified those impacts of using OSC found from the literatures.

Opinions about how these impacts can be mitigated were solicited during the interviews and reported below:

1) PROBLEMS ARISEN FROM COMPLICATED DESIGN AND CONSTRUCTION COORDINATION

In order to cater for long lead times associated with prefabrication, interviews placed an emphasis on 'freezing' associated elements of design earlier on

in the project. This brings a behavioural change to one of increased collaboration.

Further, interviewees reflected that their design teams have been front end loading their work to allow for the approval of shop drawings and the subsequent letting of trades.

Interviewee A3, an experienced Construction Manager of a large construction company in Melbourne, outlined the difference in design coordination practices, stating, "there is a lot to consider unlike when you are doing on-site, so all the way from procurement through to delivery, you have got your design, your shop drawing process, then you have got procurement of materials once you have had your shop drawings reviewed and approved, you have then got the sample approval process with your consultants and clients that you have got to go through."

Based on observation, it appears that interviewees understand the need for a more collaborative approach to be taken when using volumetric prefabrication. Interviewee A9 emphasised this, stating "I think the whole design process needs to be brought together collaboratively nor just frozen. I think the fabricator needs to be involved during concept stage so that they are aware of the designers' imperative, and the designer is aware of the fabricator's imperative".

By having this involvement, design decisions can be made without precluding necessary factors that OSC components require for installation. Interviewee B1, the design manager of a large construction company, described this, "when it comes to documentation, if we know the items are going to be prefabricated off-site we would try to build in tolerances". To assist with the seamless integration, CPOs have been adopting BIM. Admittedly, CPOs haven't been adopting BIM to its full potential, mostly utilising it for its clash detection capabilities. Again, this presents a shift towards a more collaborative approach between project parties.

2) REDUCED FLEXIBILITY

In order to combat the reduced flexibility of off-site components once fabricated, interviewees agreed that the industry has been trying to explain to the clients and stakeholders of the difficulties of making changes on-site.

In addition to education of clients, CPOs that the interviewees are working in have been relying on quality control and collaboration to ensure seamless integration of in-situ and off-site components. In regard to the freedom of design associated with off-site components, respondents only believed it was applicable with the use of modular units.

3) RESPONSE TO NEGATIVE INDUSTRY PERCEPTIONS

Interviewees believed the negative perception reported by Lu (2007) that industry stakeholders have towards OSC was waning. Through its emerging use, stakeholders have begun to realise the benefits prefabrication has on the construction practice. Whilst a cultural change within the industry has assisted in reducing the negative perceptions some may have to OSC, some parties are still wary of utilising it on projects.

However, Interviewee A8 offered a solution to negative perceptions by, "voicing the benefits, basically doing a risk and opportunity analysis on each individual project". This method aims to gain clients' acceptance. Communication of the benefits of OSC and education of stakeholders was commonly cited as the most widely adopted means of shifting industry perceptions towards one of acceptance.

However, Interviewee B2, thought client perceptions could also be a driver, stating "A customer's aspiration to be at the forefront of innovation and new trends, so this could be a driver for government or government business customers who want to show case policy, as compared to industry".

TABLE 3 VERIFICATION OF THE IMPACTS OF USING OSC ON PROJECT MANAGEMENT PRACTICE

Impacts	Verified by interviewees
1. More complicated logistics and transport	All
2. More complicated design and construct coordination	All
3. Limited choice of suppliers	All
4. Higher upfront cost	All
5. Constrained by procurement methods	All
6. Lack of expertise	All
7. Negative industry perceptions	All
8. Constrained by economies of scale	A1, A3-A8, B1-B11
9. Reduced Flexibility	A1, A7, A8, B1-B6, B10-11

4) TACKLE PROBLEMS ARISEN FROM TRANSPORT AND LOGISTICS

As identified by Jaillon and Poon (2014), an increased reliance on transport and logistics is presented as one of the most pronounced barriers to the use of OSC from a contractors perspective. In response to this new challenge, CPOs have been placing an increased focus on tracking and supply chain management.

The reliance on tracking creates new responsibilities. In their experience, Interviewee A6, a construction manager at a tier two construction company stated, "we track the procurement process offshore, whether we send people over there, right through to the loading of containers, right through to tracking the ship to clearing customs then storage".

A shift in focus away from simple site matters towards an international procurement sense is required to successfully incorporate overseas manufactured materials. This represents a resourcing change in responsibilities of key staff.

Further, contractors are having to allow for more deliveries on-site to cater for the increased use of prefabrication. With the use of larger prefabricated items that can't be transported during day time, main contractors are analysing hook time to ensure cranes are not exceeding lift time capacity. As opposed to traditional methods where pallets are simply delivered to site, stored and then installed, prefabricated components are delivered using a just-in-time strategy to cater for site restrictions, especially in high-rise construction.

This places a huge emphasis on tracking and scheduling of deliveries. Interviewee B2 illustrated this, stating "Our programs are updated daily to account for different factors whether it might be weather, or it might be a delay in an item coming to site, and you've basically just got to rearrange to make it fit".

5) COPE WITH THE SOURCE OF SUPPLIERS

To combat the risk associated with single suppliers as reported by Blismas et al. 2006, CPOs have implemented many changes to their past practice. When considering the risk of a supplier going into liquidation, not meeting quality or time requirements, Interviewee A7 presented a solution, "We found if we went to one supplier it would affect the risk profile significantly, so we split up areas and then we targeted a number of different suppliers". However, it is not always possible or preferable to go to multiple parties for a single project element, CPOs these days are looking for a one stop shop.

To cater for the aforementioned possibilities, main contractors have been seeking securitisation of the product to ensure prefabricated components become their property in the event of manufacturer liquidation. As mentioned previously, to keep suppliers on track, main contractors have been monitoring their progress with experts on the ground who can give status reports and track progress and quality control. Interviewees also noted that with the current global market, lack of suppliers is not an issue.

The above changes CPOs have made in response to the above risk can be categorised in to both changes in resourcing and organisational practice.

6) PROBLEMS ARISEN FROM CONVENTIONAL PROCUREMENT METHOD

Interviewees belief aligned with Nadim and Goulding (2010), in agreement that more collaborative project procurement methods must be taken to incorporate larger volumes of OSC. The interviewees understood that key decisions early in the design stage may prohibit the ability to utilise certain OSC methodologies.

Further, the participants understood that certain off-site approaches required long lead times that traditional procurement methods simply didn't allow for.

Notably, early contractor involvement (ECI) was suggested as the method to overcome this hurdle and achieve the best outcome for the client. Interviewee A2 noted this, saying, "to get the full benefits for the client, the contractor should be brought on earlier, at the same time as the architect. Early contractor involvement". This was supported by interviewee A1, stating, "In a lot of tier one companies, there is a push to early contractor involvement. I think it's very important. From there you can find value management options such as off-site manufacturing that you can incorporate into the building".

Further, Interviewee A4 showed a shift in the client's focus, stating that "ECI is probably 30% of our tenders. Again, this echoes the findings of Wong et al. (2017) that CPOs positioned to receive benefits are the ones pushing for the methodology as clients and main contractors both stand to benefit from its use. This represents a behavioural change from the industry, making a shift to ECI which facilitates best practice

7) LACK OF EXPERTISE

Participants believed that the lack of expertise with prefabricated components was becoming less of an issue within the Australian market due to its developing use. Specialist suppliers and

subcontractors exist within the Australian market; however, it must be noted that there are some still new to the market.

Interviewee A4 mentioned this, "There are some very sophisticated suppliers and contractors out there who often subcontract their work out, so whether it's global or local they are experts in their fields anyway". When seeking to implement prefabrication, knowledge and risk sharing must be understood. To combat this, CPOs are seeking training and knowledge sharing to ensure smooth integration of OSC into projects.

8) DEALING WITH HIGH UPFRONT COSTS

Interviewees admitted that changes had occurred to cater for higher upfront costs associated with OSC. The changes have predominantly involved a change of practice from traditional progress payments associated with in-situ methodologies towards an increased use of bank guarantees and deposits.

Interviewee B10 Identified that changes need to be made to current payment terms with financiers, stating that, "There is an issue of who is going to pay. The financiers don't pay for anything unless it's installed and if its off-site, you've got to carry a bank guarantee. I think the industry is learning. There's still a high reliance on the builder having to cash flow the product. This may make that decision prohibitive for some builders".

This process change has been widely adopted throughout the industry. Whilst with past projects, items such as lifts required deposits. Now, with the increased use of OSC, the use of deposits is becoming more prevalent within projects and builders are having to carry more of a financial burden.

The above describes the changes CPOs have made to account for the impacts of the use of OSC. The changes have revolved around an increase in collaboration among key project parties in conjunction with a focus on transport and design. Interviewee A1 believed "Collaboration still is glorified forms of existing contracts, and it's a behavioural change".

The application of technologies such as BIM is assisting CPOs implement prefabrication on projects however, they are merely scraping the surface of BIM's capabilities.

Whilst the adoption of technology can be implemented through organisational change, behavioural changes including increased collaboration can be driven by revising processes and past practice to accommodate.

THE CONCLUSIONS

This study aims to evaluate the impact of using OSC on the project management practice. 24 semi-structured interviews were conducted in Melbourne, Australia in order to accomplish the research objective. The research findings indicate that CPOs may have been changing their practice in response to the greater reliance on prefabrication. It is positive to note that the interviewees generally understood conventional construction methods of production may no longer help them cope with increasing market demands. Whilst prefabrication has been identified as a more effective alternative, project practice change is required.

This study delivers an insight into how to mitigate the impacts of more extensive use of OSC on project management practice. Nevertheless, the study recognises numerous constraints applied throughout its context. Regarding the interviews, although 24 valid responses

are considered reasonable for research of this kind, a larger number of replies are preferred. Using greater sample size for analyses and collecting data would, therefore, be desirable in further studies. Furthermore, the geographical constraints of this study should be considered when examining the findings of this study.

This study focuses on the Australian Construction Industry, in particular practitioners employed and located in the greater Melbourne region. However, it must be noted that multiple participants have backgrounds in other Australian States.

The uptake of prefabrication in terms of size is fairly consistent throughout Australia. If this study was replicated in a different geographical location, dissimilar results could be produced in accordance with current construction practices.

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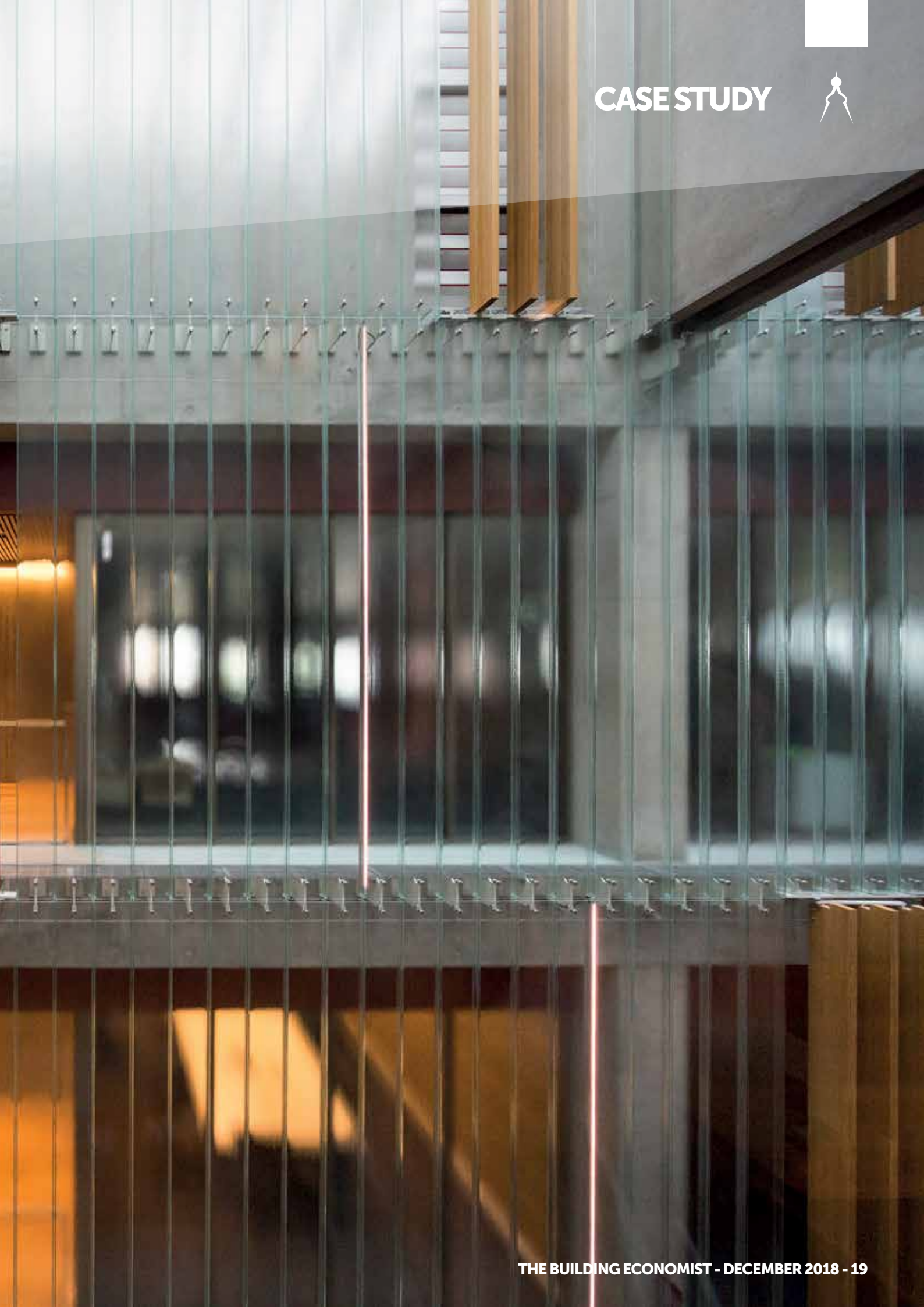
CASE STUDY

DELIVERING THE NEW AUSTRALIAN EMBASSY IN THAILAND



CASE STUDY

The new Australian Embassy in Bangkok, Thailand sits as a proud landmark at the edge of the business district. It conforms to the vision set out by the architects, BVN, of capturing the landforms of the Australian desert, in particular the iconic Uluru. The Embassy has been recognised with the Jorn Utzon Award for International Architecture at the 2018 National Architecture Awards.

The Embassy was constructed by Bouygues Thai-VSL Australia Company Limited, with a construction cost of $110 million. The Embassy complex comprises the main Chancery building, a Head of Mission Residence, and an Entry and Guardhouse Pavilion, complete with native landscaping and internal and external water displays.

WT Partnership (WT) were delighted to be appointed by the Department of Foreign Affairs and Trading (DFAT) to provide the full suite of pre and post-contract quantity surveying services.

COST PLANNING CHALLENGES

It was clear from the beginning the project faced many challenges. The project required the Embassy to be constructed to Australian Standards and meet many Australian Statutory Regulations, both of which are unfamiliar to contractors in Asia. The works included trades such as bricklaying that is second nature to the Australian construction market, but such skills are not readily available in Thailand. The materials used in the build were not familiar to the local workforce, which raised concern over the level of quality expected for the project. Additionally, unique security requirements and systems required the procurement of specialist contractors from overseas to supervise installation.

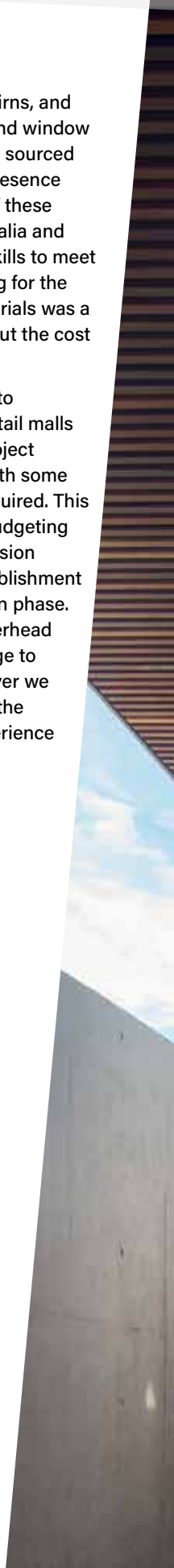
These challenges presented a unique project to WT in establishing and maintaining a budget throughout the design stage that considered an unfamiliar construction market and resource availability.

To overcome these challenges, we drew upon the experience and expertise of our Asia offices in Hong Kong and Singapore and appointed a local Quantity Surveying firm. This provided valuable input into our cost planning and a good understanding of the local construction market, including labour rates, expertise and availability of skilled labour, productivity rates, material availability and pricing, and escalation forecasts. Nevertheless, it was understood that the cost plan would need to carry an appropriate amount of risk should our assumptions need to change.

Cost planning was undertaken by considering the cost of the building if it were built in Australia, and then making suitable adjustments. On a trade by trade basis, we needed to establish whether there was sufficient local skilled labour and the level of supervision required or if we needed to hire expatriates. We also needed to assess whether materials could be procured from Thailand or needed to be imported. In many cases we needed to build up rates by first principles to consider labour rates and productivity, material supply and installation. Some trades such as security services, audio visual, and the integrated building management system required specialist expertise. These trades attracted a cost premium due to the labour being sourced from Australia.

WT worked closely with the design team to establish material choices that could be procured as much as possible in Thailand. This brought down costs, but it was clear that many specialist materials, such as high security doors and windows, would need to be sourced internationally. The project vision was also to incorporate many Australian materials into the building. Materials such as Austral bricks, Pilbara marble from Cairns, and Blackbutt timber for flooring and window sills are some of the Australian sourced materials that have a strong presence in the Embassy complex. All of these had to be imported from Australia and installed with the necessary skills to meet the quality required. Estimating for the supply and installation of materials was a significant challenge throughout the cost planning stages.

Despite Bangkok being home to commercial, residential and retail malls of an impressive scale, this project required a major contractor with some familiarity of the standards required. This added further complexity of budgeting with management and supervision costs, as well as costs for establishment in Bangkok for the construction phase. Budgeting preliminary and overhead costs was a particular challenge to our cost planning team, however we overcame this hurdle through the extensive knowledge and experience of our Asia offices.



CONTRACT SELECTION AND PROCUREMENT STRATEGY

The procurement strategy for the head works contract was heavily influenced by the need to retain control of the design, particularly due to the sensitive security requirements and systems. This requirement lent itself towards the need for a traditional construct only contract with minimal contractor design portions. As a Government funded project, certainty of cost was also a high priority. This determined the need to have a lump sum contract and to maintain a good level of cost control during the construction phase. To achieve this, WT produced a full bill of quantities that was incorporated into the contract. This enabled the desired cost control over contract variations and the assessment of contractor progress claims.

The contract selection was an amended version of the Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer prepared by FIDIC 1999. The FIDIC suite of contracts are used globally on all types of projects. This contract is known to provide a balanced approach to the roles and responsibilities of the main parties, as well as to the allocation of risk. This allowed DFAT to benefit from a competitive tender process without the loading of cost risk into the price.

Procurement of the head contract works was through a two-stage tender process, with tenderers selected following an expression of interest process. This was deemed the most appropriate strategy to deliver the most competitive price for the contract works. The successful tender was in line with the cost plan.

LESSONS LEARNED

As a construct only type of contract, a greater number of variations were expected due to the client's exposure to some risks that would otherwise be at contactor cost. The incorporation of a priced bill of quantities in the contract documents proved to be an invaluable tool to WT, as a significant portion of the cost were subject to local Thai labour rates and material pricing. This allowed us to provide a more accurate forecast for the cost of variations, and it made the agreement on the value of variations easier and more efficient. This was important for a project where cost control was paramount.

WT also maintained the services of the local Quantity Surveying firm throughout the construction phase which enabled us to seek advice on labour rates and material pricing for variation works of a different nature to those included in the contract works. We were able to negotiate the price for variations with greater confidence having this knowledge at hand.

The construction of the new Australian Embassy in Bangkok allowed us to collaborate and work with our global WT offices to understand the local market and successfully manage and deliver a comprehensive cost plan.

This case study was provided by WT Partnership.

GUIDANCE NOTE
CONSTRUCTION FINANCING REPORTS
2018

CONSTRUCTION FINANCING

BACKGROUND

PURPOSE

The purpose of this Guidance Note is to create a uniform scope of service and clarify the quantity surveyor's role in providing construction cost management services to both the financier(s) and developer. This Guidance Note does not purport to be a comprehensive description of the law and members should obtain independent legal advice.

STATUS OF GUIDANCE NOTES

Guidance Notes are intended to embody recognised 'good practice' and therefore may provide some professional support if properly applied. While they are not mandatory, it is likely that they will serve as a comparative measure of the level of performance of a member. They are an integral part of Construction Cost Standards Manual.

APPLICATION

As part of a debt funding agreement between a developer and financial institution there is often a requirement for a quantity surveyor to represent, review and oversee the financing of a project on behalf of the financier(s).

The quantity surveyor's role in delivering construction cost management services is to:

- Ensure all risks associated with the project are identified and mitigating strategies developed and documented
- Assist financiers with their due diligence process, identifying deficiencies in documentation
- Undertake due diligence on behalf of the financier
- Provide accurate and timely financial reporting in accordance with the financier's instructions
- Establish the scope and any limitations associated with this service
- Represent the financiers interest.

Typically, an Initial Report and subsequent Progress Reports are undertaken by the quantity surveyor, in accordance with the financiers' instructions.

The quantity surveyor is to provide construction financing reports in accordance with this Guidance Note unless the financing institution's instructions (Brief) stipulate otherwise.

The extent of the quantity surveyor's compliance with this Guidance Note will be dependent upon the written instructions from the finance institution.

The quantity surveyor's reports are to be provided to the appointing financial institution only, unless the financial institution has provided a Release in writing for the report(s) to be made available to third parties.

Pertinent definitions are included at the back of this Guidance Note.

MINIMUM REQUIREMENTS OF THE QUANTITY SURVEYOR

EXPERIENCE

The preparation and delivery of reports to financial institutions, acting as the Financier's representative, should be undertaken by a Corporate member of the Australian Institute of Quantity Surveyors (AIQS), holding the designation of Certified Quantity Surveyor (CQS).

Any employees undertaking this service must be supervised by a suitably experienced Corporate member.

PROFESSIONAL INDEMNITY INSURANCE LEVELS

To ensure that appropriate and not excessive levels of professional indemnity insurance are not called for, the AIQS recommend the following levels of coverage:

Construction Cost (excluding GST)	Level of PI
$ 0 – 5m	$ 1 m
$ 5.01m - $10m	$ 3m
$ 10.m +	$ 5m

Or as required by the financier.

CONFLICTS OF INTEREST

Any conflicts of interest (real, potential, or perceived) such as previous involvement in the project or other services being provided for the developer should be disclosed immediately to the financial institution. These should not necessarily preclude the quantity surveyor from undertaking their role unless they are of an issue which may in practice or in perception prevent the quantity surveyor from acting on behalf of the financial institution in an independent manner. Where the quantity surveyor has a dual role, different Directors within the quantity surveyor's company should sign-off on the different role reports.

LIMITATION OF SERVICE

Recognising that while the quantity surveyor is an expert in construction costs, they may not be experts in quality of workmanship or programming, and therefore, should limit their comments to areas in which they are competent to do so.

CONSTRUCTION FINANCING

Notwithstanding this, the quantity surveyor should make observations with regards to workmanship and programming based on their level of experience.

It is not the role of the quantity surveyor to provide an opinion pertaining to the value of the site or the expected realisation of the development.

The insurances provided by the parties are to be included in the report, with the quantity surveyor providing comment on the appropriateness or otherwise of these insurances.

INITIAL REPORT

The initial or prefunding report allows the financier to verify that the project has been properly established by way of authority approvals, a building contract, construction cost, total development cost, builder's capability, project insurances, completeness of design, consultant's professional indemnity insurance, development cost, program, positioning on title and environmental considerations. The initial report by addressing each of these criteria allows the financier to reconcile against conditions precedent to funding.

EXECUTIVE SUMMARY

The quantity surveyor should provide an overview of the project, identifying any actual and/or potential outstanding issues, risks, problems and any limitations. This should also include a summary of outstanding information and / or any non-conforming issues.

REPORT IDENTIFICATION

The report should identify the project by street address and real property address (Lot & DP or Folio Identifier). It should also list the developer and note that the report has been prepared for a named financial institution and should not be used/relied on by any other party without formal written approval from the named financial institution. The quantity surveyor should identify the source of any information included in the report.

ASSUMPTIONS AND EXCLUSIONS

The quantity surveyor should ensure that a comprehensive list of all assumptions and exclusions which they rely upon are contained within any report prepared by the quantity surveyor. These items should be reviewed by the Financier in association with the quantity surveyor to ensure that the Financier understands and accepts them.

LIMITATIONS OF REPORT

The quantity surveyor's report should be limited to the party for whom it is prepared for. The report should not be disclosed to any other party without the quantity surveyor's and / or Financier's authority and should not be relied upon by another party.

Key issues:

The quantity surveyor should be cognisant of the following:

- The report should be as comprehensive as the information allows. Where there are gaps or contradictions in the information then this should be noted in the report and brought to the funders attention
- It is important that the quantity surveyor understands that for them to prepare a comprehensive report efficiently they require all the information in a timely manner. The Financier should also understand that where information is not readily forthcoming, then the time taken to prepare the report may increase (as may the quantity surveyor's fee)
- Disclaimer Clauses and Qualification Statements.

SITE DESCRIPTION

A basic written description of the subject site should be provided noting any physical features. This should be based on both a review of available documentation and a site visit.

Key issues:

The quantity surveyor should include notations on:

- Accessibility, unusual features, is there an existing building, is it opposite a freeway, is the site steep or sloping, what is the land use surrounding the site (e.g. is it in a residential area), liability to contaminate the site, and the factors which could affect the cost of construction
- Date of site visit – the quantity surveyor should visit the site for the Initial Report
- The availability of infrastructure services
- Any site features that may hinder the efficient delivery of the building.

PROJECT DESCRIPTION

A basic description of the project should be given in the quantity surveyor's report outlining the basic parameters of the project such as areas, number of units, number of stories, number of carparking spaces etc. The level of detail should be enough for anyone reading the report to be able to identify the type, scale and nature of the project.

Key issues:

A good description is critical and should address the following:

- Description of the scale of project
- Areas – GFA, FECA, UCA
- Functional areas
- Building Fabric & Finishes
- Unit mix (if applicable)
- Ingress / egress to the site and building during construction.

PLANS AND SPECIFICATIONS

DOCUMENTATION

The documents used to prepare the cost verification and initial report should be listed. If there are many documents these can be included as an appendix rather than in the body of the report. The quantity surveyor should state whether the documents they used are the same as those the builder priced on. Variances between these documents and those used for obtaining approvals should be noted and commented on accordingly.

Any documents used to obtain local authority approvals should be provided including a copy of the stamped set.

Key issues:

The quantity surveyor should:

- Comment on completeness of documentation
- Note any design risk
- Note any design documentation and assess any inconsistencies
- Highlight the existence of any imported materials
- Note any prefabricated works.

DESIGN CERTIFICATION

It is important that the quantity surveyor obtain, and references within the initial report, copies of all relevant Statutory Authority Approvals, including (but not limited to):

- Structural engineers' certification
- Architects documents in accordance with Statutory Authority approvals
- Architects documents reflecting pre-sale contracts designs

and provide confirmation, or otherwise, that the plans contained within any sales documents are consistent with those approved by the relevant council and form the basis upon which the building contract is agreed.

LAND SURVEYOR CERTIFICATION

The quantity surveyor should ensure that the Licensed Land Surveyor's Certification:

- Confirms site boundaries are defined
- Confirms that proposed development is positioned correctly on site, and there are no encroachments
- Confirms that the set-out conforms to/ with the planning approval.

LOCAL AUTHORITIES AND APPROVALS

The quantity surveyor should review all local authority approvals required in the jurisdiction of the subject property, including (but not limited to) all Development Approvals, Construction Consents, road authority approvals, electricity supply approvals, and local water supply authority approvals.

Key issues:

The quantity surveyor should:

- Confirm any pre-construction conditions
- Include a schedule of all approvals and their details
- Note any onerous conditions
- Note any statutory commencement and completion dates
- Confirm which conditions have been satisfied
- Provide planning matrix if available
- Confirm Land Surveyor Certification.

TOTAL DEVELOPMENT COST (INCLUDING SOFT COSTS)

In detailing the total development costs, the quantity surveyor should:

- Ensure a measured and priced estimate for the construction cost is in place
- List development costs
- Comment on allowances and recommend allowances where applicable
- Comment on any 'missing' allowance
- Confirm any local government (Council) levies and approvals are included
- Comment on any government regulatory requirements (e.g. NSW Dept. Fair Trading Strata Building Bond Scheme).

The quantity surveyor should also identify any works excluded under the Contract and make provision for same in Other Development Costs. The total development costs, with the identified budget items, should be set out in a tabular format, with the Funding Table to be verified with the Financier.

CONSTRUCTION FINANCING

CONSTRUCTION COST VERIFICATION

For a cost verification, the quantity surveyor should undertake an estimate to a level of detail commensurate with the level of detail contained within the building contract documents. This should include, where possible, comparisons on a trade basis with the builder's tender. Any significant variance with the builder's tender and the construction contract should be highlighted and discussed with the parties.

Key issues:

In verifying the construction cost, the quantity surveyor should:

- Where available, compare the builders price with other tenders received
- Identify any Value Management items included in the Builder's price
- Comment on any exclusions noted in the Builder's tender and whether these items should be allowed for elsewhere, or not
- Comment on items specifically excluded from Builders tender scope to be provided by others
- Compare the Contract Sum with other benchmark projects of similar size and nature
- List any Prime Costs and Provisional Sums, and comment on the appropriateness of the allowances
- Note any potential budget overruns
- Undertake and include a proper measured and priced estimate (not metre square rates)
- Benchmark against similar projects (that the quantity surveyor has worked on), and include a statement addressing how this project compares to other projects similar in size and nature
- Identify client supply items and implications to the contract
- For Owner-builder projects, confirm the level of trade lettings to-date and whether margin is, or is not, included.

CONTINGENCY

In determining the level of contingency, the quantity surveyor should take into consideration:

- the certainty of the construction cost
- the level and completeness contract documentation
- completeness of Other Development Costs, and
- any other special risks identified.

CONSTRUCTION/BUILDING CONTRACT, SUPERINTENDENT & INSURANCES

A review of the Construction/Building Contract should be made.

The quantity surveyor should comment on the contents of the construction/ building contract(s), including details of the contract sum, parties noted, programme, contract documents, liquidated damages, performance securities provided and any other items likely to be of interest to the financial institution should be noted.

It is important for the quantity surveyor to ensure that the construction documentation being relied upon are fully executed documents. If fully executed documents are not available, then comment to this effect needs to be included in the Initial Report.

Key issues:

The quantity surveyor should:

- Note the type of contract and comment on its suitability for the proposed project
- Confirm the contract conditions are reasonable and make recommendations where they are not considered reasonable
- Comment on risk allocation of latent conditions
- Comment on the limited liability of the Builder
- Confirm bank guarantees provided as performance security are unconditional and with no expiry, and subject to Financier's acceptance
- Confirm date for Practical Completion is achievable and identify buffer against earliest presale / lease sunset date.

SUPERINTENDENT

The Initial Report should identify who the contract superintendent is and outline their contractual role.

Key issues:

The quantity surveyor's Initial Report should:

- Verify the independence of the Contract Superintendent
- Comment on the Superintendent's experience
- Note any previous experience with the Superintendent
- Include a Conflict of Interest Statement, provided by the Superintendent, including any past or present relationship with the builder/ contractor
- Note any termination clauses and/or conditions.

INSURANCES

The quantity surveyor should obtain construction insurances where a builder has already been engaged. These

insurances should include Professional Indemnity (where there is a design component), Contract Works, Public Liability and Workers Compensation insurances. The public liability and all Works policies should note the Financier as an interested party.

Key issues:

The quantity surveyor should:

- Ensure that the insurances are listed together detailing; cover, underwriter, broker and expiry date
- Confirm that Contract Works Insurance is site specific
- Confirm the insurances are in line with the Building Contract
- Comment on the level of coverage and make recommendations if coverage is inadequate.

PROGRAMME

The quantity surveyor should review and comment on the construction and development programmes.

In addition, the quantity surveyor should also review the programme with regard to sunset clauses in pre-sale and / or lease contracts, including any penalty clauses in lease agreements, where possible.

Key issues:

The quantity surveyor should:

- Comment on inclement weather allowance
- Confirm Date for Practical Completion and any Separable Portion Dates are noted in the Building Contract, and reflected in the programme
- Confirm dates in the bullet point above are achievable when measured against Planning approval commencement and completion dates.

DEVELOPER CAPABILITY

The quantity surveyor should identify any known or perceived risk associated with the project developer.

CASHFLOW

The quantity surveyor should review and comment on the builders' construction cashflow, particularly how it relates to the development program. The quantity surveyor's report should include:

- An extrapolation of the cashflow against the construction programme
- Their own cashflow and comment on how it compares with the builders
- Note any anomalies in the Builder's cashflow.

TRI-PARTITE AGREEMENTS

The quantity surveyor should request a copy of any Tri-Partite Agreements to identify the parties to the agreement and determine whether the Tri-Partite Agreement(s) conforms with the building contract. While this compliance should generally be undertaken by the Financier's legal team, the quantity surveyor should review the Tri-Partite Agreement(s) for technical requirements or any legal aspects that may affect the building contract or the delivery of the project.

The quantity surveyor should identify their role under any Tri-Partite arrangement(s).

BUILDER/CONTRACTOR CAPABILITY

The quantity surveyor should address the Builders capability to deliver the project.

Key issues:

In addressing the Builder's capability to deliver the project, the quantity surveyor should:

- Note the Builders Performance Security
- Note the Builder's Work-In-Progress and capacity to undertake the project considering existing commitments
- Note the Builder's margin (if known)
- Note the Builders licence and registrations, comment on appropriateness of class, and note whether the builder has been subject to any regulatory disciplinary action
- Comment on previous experience with the Builder and provide a list of similar projects completed
- Provide commentary around commitments and capability of the Builder's major sub-contractors.
- Assess the Builders allocated construction and management personnel and comment on experience.

CONSULTANTS

All consultants engaged by the developer should be noted. Copies of the professional indemnity insurance policies of the main consultants such as the architect, structural engineer, civil engineer, certifier, Building Code of Australia consultant and the like should be obtained by way of Certificate of Currency.

If they have not been provided, then a comment to that effect should be made in the initial report.

Key issues:

The quantity surveyor's report should include:

- A schedule of consultants and their professional indemnity insurance, presented in a tabular format.
- Comment on any experience the

quantity surveyor has had with any of the consultants on previous projects

- Comment on the suitability of the professional indemnity insurance held by the Consultants, and confirmation that they are in line with the Building Contract.

GEOTECHNICAL REPORT

The quantity surveyor should obtain and review the Geotechnical Report, noting any conditions that should be considered by the design engineers in their designs.

Key issues:

In reviewing the Geotechnical Report, the quantity surveyor should confirm whether:

- The Geotechnical Reports are draft or final
- The structural design reflects any conditions that should be taken into consideration
- The construction cost estimate allows for any advice noted in the Geotechnical Report
- Overlays (map in a council planning scheme showing the location and extent of special features such as Heritage, Environmental, Bushfire Management, and Flooding etc)
- Latent Conditions are likely, based on the Geotechnical Report and experience in surrounding developments.

ENVIRONMENTAL REPORT

The quantity surveyor should confirm whether an Environmental Report is required for Development Approval. If so, this should be reviewed in conjunction with other design documentation and Statutory Authority Approvals.

The quantity surveyor is to note the Environmental Report and advise whether there are any contamination issues associated with the development site. If contamination is identified, note whether remediation costs have been included in the Development Costs.

Commentary on environmental aspects is only to be provided if the Executive Summary identifies any issues, otherwise state there are no environmental issues or no environmental report was available at this time.

Key issues:

In reviewing the Environmental Report, the quantity surveyor should confirm whether:

- The Environmental Reports are draft or final
- The structural design reflects any conditions that should be taken into consideration (e.g. structure will need to meet earthquake requirements or withstand intense heat in bushfires)
- The construction cost estimate allows for any advice noted in the reports
- Overlays (map in a council planning scheme showing the location and extent of special features such as Heritage, Environmental, Bushfire Management, and Flooding etc)
- The Planning Approval requires an environmental report
- An Environmental Certificate is required together with any 'completion by' requirements under the planning permit;
- Provide commentary in respect of any Environmental Management Plan in place or to be implemented.

ADJACENT PROPERTIES

The quantity surveyor should review any agreements with adjacent properties, noting any easements and rights of way.

Key issues:

The quantity surveyor should:

- Obtain a copy of any adjoining owners consent
- Seek and note any formal legal agreements
- Seek and note any protection notices required
- Identify and describe any structural support for adjoining properties
- Identify potential issues with adjoining owners
- Identify environmental considerations which may impact adjoining properties.

PRE-SALES AND AGREEMENTS FOR LEASE

The quantity surveyor should review and comment on any pro-forma pre-sale agreements and agreements for lease in conjunction with the construction contract. Attention should be paid to aspects such as sunset clauses with the programme and any specifications noted in sales contracts compared to the construction contact. Any variances or issues should be highlighted.

Key issues:

The quantity surveyor should:

- Confirm whether the plans and areas contained within the sales contract(s) conform to the plans upon which the building contract is based
- Reconcile contract specifications with pre-sales
- Identify any sunset clauses.

VALUERS REPORT

Where required, a valuers' report should be provided, and the quantity surveyor should review this for any comments on

quality and materials and compare these to the construction documents. Where a Valuer's Report has been provided, check whether the construction cost used by the valuer is in line with the recommended construction budget.

OTHER MATTERS

The quantity surveyor should note:

- Remote location accessibility issues
- Identifiable political issues
- Requirement for any Specialised Development Approvals

RISK MANAGEMENT

The quantity surveyor should:

- Subject to any of the foregoing matters in this Guidance Note, identify all potential risks which could affect the delivery of the project.
- Identify any exclusions forming part of the works which need to be allowed for elsewhere (part of developers' costs).

DIRECTOR SIGN-OFF

Quality Assurance within the quantity surveyor's practice should be reported on, including:

- Person who prepared the report (Should be a CQS)
- Person who reviewed the report (Should be a CQS)
- Person who signed the report (Should be a CQS)

APPENDICES

Append any actual Reports and Certificates received. These could include:

- Verification estimate
- List of plans and specifications
- Authority approvals issued, including stamped plans
- Building Contract
- Copies of bank guarantees as performance security
- Builder's registration
- Project insurances certificates of currency
- List of consultants
- Certificates of currency of consultant's professional indemnity insurance
- Land Surveyor's certification and plan
- Geotechnical Report
- Environmental Report.

REPORT DATE

Include the date of the inspection and the date the Initial Report is signed.

PROGRESS REPORT

EXECUTIVE SUMMARY

The quantity surveyor should summarise the status of the project and works completed for the month, including key matters identified in the Progress Report. The summary should note:

- Amount of the Builder's Progress Claim
- Amount of the quantity surveyor's Certification and any difference against the Builder's Progress Claim
- Amount of Other Development Costs recommended
- When payment is due under the Contract
- Whether certification has been agreed with the Builder.

To include a summary of outstanding information and / or any non-conforming issues

Key issues:

The quantity surveyor should include commentary covering:

- Exclusions
- Assumptions
- Outstanding items
- Other significant features included in the Progress Report
- Any matter potentially impacting the project.

LIMITATIONS OF REPORTS

Any issues which may limit the report should be listed and reviewed in consultation with the Financier.

The quantity surveyor should clearly state the limits of the Progress Report, so the financier can understand the risks contained within the report.

ASSUMPTIONS AND EXCLUSIONS

Any assumptions or exclusions, which may present a risk to the financier should be listed and reviewed in consultation with the Financier.

REPORT IDENTIFICATION

All QS reports should be referenced and numbered for easy identification. This should also include the date of preparation.

Key issues:

The quantity surveyor should include commentary covering:

- Date of issue

CONSTRUCTION FINANCING

- Report version
- Claim period
- Date of builder's claim
- Commentary on status of construction
- Identity of the person who conducted the site inspection and the date of the inspection
- Identity of person preparing the Progress Report
- Identity of person who reviewed the Progress Report
- Identity of the Director/Manager who signed the Progress Report.

PROGRESS PAYMENT CERTIFICATES

The quantity surveyor should issue a Progress Payment Certificate, not make a recommendation (to the Financier).

PROGRESS CLAIMS AND DRAWDOWN REQUESTS

Progress claims are assessed by the quantity surveyor, and the quantity surveyor's certification is the basis of drawdown requests and funding by a financier. Progress claim assessments should be made in accordance with the facility and drawdown reports made by the quantity surveyor. These should be based on claims by the Builder and development expenditure claimed by the developer.

Key issues:

In undertaking a Progress Claim, the quantity surveyor should

- Note the adjusted contract sum
- Identify the value of works completed
- Identify any unfixed materials (if permitted by contract and the Financier for inclusion)
- Note the amount previously valued
- Assess the current valuation
- Builder's claim
- Ensure all certificates for completed work have been received
- Note the date of the site visit
- Assess and agree the Progress Claim(s) with the Builder in accordance with the applicable Security of Payment Act timeline
- Exclude all works beyond the staged Building Permit
- Exclude unsecured unfixed material (where acceptable performance security has not been provided).

COST TO COMPLETE

Any report on the cost to complete should be based on the premise that the original contactor will be completing the works.

The Cost to Complete should be reported in the following tabular format:

(See table 1 - Cost to Complete on References, page 17)

Key issues:

The quantity surveyor should provide commentary on (amongst other things):

- Cost of works to complete
- Whether there is sufficient funding available to complete the works
- Percentage of trades letting (from the Initial Report)
- Any Builder payment statutory declarations

All items to be assessed on a cost to complete basis. Where the Cost-to-Complete exceeds the funding facility, the developer will need to provide funding prior to the Financier making any further payments.

CONTRACT SUM ADJUSTMENTS

Contract Sum Adjustments should be defined as:

1. "Approved Variations",
2. "Unapproved Variation Claims, or
3. "Potential Variations".

Variations will include provisional sum adjustments.

Key issues:

The quantity surveyor should provide comment on:

- Whether the variations exceed the agreed variation thresholds as per the tripartite agreement
- Any new approved and pending variations each month
- Potential variations
- Pending variations
- Provisional Sum Adjustments
- Other development work variations.

UNFIXED MATERIALS

Unfixed materials should only be included with the agreement of the funder and in compliance with the construction contract. If the Financier agrees to unfixed materials, the quantity surveyor should confirm:

- Insurance cover for the value of the goods, with the Financier named as an Interested Party
- Any unfixed materials are identified and included in the contract
- The transfer of ownership of material
- Materials are labelled as being the property of the developer
- The goods are appropriately secured
- Any undertaking in the form of an unconditional bank guarantee will

need to have the Principal listed as a beneficiary.

If the contract does not address any of these issues, the quantity surveyor should include a note to that effect in the Progress Report.

CONTINGENCY

As the Financier may adopt a different contingency level to that recommended by the quantity surveyor, ensure the reported contingency budget is aligned to the final funding table.

Key issues:

The quantity surveyor should make a note in the Progress Report on:

- amount of contingency used
- whether remaining contingency is sufficient and make recommendation if not sufficient
- percent of Cost-to-Complete

SITE OBSERVATIONS

This should include an objective statement in respect of the progress of the works with relevant photos.

The quantity surveyor should provide commentary with respect to site activity and the quality of the work (including noting any Work Method Statements), any unsafe work practices, and any change in key site personnel and site specific industrial activity.

PROGRAMME

A regular review of programme should be made and any departures from this should be reported. Particularly, where the departure will lead to a delayed completion which could affect sale contracts or lease agreements.

Key issues:

The Progress Report should include Programme commentary by the quantity surveyor advising:

- Time to complete
- Forecast Completion Date (Builder's and quantity surveyor's independent forecast)
- Effect on sales contracts and lease agreements
- Approved and pending Extension of Time (EoT) - Adjusted Date for Practical Completion
- Adjusted project completion dates
- Suitability of revised programme (if applicable)
- "Net Programme" and "Gross Programme"
- Provide commentary on completion programme status
- Contingency or "delay" allowance to be included in Programme
- Whether the Programme is back-to-back with contract
- Whether the programme is detailed enough to identify key milestone dates
- Actual cashflow against performance

The quantity surveyor should provide an opinion only, with respect to the forecast Project Completion date (Noting that the quantity surveyor does not hold themselves out as an expert in construction programming).

Where a sub-consultant construction programmer is required to provide commentary on the development programme and whether the contracted timeframe will be met, the quantity surveyor should make an allowance for such.

CASHFLOW

To ascertain percentage of works completed against percentage of time lapsed as an indication of status with progress (work vs time).

Key issues:

The quantity surveyor should:

- Comment on how the Builder is tracking against their original cashflow, and also against the quantity surveyor's forecast cashflow
- Ensure the Cashflow does not include variations
- Provide an updated cashflow table (Actual and forecast expenditure)

BANK GUARANTEE SCHEDULE (WHERE REQUIRED)

Where applicable the quantity surveyor should list the Bank Guarantees, including:

- Builder's Security, and
- security for unsecured and offsite material

LICENCES AND REGISTRATIONS

The quantity surveyor should ensure builders licence and registration are current (Expiry dates to be identified).

INSURANCES TABLE

Builders and Consultants insurances should be reviewed monthly to ensure that they have not expired. Where they have lapsed, Certificates of Currency should be obtained prior to issuing a drawdown report.

The types of insurances required include Professional Indemnity / Liability /

CONSTRUCTION FINANCING

Workcover where the contract is a design and construct, public liability and all works contract insurances.

Key issues:

The quantity surveyor's report should:

- Identify Insurance levels
- Note expiry dates
- Provide Insurances in a table format
- Ensure Financier's interest is noted on Builder's Contract Works and Public Liability insurance.

The schedule of insurances for the Builder and any Consultants should be reported in the following tabular format:

(See table 2 - Insurances Table on References, page 17)

CONFORMITY OF CONSTRUCTION WORKS TO DATE

The quantity surveyor should obtain a copy of all relevant compliance certificates from consultants, including:

- Building Certificates
- Structural Engineering Certificates
- Civil Engineering Certificates
- Practical Completion
- Certificates of Compliance

DESIGN COMPLIANCE (INCLUDING CONSULTANT STATEMENT)

Where required by financiers, this should include a schedule of works compliance, or quality assurance, by way of consultant statements from Architects, Structural, Servicers, and Fire Engineers, that works have been completed in accordance with the building contract and authority approvals.

LOCAL AUTHORITIES AND APPROVALS

The quantity surveyor should identify all required local authority approvals in format, similar to the one below:

PLANNING PERMIT

We have received a copy of the following Planning Permit for the project (refer Appendix __).

(See table 3 - Local Authorities and Approvals on References, page 17)

There are ___ (No.) conditions attached to the Permit. We do not believe any of these conditions are unusual for a project of this nature. If any unusual conditions these must be listed. If any conditions would be considered standard but have a cost implication, recommended to list these.

We have requested but not yet received the Stamped for Approval drawings issued with the Planning Permit. We will include in our Cost to Complete reports when made available.

ENDORSED DRAWINGS

We have received a copy of the following stamped for Approval drawings (refer Appendix __).

Town Planning drawings prepared by _____ dated _____

OR

We have requested but not yet received the Stamped for Approval drawings issued with the Planning Permit. We will include in our Cost to Complete reports when made available.

The Contract documents are generally in line with the planning permit.

(If Town Planning drawings differ to Contract drawings, make a note).

PERMITS

We have received a copy of the following Building Permit(s) for the project (refer Appendix __).

(See table 4 - Permits on References, page 17)

To include all permits, including demolition permit if applicable.

OR

We have requested but not received a copy of the Building Permit. We will attach copy/ies of Building Permit/s as they become available in our monthly Financial Reports.

In our opinion receipt of a Building Permit should be a condition precedent to the first drawdown.

PLAN OF SUBDIVISION

We have received a copy of the Plan of Subdivision and to the best of our review we believe the Contract documents are in line with the Plan of Subdivision as issued to <insert name of QS company>.

LAND SURVEYORS CERTIFICATE

We have received a copy of the Land Surveyors Certificate identifying:

- boundaries of the land being developed;
- location of each building or structure on the land;
- existing contours of the land.

CERTIFICATE OF TITLE

We have received a copy of the Certificate of Title for the site stating _____ Pty Ltd as the proprietor

of the subject property.

Key issues:

The quantity surveyor should:

- Comment on progress, or site vs permit approval stage.
- Provide updates on construction cost verification at each Progress Claim

STATUTORY DECLARATION (FOR WAGES AND PAYMENTS)

An appropriate wages and payments Statutory Declaration (from authorised company representatives) should be obtained from the Builder, sub-contractors, and suppliers, prior to any drawdown certification being completed.

Should the Builder default on any payments, the Financier may end up having to make the payments to maintain progress on the project

Key issues:

The quantity surveyor should:

- Verify all wages and payments for which the Builder is liable for and due, have been made, and obtain a copy of the Builder's Statutory Declaration in respect of this
- Where a construction management agreement is in place, be conscious of the consequences of obtaining tax invoices from all the sub-contractors.
- All payments are in compliance with the applicable Security of Payment Act legislation.

OTHER MATTERS

The quantity surveyor should comment on amendments and/or updates to any Tri-Partite Agreements, and advise on any variation thresholds, delays, or extensions of time.

Should the quantity surveyor believe that aspects of the project are outside their area of expertise they should engage appropriate additional assistance including programmers, architects and the like. This is particularly relevant for large complex projects.

CHECKLIST

(See table 5 - Checklist on References, page 17)

APPENDICES

Append any actual Reports and Certificates received. These could include:

- Payment certificate
- Local Authority Approvals
- Variation summary
- Copies of bank guarantees for unfixed materials
- Builder's program
- Any updated certificates of currency for insurance
- Builder's statutory declaration in respect to payments
- Consultant's sign off in respect to the works completed to date

NOTES

VARIATIONS

Variations are not always required to be assessed by the quantity surveyor acting as the Financier's representative. Where they are required, the quantity surveyor should ensure they have allowed for this within their fees or covered them by hourly rates.

Variations are usually required to be funded from the contingency and the quantity surveyor should be monitoring the contingencies expenditure and commitments.

The quantity surveyor should check to see if the threshold of any Tri-Partite Agreement(s) have been met.

ADDITIONAL REQUIREMENTS FOR BUILDER DEVELOPERS AND CONSTRUCTION MANAGEMENT PROCUREMENT

In the situation where the project is being undertaken by a builder-developer or under a construction manager agreement, more rigor is required by the quantity surveyor who should be auditing the sub-contract arrangements and valuing these.

PROCUREMENT SCHEDULES AND PROGRAMME

The quantity surveyor should be cognisant of the provisions of the relevant Security of Payments Act.

SUB-CONTRACT INSURANCES

Where a construction management agreement is in place, public liability and all works insurances should be obtained from all sub-contractors. It is the construction manager's responsibility to ensure these are on-hand for review by the QS.

CONSTRUCTION FINANCING

REFERENCES

TABLE 1 - COST TO COMPLETE

Item	Agreed Budget	Forecast Cost	Expenditure Previous	Expenditure to Date	Expenditure this Month	Cost to Complete

TABLE 2 - INSURANCES TABLE

Insurance Type	Amount Insured	Underwriter	Broker	Expiry Date

TABLE 3 - PLANNING PERMIT

Council	Planning Permit No.	Issue Date	Commencement Date	Expiry Date

TABLE 4 - PERMITS

Permit For	Building Permit No.	Issue Date	Commencement Date	Expiry Date

TABLE 5 - CHECKLIST

Item	Date	(By Whom) - Person
Site Inspected		
Report Prepared		
Quality & Assurance Checking		
Director Sign-Off		

DEFINITIONS

Approved Variations	those changes approved and agreed by the Superintendent under the Building Contract.
Builder	includes any Developer, Builder, Owner-Builder, Principal Contractor, Contractor.
Builders Security	provision of bank guarantees and the like to "secure" performance of a party's obligations. Typically, these are provided by contractors (or subcontractors) "upstream" to assure performance of construction and defects obligations, as well as in circumstances where there has been pre-payment for long lead items or where materials paid for by the principal / head contractor are being stored off-site.
Building Contract	A contract between an owner or occupier of land and a building contractor, setting forth the terms under which construction is to be carried out, basis of remuneration, time scale, and penalties, if any, for failure to comply with terms of the contract.
Client	the Developer undertaking the project by way of the Building Contract integral with acquired finance from a Financier.
Contract Sum	the stated cost to complete the works by the Builder under the Building Contract.
Contract Superintendent	the nominated party under the Building Contract to administer the Contract to ensure satisfactory completion of the works.
Contract Works Insurance	insurance of the works as required under the Building Contract.
Environmental Certificate	a certificate or statement of environmental audit by an independent auditor in respect to any environment condition and the change in use of the land integral with the proposed development.
Environmental Report	the site investigation report in respect to any possible contamination or hazardous materials involved with the subject property undertaken by an accredited environmental consultant.
Financier	the entity providing funding to the Client which allows the Client to undertake the project to completion.
Gross Programme	Construction Programme for works including allowances for wet weather and unforeseen circumstances.
Initial Report	the first or prefunding report prepared by the Quantity Surveyor which verify the proper establishment of the project and deals with authority approvals, building contract, builder capability, insurances, consultants, consultant's professional indemnity insurance, environmental and land surveyor's certification. The report allows the Financier to reconcile these project requirements to conditions precedent to funding.
Land Surveyor Certification	a certificate and plan of survey by the Land surveyor which confirms that the development is properly on the identified property and that there are no encroachments.
Latent Conditions	means physical conditions on or below the site and its near surrounds, including artificial things (but excluding weather conditions or physical conditions which are a consequence of weather conditions), which differ materially from the physical conditions which should reasonably have been anticipated by a competent Builder at the time of the Builder's tender had a competent contractor inspected: a) all written information made available by the Principal to the Builder for the purpose of tendering; b) all information influencing the risk allocation in the Builder's tender and reasonably obtainable by the making of reasonable enquiries; and c) the site and its near surrounds, made available prior to or at the time of tender.
Liquidated Damages	the mechanism through which one party can claim monetary compensation for loss or damage that occurs as a result of the other party's failure to deliver the works, goods or services under the contract on time.

CONSTRUCTION FINANCING

Nett Programme	Construction Programme for works excluding allowances for wet weather and unforeseen circumstances.
Overlays	separate planning and development policy and guidelines affecting a property which allow Councils to achieve their desired outcomes integral with a development.
Prime Costs	specified costs as part of the Building Contract that are net of labour, overheads and profit.
Principal	the person/company conducting the business or undertaking that commissioned the construction project.
Potential Variations	possible variations under Building Contract which have not been committed to as yet.
Progress Payment Certificate	the periodic payment certificate by the Quantity Surveyor or Superintendent as an assessment of the work completed to date to effect the progress payment to the Builder.
Progress Report	This is the ongoing report usually provided monthly by the Quantity Surveyor which allows the Financier to make a funding assessment and to provide funding to Client. The progress report usually equates to the required payment to the Builder under the Building Contract.
Provisional Sum Adjustments	the actual cost adjustments for the defined works against the allowance for that Provisional Sum under the Building Contract.
Provisional Sums	specified costs as part of the Building Contract that are inclusive of material, labour, overheads and profit.
Release	the Financier's approval in respect to the Initial Report and Progress Report being used by a third party.
Security of Payment Act	ACT Building and Construction Industry (Security of Payment) Act 2009 NSW Building and Construction Industry Security of Payment Act 1999 No 46 NT Construction Contracts (Security of Payments) Act 2014 QLD Building and Construction Industry Payments Act 2004 SA Building and Construction Industry Security of Payment Act 2009 TAS Building and Construction Industry Security of Payment Act 2009 VIC Building and Construction Industry Security of Payment Act 2002 WA Construction Contracts Act 2004 And their associated Regulations.
Soft Costs	those development costs necessary to deliver the development outside the cost of the land and construction costs. These typically include; professional fees, Statutory Authority fees, Council levies, land costs, etc.
Specialised Development Approvals	the specific Development or Planning Approvals issued by Council to allow the development to be undertaken.
Statutory Authority Approvals	all approvals by the relevant authorities necessary to undertake a development. The required approvals encompass development and building approvals together with approvals by utility authorities.
Superintendent	Person who represents the owner or principal and administers the contract terms and conditions.
Unapproved Variation Claims	those claims made by the Builder in accordance with the Building Contract which have yet to be approved by the Superintendent.
Value Management	the process usually undertaken during the design documentation process which is an effort to effect a more economical design and buildability to reduce the development cost. The process can be undertaken with the Builder as prelude to entering into the Building Contract.
Work-In-Progress	the work being conducted by the Builder under the Building Contract to complete the project.

RESPONDING TO THE CHANGING NEEDS OF CONTEMPORARY FEMALE LEADERS AND THEIR ORGANISATIONS

For over fourteen years, Women & Leadership Australia (WLA) has been developing female leaders and supporting the increased presence of women in business and community leadership roles. Based on a simple truth, that women represent an enormously under-utilised national resource, WLA believe that supporting a greater percentage of women to step up into leadership positions enables tremendous cultural and economic benefits.

AIQS member, Sophie Ly was successful in her application and has been a participant in a WLA Leadership Development Program, a rich and empowering learning environment which is singularly geared to enabling each participant to achieve their own unique vision of success.

Sophie has provided the following insights.

DO YOU THINK THERE ARE PARTICULAR LEADERSHIP CHALLENGES FOR WOMEN IN THE CONSTRUCTION SECTOR? IF SO, WHAT ARE THESE?

I believe the main challenge is overcoming the mindset that the construction sector is imitating men and dominated by men. It is, by default, a non-traditional industry for women. Due to this perception and increasing demand, I see it as more of an advantage than a challenge for women to be in the construction sector, especially when we are in a time where women are being encouraged and recognised. Such as industry bodies/associations allowing women to share their experiences and creating an environment for mentees to meet mentors for guidance. I find that participants in the construction industry today are strong supporters of women in construction.

WHY DID YOU PARTICIPATE/ARE YOU PARTICIPATING IN THE COURSE?

Curious to find out what being a leader entails and whether I have the capability to meet those demands.

Encouragement and recommendation from my senior staff.

WHAT HAS BEEN THE MOST HELPFUL THING YOU HAVE LEARNED?

A positive attitude is something that I am still trying to implement and learn. Positivity is an attractive energy. Being a leader that has an open mindset are productive, creative and engaging.

WOULD YOU RECOMMEND THIS PROGRAM TO OTHER WOMEN?

Of course! I recommend it to any female who is an emerging manager/leader. This program is a great way to equip yourself with knowledge and behavioural insight that can be applied and actioned in the workplace or personally.

WHAT CAREER OR LEADERSHIP TIPS OR SUGGESTIONS WOULD YOU GIVE TO WOMEN WHO ARE LOOKING TO PROGRESS IN THE CONSTRUCTION SECTOR?

Be passionate. Once you are passionate there will be a natural curiosity in anything you do. The construction industry is a high pace and highly demanding environment and the 'drive' is often what makes you keep going, growing and pursuing. Being a Quantity Surveyor is a great opportunity to be deeply involved in project lifecycle, from feasibility to handover.

Sophie Ly, MAIQS, CQS

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NATSPEC LAUNCHES OPEN BIM OBJECT STANDARDS

In the June 2018 edition of The Building Economist, we provided information about the NATSPEC BIM Properties Generator which sets out the rules for applying properties to objects, specifies their format and provides requirements for the graphical modelling and functionality of a BIM object.

NATSPEC have recently released the Open BIM Object Standard to complement and align with the BIM Properties Generator. This release follows extensive joint research and work carried out by the technical teams of NATSPEC (Australia) and Masterspec (New Zealand).

With the aim of harmonising BIM practices internationally, an extensive review of existing global guides, standards and protocols relating to the creation of BIM content was completed as part of the research and preparation work.

This Standard is a free resource to assist in the creation of BIM objects, for use by all construction professionals – from designers and specifiers to manufacturers and BIM content developers, to assist in the creation of standardised generic, manufacturer and project specific BIM objects.

Having a standard for BIM object creation in place within Australia will provide confidence to object authors and, importantly, to product manufacturers that their BIM objects will be acceptable to the end users of the objects, allowing them to manage their BIM content in a consistent and structured manner. The acceptability of standard-based content means that authors and manufacturers do not waste their time, money and resources creating BIM content that may not be accepted by industry.

AUSTRALIAN CONSTRUCTION MARKET REPORT

The Australian Construction Industry Forum (ACIF) has released the November 2018 Australian Construction Market Report.

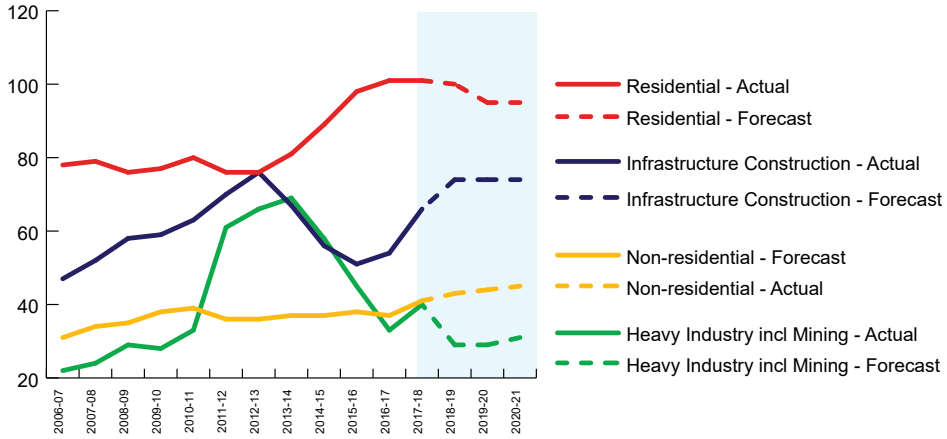
The report outlines building and construction activity on a national and state-based level.

Bob Richardson FAIQS, CQS Chair, Construction Forecasting Council cites the following key points in the Report:

- Building and construction work had a good year in 2017-18 and activity grew to $247 billion (in real terms).
- Building and construction activity now accounts for 14% of GDP and construction sector jobs account for nearly 10% of total employment.
- Re the outlook for building and construction activity overall - the pluses are marginally outweighed by the negatives and activity is forecast to shrink next year by less than 1%, landing at $245 billion (in real terms in 2015-16 prices).
- We expect the roll out of major infrastructure projects to continue over the next few years.
- Heavy Industry construction will return to an underlying down-trend over the next two years.
- Non-Residential Building activity is expected to grow again next year.
- Residential Building is entering a down-turn at present.
- The ACIF Forecasts that are behind this report outline the next ten years of upcoming demand for work across the four key construction sectors, as well as what is happening with labour requirements.

Most of the growth in building and construction activity over this year (2018-19) is expected to be in New South Wales, Victoria and Queensland. Meanwhile, the value of work done in 2018-19 is forecast to fall in Western Australia and the Northern Territory.

Building and Construction Work Done (AUD billion)
Source: Australian Bureau of Statistics and Australian Construction Industry Forum Construction Forecasting Council



To access the Report go to www.acif.com.au. AIQS members have free access to this Report and the ACIF Dashboard, simply login to the AIQS website and follow the links - www.aiqs.com.au

FRONT-END STRATEGIES TO REDUCE CONSTRUCTION WASTE ON AUSTRALIAN PROJECTS

By

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The work has recently been completed as a Master of Science by research at Southern Cross University, by Peter G. Rundle, with co-supervisors, Dr. Bahadori and Dr. Doust, on the evaluation of 8 methodologies that would potentially add to the efficiency and effectiveness of the Australian engineering construction industry. The preliminary 8 options were chosen after an initial review of the literature, selected against key performance assessment criteria.

This 'long-list' was comprised of the following options:

I. Knowledge Management
II. Lean Construction
III. Construction Contract Procurement Practices
IV. Optimal Work Duration on Site
V. Construction Site Waste
VI. Rationalisation of Australian Construction Safety Regulations
VII. Sustainable Construction Labour Force
VIII. Portfolio Project Development.

Front-end strategies to reduce construction waste on Australian projects was selected for detailed research by an independent peer review panel of 10 eminent engineering construction industry practitioners.

QUALITATIVE RESEARCH ON POTENTIAL SOURCES OF SITE WASTE

During the development of the research framework, it was decided that it was critical to evaluate actual potential sources of site waste on Australian projects, as a precursor to investigating front-end site waste minimisation strategies.

In 1974, Spivey of the US Army Corps of Engineers produced a seminal paper on construction work (1). Building on the seminal work of D. A. Spivey, in 1998, O. Faniran and G. Caban, from University of Technology Sydney, developed a seminal model for evaluation of the potential sources of site waste, based on respondent qualitative research survey

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answers to 13 questions, to develop a severity index to rank sources of waste (2). This model was subsequently used in this research to allow comparison of results with previous local and international research, for data reliability and validity purposes.

51 respondents of the 102 participants, polled, correctly completed the research questionnaire which evaluated 13 potential sources of construction site waste.

Respondents were asked to indicate the relative significance of construction site waste sources by specifying if the sources were "very significant", "significant", "of minor significance", or "not significant". In accordance with the Faniran and Caban (1998) model, (from which the Part 2 questionnaire for this research was adopted) for each of the 13 construction site waste sources identified on the survey, a severity index was determined by calculating the percentage of respondents giving the response "very significant" and the 13 site waste sources were ranked on this basis. Table 1 shows the severity index and the ranking for each source of construction site waste.

Comparing this research and the 1998 Faniran and Caban data, with both surveys using the same questionnaire template, using a severity index analysis of the four most likely sources of waste for each data set, indicates that there are three common results, which are:

I. Client initiated design changes

II. Packaging and pallet waste (and other non-consumables)

III. Design and detailing errors.

Note that the Faniran and Caban study used simply 'Design Changes' as a possible source of waste. When framing their question, it was important to this research to determine who had initiated the design revision.

A final survey question was asked for respondents to provide comments on any other potential sources of waste

TABLE 1 - POTENTIAL SOURCES OF CONSTRUCTION WASTE SEVERITY INDEX

Survey Question Number	Possible Source of Site Waste	Severity Index = # "Very Significant"/ Total Respondents	Severity Index Ranking
24	Lack of on-site material planning and control	24%	1
22	Packaging and pallet waste	20%	2
12	Design and detailing errors	20%	2
13	Client initiated design changes	20%	2
17	Procurement ordering and take-off errors	16%	5
16	Improper materials storage	14%	6
18	Poor workmanship	14%	6
15	Improper material handling	10%	8
14	Contractor initiated design changes	8%	9
20	Site accidents	4%	10
21	Leftover off-cuts	4%	10
19	Poor weather	2%	12
23	Criminal waste caused by vandalism or pilfering	2%	12

other than those 13 sources listed for the Faniran and Caban model. A rich pool of data was provided by the participant responses to this question, which was evaluated using thematic analysis.

Thematic analysis is a qualitative research tool that focuses on evaluating the themes and sub-themes captured within the data. Coding is the main process for preparing and developing themes and then sub-themes from the raw data. Thematic analysis concentrates on the human subjective experience that emphasises respondent's perceptions, opinions and experiences on the topic, to synthesise the data.

QUALITATIVE RESEARCH ON FRONT-END SITE WASTE MINIMISATION STRATEGIES

A 2013 USA research paper on sustainable construction waste management was commissioned by American peak contractor body, the Construction Industry Institute and was executed by Distinguished Professor, J.K Yates, Dean of College of Engineering Technology at Ferris State University (13). The relevant front-end site waste minimisation questions from this Yates model were adapted for use into an abridged survey questionnaire, and used by the author in his research, as the USA research involved participants, in both the heavy construction, as well as building sectors. Use of an abridged Yates model in this research allowed for a comparison of results between recent USA and Australian for data reliability and validity purposes, with both countries having similar physical site waste profiles, as an example – 40% of total landfill volume comprises Construction and Demolition waste.

49 respondents of the 102 participants polled, correctly completed the research questionnaire which evaluated 9 questions surrounding front-end site waste minimisation strategies. The first 8 questions asked respondents to indicate whether they adopted a particular waste minimisation strategy.

The 9th question asked respondents to provide examples of other strategies, over and above, those strategies indicated in the previous 8 questions.

The abridged questionnaire was devised to have questions that would be answered with "yes", "no", or "do not know" answers and if the respondents answered in the affirmative they were provided with additional space to explain on their "yes" answer by providing examples of situations, where methodologies, processes, or ideas which have been adopted on actual construction projects. The Yates research provided a tabular presentation, similar to Table 2, which provides summary results of the survey.

The Yates study also provided a comprehensive summation of results from each question and this research also included this information. However, only four results were considered in this paper.

TANGIBLE BENEFITS VIA ADOPTION OF FRONT-END SITE WASTE MINIMISATION STRATEGIES ON AUSTRALIAN CONSTRUCTION PROJECTS

It is worth reiterating that the 6 KPIs for this research project were carefully evolved, so as to be of maximum benefit to the engineering construction industry, the ecology and the community at large, to be readily implemented and to benefit parties across a broad spectrum. These KPIs are noted as follows:

I. will be of transparent commercial benefit to contractor/engineering houses, client end users and the community at large

II. the proffered solutions can be readily and therefore, expediently, implemented

III. shall provide maximum stakeholder benefits

IV. the solutions to the identified inefficiencies and ineffective practices are, by and large, available within the academic and professional international body of knowledge

V. must be practical in nature and address a void in the Australian engineering construction business and the work must be valuable to this industry

VI. broadly comply with a triple bottom line philosophy and that commercial, social and ecological benefits will be provided by these options.

Using data from the peak industry body, the Australian Construction Industry Forum, turnover for all construction in Australia, in 2016, was A$218 billion, which, by sector, includes residential building construction (A$96 billion), non-residential building construction (A$37 billion) and engineering construction (A$85 billion) (4).

Research at the University of Exeter in the UK has shown that by the application of front-end strategies to minimise waste, 2% of project cost can be readily saved (5).

A saving to the nation's engineering construction industry of 2%, or, A$4.36 billion is possible by following these simple front-end waste minimisation strategies that require no innovative technology or large capital infrastructure expenditure such as recycling and recovery facilities. Engineering consultants and building product suppliers would also benefit, as the residual available investment capital would likely create employment and increase GDP by encouraging public,

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TABLE 2 - RESPONDENT ANSWERS - SITE WASTE MINIMISATION STRATEGIES

Waste Minimisation Question No.	Question Description	"No" %	"Don't Know" %	"Yes" %
26.	Is your firm using techniques that improve resources efficiency, equipment efficiency, material resource efficiency and allow for training of manual labour?	39.58	18.75	41.67
27.	Are innovative designs, construction components, or construction processes, being integrated into your projects to reduce site generated waste?	31.25	20.83	47.92
28.	Do you adopt a structured approach both for engineering design and in determination of construction methodologies that involve waste minimisation strategies?	29.17	20.83	50.00
29.	Do you address waste generation reduction during project pre-planning to utilise designs that minimise waste using any of the following techniques: precast; prefabrication; pre-assembly and modularisation?	29.17	14.58	56.25
30.	As Builders, Contractors and Engineering Consultants, do you ensure a minimum amount of permanent and temporary materials, are expended in the effective provision of Client conforming construction/ building product.	31.25	31.25	37.50
31.	Regarding use of temporary construction materials, do you consider waste minimisation processes? As an example, for concrete construction, do designers specify concrete elements of similar dimensions, where practical? Are steel shutters used on repetitive formwork; is formwork adequately treated and robustly fabricated, to allow re-use and are orders "Just in Time", to reduce material losses on site?	18.75	29.17	52.08
32.	Does the Contractor / Builder, Consultants and Vendors, constructively work with the Client to minimise change orders that make pre-ordered products, redundant and suitable only for waste?	35.42	22.92	41.67
33.	Does the Contractor / Builder and / or Client have a mandatory waste minimisation plan developed as part of the project execution plan?	33.33	29.17	37.50
34.	Provide other examples of situations where methods, processes or ideas were implemented, on your construction site projects that minimised waste.	16.67	33.33	50.00

private and citizen expenditure.

A 2011 Hyder report commissioned by the Australian Federal Government shows that construction and demolition waste accounted for 31% of landfill waste in Australia (6). Around 40% of all waste produced in Australia is from construction and demolition site waste. Any reduction in construction material waste shall improve the productive use of Australia's finite volume of raw materials.

Australian Federal Government data on landfill sites notes that there is a minimum of approximately 600 medium to large facilities currently in operation, and while the total number of landfill facilities are unknown, there could be as many as 2,000 unregistered and unregulated landfill sites in Australia (7).

The Australian construction industry is a major user of private landfill sites and it is concluded that measures to reduce front-end construction waste could reduce both registered and unregistered landfill footprints, which would provide considerable social and environmental benefits.

New South Wales charges a punitively high levy of A$133.10 per tonne of waste for landfill waste to encourage recycling, while Victoria imposes a landfill levy of A$60.52 per tonne.

South-east Queensland has an average levy of only A$30 per tonne of waste to landfill, which has resulted in the significant disposal of construction waste and other large volumes of waste from New South Wales and Victoria across the border to Queensland, with an estimated total of 875,000 tonnes of waste disposed in Queensland landfill sites by these other two states in 2014 and 2015, which created an extra 15,000 truck movements along the Pacific Highway (8).

These cross-border truck transportation waste disposal activities are causing extra pavement wear and increasing accident risk potential. Front-end waste minimisation, will result in a significant decrease in landfill footprint, without the

need to apply punitively high disposal costs to encourage back-end recycling.

The front-end approach to construction waste reduction bypasses the carbon emissions caused by recycling transportation and processing, along with the alleviation of general traffic congestion by waste and bin handling operations.

The total benefits attributable to a reduction in construction material site wastage shall include, but not necessarily be limited to:

I. carbon footprint reductions via manufacture transportation and disposal/recycling of significantly less construction materials

II. savings in energy and water via significantly less construction material manufacturing and recycling

III. ecological benefits for the groundwater and aquifer systems, due to landfill reductions.

IV. savings in the cost of transportation, procurement and storage, and landfill

V. environmental benefits to the broader community via pollution reduction and less impact on the environmental footprint via a reduction of landfill sizes, and a reduction of unregulated and possibly contaminated landfill sites

VI. savings in rare and valuable irreplaceable raw resources, such as lime, timber, sand, clay, rock, gypsum, coking coal for steel manufacture, titanium, copper, bauxite and iron ore.

CONCLUSION

The current research has shown that the principal possible sources of site construction waste on Australian projects, are the same as those identified 20 years ago by a previous seminal study. Further, the 8 front-end strategies to minimise site waste, nominated in this work are off the shelf practical solutions, which require no extra capital expenditure to implement. Further, no other front-end strategies could be put forward by the 49 respondents who were drawn from Australia's peak industry engineering construction bodies – Australian Construction Industry Forum, Master Builders Association, and Australian Constructors Association and other engineering construction personnel, 35 % of whom were current Company Directors from this industry. 46% of participants having worked on projects of A$2.1 billion or more and 45% of respondents holding post graduate tertiary qualifications, with 48% of this sample pool working in engineering construction for 25 years, or more.

The major conclusion of this research is that an Australian code of practice for construction site waste minimisation could be developed by the Australian Federal Government for mandatory national use, from which engineering construction industry consultants; contractors; builders; suppliers; vendors; and public/private sector clients would have to adopt. This national code of practice would be included in all capital works contracts. It would be the ultimate responsibility of the client project stakeholder to ensure this document's adoption and compliance, with a company site waste management plan from all of the contracted entities being a condition of tender submission. A project specific site waste management plan could be developed by the prime contractor and approved by the client.

Each site waste management plan from the proposed national site waste code of practice, to the client document down to the design consultant, contractor and supplier documents, along with the site waste management plan would all be complementary.

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QUANTIFICATION OF DAMAGES FOR DEFECTIVE WORKS

A defective work claim is the most common claim made by owners. Damages for defective works are generally the amount necessarily incurred to have the works conform with what the contractor was required to do as per the contract. There are three heads of damages for breach of contract for defective works:

1. Cost of Rectification;
2. Diminution in Value; and
3. Loss of Amenity or Non-Pecuniary Loss.

As with all disputes, the viability and success of these claims (or defenses) are largely dependent on the facts and evidence of the particular case, nonetheless, a knowledge of the principles developed by the Courts are essential for a practicing Quantity Surveyor.

DEFECTIVE WORK CLAIM

A defective work claim is usually for the cost or estimated cost of rectification of the defective work. However, where rectifying the defective work is unreasonable, then the claimant may not be entitled to the cost of rectifying the defect but instead may recover:

I. the difference in value between the intended value of the work and the actual value of the work on account of the defective work; and/or

II. loss of amenity or non-pecuniary loss.

Whilst most standard form contracts specifically deal with the rectification of defective works, the principal's entitlement to damages at common law for breach of contract for defective work is not usually precluded.

However, the principal's entitlement to damages for defective works for breach may be controlled by the contract and be subject to the relevant contractual notice requirements being issued by the superintendent or the principal (whichever is applicable).

The Supreme Court of New South Wales in *Turner Corporation Ltd (receiver and manager appointed) v Austotel Pty Ltd*, held that the entitlement to recover the cost of work performed by others at the request of the principal is subject to the issuance of the notice required by the contract prior to the rectification of the defective work being performed.

In 2010, the Supreme Court of New South Wales in *Bitannia Pty Ltd v Parkline Constructions Pty Ltd* followed the decision in *Turner*. In *Bitannia*, the owner took possession of the property prior to the contractor finalising the alleged defective works, and the owner engaged a third party to rectify the defects and later claimed against the contractor for the costs to rectify the defects. The court when denying the owner's claim found that the owner repudiated the contract when it asked the contractor to leave the site and not to return, thus denying the contractor the opportunity rectify defects under the contract.

DAMAGES UNDER THE CONTRACT

The damage reviewable may be limited by the provisions of the contract or the Builder may have the right to rectify. The provisions of the contract need to be carefully reviewed.

DAMAGES AT COMMON LAW

Generally, where one party breaches the contract, he must indemnify the other in damages.

Where two parties have made a contract which one of them has broken, the damages should be those either arising naturally (i.e. according to the usual course of things from a breach) or as may reasonably be supposed to have been in the contemplation of both parties, at the time they made the contract. *(Burns v MAN Automotive (Aust) Pty Ltd)*

COST OF RECTIFICATION

The High Court's decision of *Bellgrove v Eldridge* is the leading authority on the measure of damages for defective and incomplete work. In this case, the plaintiff cross-claimed against the builder for the cost of demolition and rebuilding of the house as a result of the faulty construction of foundations.

The High Court affirmed that the general rule was that the measure of damages was the difference between the contract price of the work and the cost of making the work conform to the contract.

At paragraphs 617 to 619 of the judgement the High Court laid down the three principles:

I. The usual measure of damages for defective works will be the cost of rectification over diminution in value; however

II. Rectification must be both 'necessary' to produce conformity with the Contract; and

III. A 'reasonable' method of dealing with the situation.

The Full Court of the Supreme Court of South Australia, in *Stone v Chappel* rejected the argument that the principles applied in *Bellgrove* only applied for construction works that substantially complies with the contract. The Full Court said that the availability of rectification damages depends upon factors including:

I. The plaintiff's performance rights, in particular, whether the contractual objectives were merely functional or a matter of aesthetic choice of

amenity on the plaintiff's part;

II. The extent to which the defendant has achieved the contractual objective;

III. A lack of proportionality between the cost of rectification work and the benefit of that work to the plaintiff;

IV. The plaintiff's intention and ability to carry out the work; and

V. The degree of the defendant's capability.

In *Alucraft Pty Ltd (in liq) v Grocon Ltd ('Alucraft')*, the head contractors claim against the sub-contractor for defective work is restricted to the amount for which the head contract is liable towards the principal, as such, the head contractor does not recover damages from a subcontractor where the head contractor had been paid in full and neither head contractor nor the principal has any intention to rectify.

In 2017, the NSW Court of Appeal in *Walker Group Constructions Pty Ltd v Tzaneros Investments Pty Ltd* confirmed that a party's entitlement to damages measured by the cost of rectification will not necessarily be affected by an intervening sale of the property. Further, the allowance for betterment is denied where the defendant fails to satisfy its burden of showing that a cheaper alternative will comply with the contract.

The NSW Court of Appeal in *PND Civil Group Pty Ltd v Bastow Civil Constructions* confirmed when calculating the cost of rectification, the Claimant is entitled to recover external costs, but not the cost of an employee's time, unless the Claimant can prove that:

a. Existing staff were paid more; or

b. Additional staff were employed to either:

   I. Manage the breach of the contract and its consequences; or

   II. Attend to tasks from which existing staff has been distracted because of their attention to defective work issues; or

c. If no additional staff were employed, nonetheless the diversion of management time to the breach of the contract meant that the employer lost other valuable business opportunities, then damages might be allowed,

However, quantifying damages on the loss of business opportunity may be difficult to establish.

DIMINUTION IN VALUE

Instead of the cost of rectifying defects, the courts may award the owner the difference in value between what the work would have been worth had it been performed in accordance with the contract and its actual value.

As opposed to the cost of rectification, an assessment under the diminution in value may involve a sum that would be ordinarily much lower than the cost of rectification.

A Plaintiff suffering loss from another's breach is under an obligation to minimise that loss and is not entitled to recover from the person in breach any damage exceeding the fair and reasonable loss.

In *Ruxley Electronics and Construction Ltd v. Forsyth*, the House of Lords focused on reasonableness and decided that in circumstances where the cost of rebuilding is out of proportion to the benefit to be obtained, the cost of rebuilding will not be awarded as damages, and if the cost of rebuilding cannot be awarded as damages, the correct measures of damages is the difference in value, even if the diminution in value was nil. In that case, the court held that there was no difference in value and therefore only awarded a nominal amount of damages for general inconvenience and disturbance.

Further, in *D Galambos & Son Pty Ltd v Mcintyre*, Woodward J stated as follows:

> *"Where it would be reasonable to perform remedial work in order to mend defects or otherwise to produce conformity with the plans and specifications which were part of the contract, the measure of damages is the fair cost of that remedial work. Where the defect is such that repair work would not be a reasonable method of dealing with the situation (usually because the cost of such work would be out of proportion to the nature of the defect), then the measure of damages is any diminution in value of the structure produced by the departure from plans and specifications or by defective workmanship"*

However, in *Tabcorp Holding Ltd v Bowen Investment Pty Ltd*, the tenant breached the contractual clause and made alternations to the foyer and removed the existing foyer constructed of special material. The issue for the High Court was whether the innocent party was entitled to the cost of rectification for restitution of the original foyer or whether the amount of damages for breach of the contract was limited to the diminution in value of the premises. The Court held that the innocent party, in this case, was entitled to the cost of rectification and the loss of rent while rectification was being carried out. Despite the Tenant's reliance on *Ruxley Electronics,* the court found that the appropriate measure of damages was the loss sustained by the failure of the tenant to comply with the terms of the contract, which in this case was the cost of restoring the foyer to its original condition.

In 2009, the Supreme Court of WA in *Willshee v West Court Ltd*, followed the High Court decision of *Tabcorp* and found that Mr Willshee would not be entitled to rectification cost if it was 'unreasonable' to award them to him. However, the court held that the test

of 'unreasonableness' would only be satisfied if evidence was available that established Mr Willshee was relying on a 'technical breach of contract to secure an uncovenanted profit'. There was no such evidence presented by Westcourt and therefore awarded the amount of money that was required to put the Appellant in the position he would have been if the house were to be constructed as per the contract, being the cost of replacing the limestone.

The principles of *Wilshee* was accepted in 2011 by the Supreme Court of NSW in *Tranquility Pools & Spas Pty Ltd v Huntsman Chemical Co Pty Ltd*.

LOSS OF AMENITY OR NON-PECUNIARY LOSS

Damages for loss of amenity, loss of working life or productivity and non-pecuniary loss can account to another measure of assessing damages.

The New South Wales Court of Appeal in *West Point Management Ltd v Chocolate Factory Apartments Ltd* highlights the need for parties to consider:

I. prescribing a method by which damages for defective works after practical completion are to be assessed,

II. for contractors, limiting the owner/principal's ability to claim for such damages to the express terms of a contract,

III. specifying that certain aspects of a project are 'priorities' which are the subject of clauses which prescribe agreed damages for any defective works.

In *D Galambos & Son*, the award of damages was in relation to the prevention of the owner from enjoying or using part of the building as intended. In doing so, Woodward J referred to authority affirming that:

> *"damages may be recovered for substantial inconvenience and discomfort caused by breach of contract. The difference between 'mere annoyance and injury to feelings, on the one hand, and physical inconvenience, on the other' was stressed"*

In *Ruxley*, Lord Mustill made the following observations in relation to the proposition that there are only two measures of damage available, namely reinstatement or loss of value:

> *"The proposition that these two measures of damage represent the only permissible bases of recovery lie at the heart of the employer's case.*
>
> *But the law must cater for those occasions where the value of the promise to the promisee exceeds the financial enhancement of the promisee's position which full performance will secure.*
>
> *This excess, the "consumer surplus", is usually incapable of precise valuation in terms of money because it represents a personal, subjective and non-monetary gain. Where it exists, the law should compensate the promisee if the performance takes it away."*

In *Chas Drew Pty Ltd v JF & P Consulting Engineers Pty Ltd* damages for loss of profits based on inordinate delays were given against a supervising engineer.

Smit J held in *Gimtak v Cathie* that costs in carrying out attempted repairs if reasonably incurred can be claimed.

In *Auburn Municipal Council v ARC Engineering Pty Ltd* the attempted repairs of a pavement were claimed in addition to complete replacement.

In *Belgrove* damages included

I. the cost of demolishing;

II. the costs of re-erecting the house; and

III. certain consequential losses, less;

IV. the demolition salvage; and

V. moneys unpaid on the contract.

In *Jandon Constructions v Lyons* where footings defects were found to exist, demolition and rebuilding were unreasonable to fix the defects.

Mohr J in *Carosella and Carosella v Ginos & Gilbert Pty Ltd* held that demolishing and rebuilding, not cosmetic rectification, was justified. Damages included a diminution in the enjoyment where part of the building was not suitable for use as intended.

In the New South Wales Court of Appeal case of *Auburn Municipal Council*, the court took the view that where demolition and reconstruction of a building are necessary, damages are calculated differently for an engineer who does not contract to design a structure which will produce the desired result but only to exercise skill for that purpose. The Engineer was liable for the loss associated with the poor design but not the cost of building a satisfactory design.

In *Greaves & Co (Contractors) Ltd v Baynham Meikle and Partners*, a design engineer did contract to produce a result - that the building would be reasonably fit for loaded trucks.

In *Morton v Douglas Homes Ltd*, defendants were liable for repairs and for the diminution in value after repairs.

Director of *War Service Homes v Harris*:

> *"The owner of a defective building may decide to remedy the defects before he sells it so that he may obtain the highest possible price on the sale; he may sell subject to a condition that he will remedy the defects; or he may resolve to put the building in order after it has been sold because he feels morally, although he is not legally bound to do so. These matters are nothing to do with the builder, whose liability to pay damages has already been accrued. "*

A claim for mental distress was rejected by Giles J in *Kennedy v Collings Constructions Co Pty Ltd* but not because he held that such a claim was not maintainable at law. However, in *Watts v Morrow* it was held that a plaintiff is not entitled to recover general damages for mental distress not caused by physical discomfort or inconvenience resulting from the defendant's breach of contract.

In *Burke v Lunn* damages were awarded for physical inconvenience and time spent by the building owner in rectifying and arranging to rectify defects.

In *Boncristiano v Lohmann* the Victorian Court of Appeal considered an appeal against an award of $500 for the inconvenience and $1000 for mental distress. Winneke P (with whom Charles and Batt JJA agreed) held (at 94):

"It now appears to be accepted, both in England and Australia , that awards of general damages of the type to which I have referred can be made to building owners who have suffered physical inconvenience, anxiety and distress as a result of the builders ' breach of contract, but only for the physical inconveniences and mental distress directly related to those inconveniences which have been caused by the breach of contract.."

CONCLUSION

There are two main heads of damages at common law for breach of contract for defective works. As discussed, the third head of damages is for the loss of amenity or non-pecuniary loss.

The Court places an importance in compliance with the obligations of the parties as contained in the contract to be complied with (*Bitannia*).

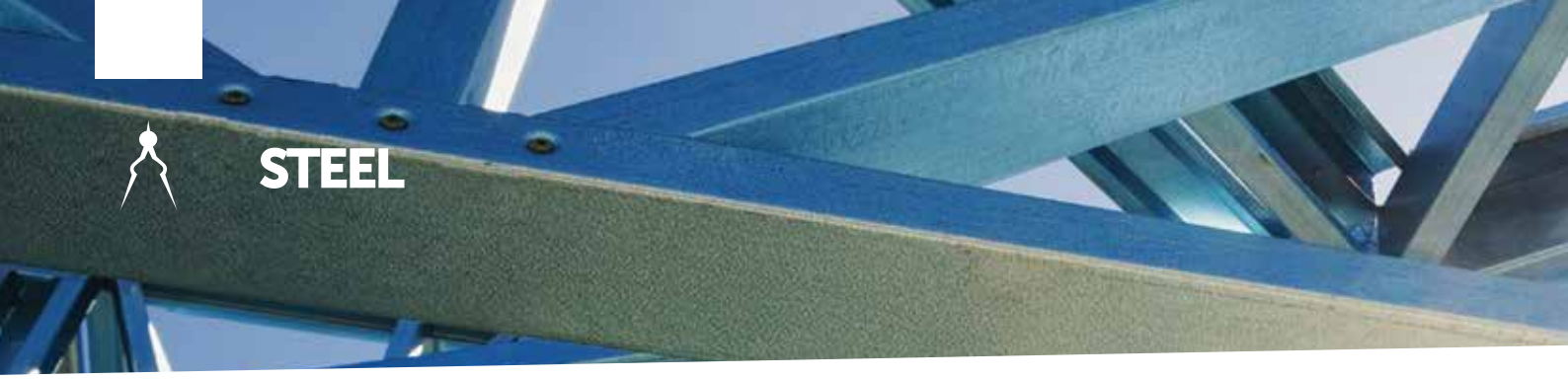
As with all disputes, the viability and success are largely dependent on the facts and evidence of any particular case. The time, effort and money involved in dealing with a defective work claim may be largely pre-empted or minimised if contract documentation is vetted and prepared for each individual project setting out effective and feasible methods of risk allocation and clear obligations in relation to standards and quality.

This article has been written by Doyles Construction Lawyers. Copies of the cases referred in this article may be obtained from www.doylesconstructionlawyers.com

THE VALUE OF USING STEEL

COST-EFFECTIVE AND LONG LASTING

Steel provides a particularly high quality, safe, and cost-effective solution for building structures, delivering value both during the initial construction, and over the full lifecycle of an operating structure.



STEEL

Choosing steel as the key construction material from the outset of a building structure project can provide a myriad of benefits, from savings in the construction schedule, through to on-site labour and logistics cost-efficiencies. The use of steel can also minimise impacts on the design of other major elements within a project, such as cladding and service installations.

The choice of material for both framework and form generally occurs early in the design process, and is often based on early design principles, limited information and budget costings. While it is possible to change framework material at a later stage—which happens regularly when a steel option is presented—choosing a steel solution from the outset can have several positive outcomes.

According to Peter Key (National Technical Development Manager, Australian Steel Institute), "Cost is obviously a key consideration in the decision-making process, but it should not be the only one. It is vital to support informed decision-making with realistic cost information at the conceptual design phase, before it is then refined during the detailed design phases."

"This may be a challenging task given that the cost of structural steel can fluctuate throughout the economic cycle and steel frame costs are also heavily affected by project-specific key-cost drivers, such as program, access, spans, and building form," said Key.

"In addition, the initial construction cost of a structure is usually only one small component of its long-term lifecycle cost. In fact, it is estimated that the initial construction price of a building accounts for only approximately 2% of the life-cycle cost over a 30 year period. Therefore, value engineering should realistically take account of the life-cycle cost of a structure, not just its initial construction cost."

VALUE ENGINEERING

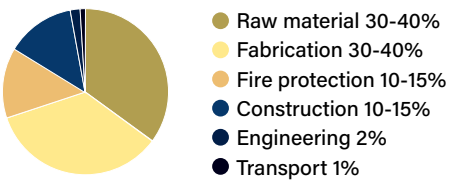
"The most effective approach to reducing steelwork construction costs is through pragmatic value engineering. Steelwork responds exceedingly well to considered approaches to rationalisation, with the potential to reduce costs in all phases of the building supply process," said Key.

"Ideally, value engineering should commence at project inception when the capacity to influence design outcomes and the benefit to the final design are the greatest. Specific value engineering workshops early in the project planning and conceptual design process can help maximise value for money. The definition of what is good value on any particular project will change from client-to-client and project-to-project."

STRUCTURAL FRAME COST COMPONENTS

To rationally cost a constructed steelwork project at each stage of the design development process, it is therefore necessary to have an appreciation for the approximate relative cost components of a completed steelwork structure.

Figure 1: *Breakdown of Steel Framed Multi-Level Building Costs* (see below) offers a typical breakdown of costs for a multi-level steel framed building. Note that it represents the structural steelwork frame only, which generally accounts for 10% of the overall building cost.



The raw material cost accounts for approximately 30% to 40% of the finished structure cost, with fabrication accounting for another 30% to 40%. Therefore, while a minimum structure weight is an admirable objective, if achieving this objective comes at the expense of overly complicated fabrication or connections, any cost saving in weight are likely to be overridden by an increased fabrication cost.

"The art and science to a cost-effective overall structure lies in the right balance between steel tonnage and fabrication complexity. Value engineering aims to find that right balance," said Key.

The construction cost accounts for 10% to 15% of the finished structure cost. Factors that mitigate the erection cost should be examined carefully. Prefabrication of assemblies, the extent of repetition, the piece count and the ease of assembly of connections can all significantly impact on the construction cost of the framing

Fire protection is another 10% to 15% of the finished structure cost. According to Key, "A fire-engineered solution can significantly reduce the cost of fire protection, including negating the requirement for any fire protection in some cases. An initial investment in fire engineering will, for all but the simplest of structures, have a very positive return on investment."

Engineering is a small percentage of the finished structure cost. A contractual arrangement that incentivises value engineering can lead to a significant multiplier effect in relation to savings in overall project cost.

The supplied cost (raw material + fabrication) of the fabricated steelwork represents a very significant 60% to 80% of the finished structure cost. It is therefore very important that the correct representative cost figures are used, often quoted as $/tonne.

COSTING STRUCTURAL STEELWORK

The approach to costing structural steelwork necessarily varies depending on the stage of the project design development. The accuracy of any costing exercise depends on the level of design information on which it is based.

At very early stages of project evaluation, a Quantity Surveyor may utilise simple area-based ($/m^2) rates for different types of structural steelwork-based buildings. As the design progresses, and information becomes available on the type of steelwork and member sizing, the $/m^2 rates can be refined with input from fabricators, culminating finally in a 'hard-number' quotation from selected fabricators during tendering.

"An important part of obtaining a value-for-money solution is taking the opportunity to value-engineer the design during the design development. Early engagement with fabricators and steel detailers can help inform the selection of the member and connection details to achieve the right balance of structural weight versus simplicity of fabrication and erection," said Key.

DESIGN COST PLANNING

The type and accuracy of cost data depends on the level of design information on which it is based and is therefore related to the design development stages, which are summarised below.

STAGE 1: BUILDING TYPE-BASED COSTING

Initial cost estimates before any substantive design is undertaken may be based on the costings of similar, already complete projects. Standard industry publications providing regularly updated cost indices for various types of construction may also be utilised, although care should be taken to understand the scope and limitations of these figures.

STAGE 2: STRUCTURAL SYSTEM-BASED COSTING

Once some early-stage design development has been undertaken, the structural engineer should be able to provide indicative area-based tonnage rates (kg/m^2) for the different structural systems present in the building (such as suspended floors, columns, secondary infill steelwork, and so on).

A more refined estimate of the erected structure cost can be developed once several factors are understood, including: the area or linear meterage of the respective structural systems, a realistic rate for supplied and fabricated steelwork ($/tonne) for each of the structural systems, and the corresponding erection rate.

"At this stage, it is important to have a realistic, representative cost per tonne for the particular structural system type. The fabricated cost per tonne for steelwork can vary significantly depending on the complexity of fabrication and the type of raw material. However, the type of fabricated steelwork utilised for standard multi-level building construction is usually at the lower end of the cost per tonne range," said Key.

STAGE 3: ELEMENTAL COSTING

As the design progresses, information on member sizing and connection detail should be made available by the project's structural engineers. At this stage, the structural system can be broken down into four prototypical components:

- Main members: carry the primary loads through to the foundations, and include beams, columns and trusses.
- Secondary members: carry specific loads or trimming openings and the like. These members are usually smaller than the main members but may involve similar levels of fabrication.
- Fittings and connections: including bracing, stiffeners and the connections that transfer load between structural members.
- Miscellaneous items: such as temporary steelwork, steel decking for composite floors and stair units.

BUILDING INFORMATION MODELLING AND COSTING

"Building Information Modelling (BIM) is becoming increasingly prevalent, particularly as it provides an opportunity for achieving higher-quality and more accurate costing at earlier stages of a project's lifecycle," said Key.

So-called 5D modelling (3D + project schedule + project costing) makes use of the element-based 3D modelling in BIM to overlay cost data, including down to the element level. If current accurate cost data is utilised in the model, the overall project cost may be continuously and virtually automatically updated as design development within the BIM model evolves.

STEEL

THE VALUE OF STEEL

Steel delivers significant value in several areas, from safety and efficiency, through to cost-effectiveness and quality assurance.

SAFETY

The use of steel reduces the number of workers on site considerably—steel construction utilises approximately 10% to 20% of the labour required for concrete. This reduces a builder's accident liability rate considerably.

Accurate, efficient off-site construction reduces the amount of handling required, with preassembled steel construction packages lifted straight from the truck to the building in construction sequence.

SPEED

Off-site steel fabrication means quality issues are solved off-site, thereby saving time. Plus, steel construction is universally recognised as significantly faster than concrete construction. This improved construction speed markedly improves preliminary costs.

QUALITY

Every batch of steel produced is certified and traceable, and fabrication can be driven by 3D modelling and numerically controlled fabrication equipment, providing the surest guarantee of quality construction.

EFFICIENCY

Steel is structurally efficient, and buildings are considerably lighter as a result. Foundations are lighter and cheaper relative when compared to concrete. Just-in-time deliveries can be sequenced and synchronised with the construction program. Steel is fabricated in controlled conditions with little waste.

SUSTAINABILITY

More than 95% of all structural steel is recovered and reused or recycled. Steel by weight is the most recycled material in the world without degradation or loss of quality. Plus, steel buildings inherently lend themselves to addition and modification easily and quickly

WASTE REDUCTION

Significant savings can be made through waste reduction compared to concrete construction. In addition, considerable savings are made when it comes freight—the use of steel means significantly fewer truck movements—because the use and removal of formwork is eradicated.

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- www.steel.org.au/focus-areas/steel-in-buildings/
- www.steel.org.au/focus-areas/steel-in-buildings/steel-costing---multi-level-construction/
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BUILDING COST INDEX

THE BUILDING COST INDEX IS PUBLISHED IN THE PRINT VERSION OF THE BUILDING ECONOMIST.

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