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## 2013 AUSTRALIAN CONSTRUCTION ACHIEVEMENT AWARD – STAGE 2 SUBMISSION

SOUTHBANK CULTURAL PRECINCT REDEVELOPMENT - HAMER HALL

Baulderstone | February 2013



## SOUTHBANK CULTURAL PRECINCT REDEVELOPMENT – HAMER HALL

A. Describe the scope of work of the project.

## **PROJECT SCOPE**

Hamer Hall was opened 33 years ago in 1980 and was definitely in need of an upgrade. It was Melbourne's main specialist Concert Hall – and is the home of the Melbourne Symphony Orchestra.

The interiors were worn and dated, the patron access and circulation was poor, the toilet amenities were insufficient and the acoustics in the Auditorium was not at a sufficient standard for the stature of such a venue. The theatre technology also needed significant updating as did the comfort levels of the patrons.

Hamer Hall is deceptive in size as it comprises eight distinct levels; five below St Kilda Road level and three above. The shape of the building mirrors an avocado. The three tier Auditorium has approximately 2,500 seats and is 30 metres in height from the Stalls level to the concrete ceiling. The Auditorium is surrounded by a five level Front-of-House public area to the east and four levels Backof-House for the performers and staff to the west. The remainder of the floors are plantrooms and spaces for stage theatrics.

The state Government originally assigned \$128.5m to the refurbishment to undertake the following key works:

## The Auditorium

 Improved acoustics through treatment of stage surround and crystalline acoustic diffusers on upper walls and removal of balcony arms

- New integrated theatre technical zone and flying system
- New over-stage acoustic reflector
- New, wider seats, maintaining existing distance between rows
- New hybrid displacement air conditioning system.

#### The Foyer

- St Kilda Road foyer reconfigured and enlarged to accommodate an expanded box office and cloaking facility
- All escalators replaced with wider escalators between every public level
- Reconfigured and redistributed toilets (80% more women's toilets overall)
- Existing foyer bars upgraded and increased in size.

#### Backstage

- New dedicated performance loading area
- New dedicated food and beverage loading dock
- New dedicated scenery lift from loading dock to stage level.

#### Riverside

- New entry foyer from river level
- New box office and cloaking facility
- New restaurants spaces
- New internal and 24-hour external lift from river level to St Kilda Road
- New 'civic stair' from the river to St Kilda Road.

The design had to be sympathetic to the original designers, Roy Grounds and John Truscott and the Heritage listing of the structure and finishes.

Key elements of the design were to create an outward facing venue, making it brighter and more accessible and inviting to the public.

Two thirds the way through the project an additional \$7.2m was funded and increased the project value to \$135.8m.

This additional scope included:

- Upgrade audio visual equipment
- Refurbish Back-of-House change room and toilet facilities
- LED display signage
- Projection equipmentment
- Additional disable toilet facilities

However, works still needed to be complete by the original opening date of July 2012, as by that stage the opening gala event had finalised the performers. B. Included details on the type of contract used for the project

#### ALLIANCE CONTRACT

To address the challenges of the project within a fixed budget and timeframe a Project Alliance was formed which included the following parties:

- Arts Victoria Client
- Arts Centre Melbourne Client / Proprietor
- Major Projects Victoria Client Project Manager
- Baulderstone Builder
- Ashton Raggatt McDougall Architects

The Hamer Hall Alliance is the first Building Alliance in Victoria and only the second in Australia. The redevelopment of this significant cultural venue is the first stage of the Southbank Cultural Precinct Redevelopment. There was a purpose made Project Alliance Agreement (PAA). This committed to a collaborative approach between participants to ensure "best for project" decisions were made in each phase and for each element of the project. Accordingly the opportunities and risks were shared amongst the participants.

The PAA sets out the manner and terms in which the Alliance operates in order to achieve and exceed the minimum conditions of satisfaction in each of the objectives , known in this case as Key Result Areas (KRA's).

The PAA also defines project and team responsibilities, payment entitlements, agreed margins and a performance model for sharing of the risk and opportunities. A key element of the PAA was no entitlement to an "Extension of Time"

#### Project Organisational Chart (Extract Only)



- C. Detail with supporting examples and evidence, addressing the Evaluation Criteria in the order stated above, the case in support of the project that warrants the winning of the Award.
  - Outcomes achieved against planned targets for key project parameters

## **KEY RESULT AREAS OUTCOMES (OBJECTIVES)**

The Alliance formulated four themes for the KRA's with different degrees of weighting:

KRA'S	WEIGHTING
Place	10%
Activation	30%
Functionality and Build Quality	30%
Conduct of the Project	30%

The scoring is set up in such a way that "minimum condition of satisfaction or business as usual" outcomes provide no incentive payment, "stretch" around 50% and "exceptional or best practice" 100%. Note that "poor" and "failure" results would take money off the participants. Whilst these outcomes cannot be completed until the expiry of the Defects Liability Period, the project is on target to achieve a "stretch" result.

There were ten specific KRA objectives which were covered by these themes. Although individual scores for all ten areas cannot be determined yet, we can provide a synopsis of the situation. Note that many of the objectives are not construction related and refer more to the wholistic outcomes of the precinct. Focus is provided on construction aspects for the purpose of this award submission:

#### **Architectural Quality**

 This objective is a lag indicator which is designed to measure Architectural Quality of the design including to enhance Melbourne's International reputation for innovative Architecture, creates a contemporary civic environment and demonstrates professional design excellence. 2. A number of renowned Architects have formed an assessment panel to evaluate this KRA. Results are not yet known but early indications are that the exterior design, to bring the outside light into Hamer Hall and the complex Riverside structure, have drawn critical acclaim.

#### **World Class Acoustics**

- Acoustic construction and performance exceeded expectations with positive comments from acousticians and performers / conductors. This was a major risk for the project but reports from guest conductor for the Melbourne Symphony Orchestra and Welsh Male Choir verified the excellent acoustic qualities. It may well possess the best acoustics of any concert hall in Australia now.
- 2. This was achieved through the innovative fold-away brass reflector panels above the stage. They have now replaced the fixed plastic sound domes. The design of the reflector panels are ingenious as they are like a series of large "gull-wings" that can be raised up and down on computerised winches and fold away to create different acoustic effects in the auditorium. This is a first in Australia and sets a benchmark to show what can be done.
- The new theatre seats were rigorously tested to prove their acoustic properties when people were not sitting in them. Tests were also conducted with people in the hall and comparisons made.

 Another shining success was the introduction of a thin (3mm) acoustic spray to the protruding concrete wall elements in the auditorium. The walls were originally constructed from precast concrete and formed crystalline shapes. Exacting spray techniques were supervised by an American supplier who trained Victorian personnel to complete the task.

#### **Attractive Enjoyable Foyers**

- 1. This objective is to ensure that visitors enjoy the ambience, comfort and improved amenities including bars and foyers.
- 2. No measurable data until surveys are conducted by patrons and independent panel.
- 3. However, no negative comments received to date, they have only been positive.

#### **Easy Efficient Circulation**

 The circulation time to vacate the building in case of an emergency has been dramatically reduced by a factor of three to 4. It is now much easier to circulate from the auditorium to street level through the foyers and vice- versa. This is done through the introduction of a new entrance to the Riverside, additional escalators and stairs as well as a re-organised internal layout to create more free space.

#### Delivers The Brief Operationally / Fit For Purpose

- This objective is that the final built outcome delivers the functional brief well. It works, it is convenient, safe, efficient and fit for purpose for its performers, staff and patrons.
- 2. The number of fit for purpose noncompliances has been very low and the associated cost of rectifying these issues

has been less than 0.1% of the overall value which is much less than similar projects whereby 0.3% is usually spent.

## **Quality Build**

- 1. A number of quality risks were understood at the commencement of the project, especially those which required to marry-in existing Architectural finishes with new. One element that is extremely difficult to see is the delineation of the existing scenic paint to the walls in the auditorium with the new. We used the same scenic artist who painted the "cave like earth lines" from 33 years prior to paint over the acoustic spray. The contractor, Ross Turner and associates still had the plans with the colour swatches and managed to meticulously hand paint the walls over a six month period. Similarly new plaster is painted to look like timber veneer and most people are astounded at the quality of workmanship as the similarity is extraordinary.
- 2. The matching of the old upholstered wall leather to the new is similarly impressive as is the gold leaf to the ceilings. Whilst there has been some design or construction defects raised after Practical Completion, their nature has been minor and has not affected any performance or operation of the facility.
- The construction of 70 tonnes of structural steel, 30m above the stage using a three tonne crawler crane on a birdcage scaffold is a first in Australia. From our investigations with other scaffolding companies we have not found where this has been done before. All of the 5m high structural steel trusses and framework were built in an outstanding 22 working day period. This is notable, considering that only a single doorway was available to load in the structural steel and grid mesh a piece at a time and walked in.

- 4. The off-form concrete "belly wall" is a free standing 7m high concrete wall structure that is curved in plan view and slopes one way by 15 degrees and the other way by a similar angle. The construction techniques used old style boat building techniques whereby a series of machine cut gussets at 300mm centres were formed and the soldier members and formply bent to this profile. The wall was poured in two halves and the formwork had significant loads to carry due to its thickness, exceeding 700mm in parts.
- 5. Extensive use of prototypes were adopted. For example a large mockup of the concrete wall structure to the Riverside was built to establish off-form finish, colour control, aggregate size, bush hammer surface finish and complex wall curved shapes. Similarly, a full-size fully operational brass gull-wing reflector was built off-site and rigorously tested prior to main manufacture.

## Sustainable and Efficient

- The objective is for Hamer Hall and the precinct to improve ecological sustainability and that it is cost effective to keep the buildings and public domain clean and well presented.
- This KRA is predominantly a lag indicator with final measures of water and electricity consumption undertaken at the completion of the first 12 months of operation. The design has introduced elements to achieve 40% reduction in water usage per patron per annum and 30% reduction in electricity usage.
- 3. Early indications are that the venue is easily maintained and that consumptions are down on previous readings, but the extent still needs to be verified.

## **Re-Opens On Time**

- 1. Achieved completion of 26 July which was the required date for re-opening and complied with the contractual completion date. Note that the gala opening event with KD Lang was booked approximately six months prior and an additional \$7.2m worth of work was performed without moving the opening concert. Extra emphasis was placed on procurement times for specialist products like leather, hand woven foyer carpet and woven brass mesh.
- 2. A trial performance was conducted ten days prior to the gala opening to ensure any teething issues were discovered. They were some, like sewer blockages, but issues were solved in time.
- 3. As stated before the contract did not consider an entitlement for Extension of Time as provided in traditional contracts. Therefore, a completion date matching, the original contractual date may not sound anything special, the reality is far from the case considering that all design issues, latent conditions, inclement weather and \$7.2m of additional funding was absorbed.

## **Re-Opens Success**

- The four day opening celebrations attracted 50,000 people to the Arts Centre Melbourne. Extensive media promoted the opening with radio, television and print media in attendance. All articles were positive.
- 2. There is an expected 60,000 additional people to the Arts precinct per annum. Current reports are that it is now the busiest the Arts Centre has ever been following the opening of Hamer hall, with five different shows per day.

## Handover from Construction to Operations

- The Alliance ensured there were progressive handovers to ensure that the F&B tenancies were made available as agreed and the Arts Centre could maximise their fit-out period. All handovers for tenancies A,B and C were completed on time.
- 2. In lieu of commencing the Arts Centre move in period after construction works this was performed during construction activities. Arts Centre staff completed white card training and this ensured the venue was ready in time for the opening events.
- 3. Progressive training occurred on the theatre tech zone and all building services with the Arts Centre prior to handing the building over.

• Complexity, difficulty and optimisation of the construction task

### SITE CONSTRAINTS

Hamer Hall is surrounded by St Kilda Road to the east, the Yarra River to the north, City Road to the south and Southgate Avenue to the west. The restrictions associated with this location included:

- St Kilda Road is Melbourne's main arterial and does not have a parking lane. The road was out of action for construction use. Only occasional out of hours deliveries were allowed to the forecourt of Hamer Hall, accessed from St Kilda Road. Individaul approvals and road permits were required from Melbourne City Council to enable this.
- 2. The Riverside area to the north required a 3m deep sewer main to be installed to the length of the site following demolition of the main deck over. This put tremendous limitation on mobile cranage and deliveries for more than two-thirds of the duration of the project. The deep excavation was also controlled by the tides of the Yarra River as the base of the trench was below the water lines.
- 3. Southgate residents (Quest Apartments) and restaurants were immediately to the west. Restrictions were put in place to ensure there was no demolition during lunch hour, early morning or evenings. Demolition occurred for about 20 months of the 24 month period.
- 4. Dust control was imperative for the outdoor dining areas at Southgate as this was a health issue as well as an environmental one. A temporary mist spray water line was established to the perimeter of the site and was maintained for a nine month period to settle airborne dust.

- 5. All deliveries and construction activities could only occur from one construction zone in Southgate Avenue. As there was no tower crane possible, only mobile cranes were used and could only be founded in Southgate Avenue. This road was the main arterial for Southgate deliveries and Quest Apartments.
- 6. The old concrete deck which linked St Kilda Road and Southgate had to be demolished but this provided public access. There was a ministerial directive to ensure that the general public could maintain access to Southgate at all times from St Kilda road. To ensure this could happen the Alliance provided a series of gantries on the River Edge to the north and another raised access and stairs to the south. Once the south stairs had to be removed for construction works a 100m long public walkway was constructed and maintained to run through the construction site on the new concrete deck. This was moved at least six times to ensure screeds and bluestone paving could be laid concurrently.

## COMMUNITY AND STAKEHOLDER RELATIONS

#### **Melbourne City Council**

The majority of the external landscaping works were performed on City of Melbourne land. The Alliance worked closely with Rob Adams and Frank Isgro to coordinate the logistics and quality inspections to lay the screeds and bluestone pavements. Regular contact was made regarding public safety issues, noise issues and construction zone / pavement rental. There were no by-law fines issued at all for the project. At the conclusion of the project Frank emailed our Stakeholder manager and said;

"We appreciate yours and the team responses to the various challenges that cropped up during the project and congratulations on its successful completion. Regards Frank"

#### Southgate / Quay West

The residents at Quay West and tenants at Southgate were very aware that construction activities were going to impact their daily lives for a two year period. A Baulderstone stakeholder manager was employed to negotiate requests and communicate activities on a daily basis. Special attention was given to anything that could impact on noise, dust, access, visual or safety concerns.

One initiative was to progressively invite these external parties to tour groups of the site to show them first-hand what special measures were being undertaken and the degree of difficulty. Also a Facebook and Twitter page were established. Facebook was the key method of communicating with external parties and issues were logged and addressed via these medium.

The owners corporation of 28 Southgate Ave, Ian Taylor, said via e-mail:

"As the Owners Manager for 28 Southgate I would like to add to Inge's comments (of thanks) and thank you for a very professional job over the past year or so. The level of communication and consideration of neighbours from all involved with the project has been great."

#### **RISKS**

Construction risks were mainly focused around the logistics of constructing the technical zone and the Riverside curved wall structures and whether there was sufficient time to fit within the allocated period in the construction programme. Further details are provided in later sections of this submission.

With any refurbishment project there is an underlying risk of latent conditions for the structure, finishes and services. Although existing original drawings were available latent conditions were discovered throughout the project.

These included old and brittle wiring for the distribution boards, mains fire pipe not installed where it should have been, asbestos and mineral fibre, greater thickness and strength of concrete water ingress into trenches and general basement damp proof problems. The design relied upon opening up sections of the building to inspect existing conditions but this was quite limited due to its invasive nature and performances occurring until the closure date. In each case, when an issue was discovered a solution was sought to comply with the KRA's through discussion at separate coordination meetings.

Baulderstone employed a senior Site Manager, Dennis Deveson, to manage latent condition issues along with buildability and prototyping. This proved invaluable as it minimised considerable delays on the program. • Leadership and management of the project delivery

#### LEADERSHIP, MANAGEMENT AND INNOVATION

A true partnership between private and public sectors existed through an adoption of the Alliance delivery model.

The site based management team had overall responsibilities to deliver the project and manage the daily time, cost, quality and safety issues. This team was called the "Alliance Management Team". It was represented by one member of Baulderstone, MPV, Arts Centre and Ashton Raggatt McDougall.

An Alliance Leadership Team (ALT) had overall contractual responsibilities and had responsibility to make decisions when there wasn't agreement at AMT level, review implementation measures for the KRA's and alter / discuss Project Alliance Agreement. It compromised Senior Management (General Manager level) participants from the same parties listed above including Arts Victoria.

In order to achieve the KRA's a high degree of collaboration and fast tracked approach to design, scope resolution and construction were required. Time, cost, reputation and quality issues were considered for public and private proponents when making decisions, noting that the opening date could not move under any circumstances. The Alliance overcame challenges through extraordinary teamwork, with a focus on face to face and proactive problem solving, whilst avoiding blame. Collaboration was assisted by all team members occupying one open office.

Examples of teamwork include:

- Solving a significant latent condition which was discovered only two months prior to opening date. The existing large suspended concrete slab at the main St Kilda Road entrance was found to be 200mm too high and couldn't provide the correct falls for water shedding and disabled access. There were functional battery rooms below and the removal and recasting would have meant a two month delay to the opening. A solution to mill the concrete and epoxy additional tension bars eliminated the delay and minimised cost exposure.
- Southgate businesses were being impacted by their own refurbishments along with Hamer Hall refurbishments. The project ensured a 100m long public walkway was created and moved many times over eight months to ensure thousands of daily patrons

## CONSTRUCTION PLANNING

Baulderstone was instrumental in influencing the design to minimise safety issues and maximise buildability issues. Establishing the construction team well before construction commenced allowed significant pre-planning to enable safety in design to be incorporated into building methodologies.

Our approach has included:

- Thorough consideration of constructability in the design phase, including reviews of material selections, construction techniques and trade skill availability
- Disciplined approach to programming, linked to robust resource planning
- Application of lessons learnt on similar projects, eg. State Library and National Gallery of Victoria
- Trade-partner input through prototyping and buildability advice eg. patina brass finishes, gold leaf ceilings and leather reinstatement
- Thorough site investigations to inform designers of the nature of existing conditions
- Early consideration of design outcomes and construction processes to ensure business continuity
- Optimal opportunity to test and realise visionary and challenging design and construction elements
- Clarification and confirmation of performance benchmarks and operational criteria through mechanisms such as 'return briefs' eg. visiting the recently completed Recital Hall
- Regulatory compliance.

Baulderstone led the buildability initiatives incorporating safety in design that have been implemented on the project include:

#### Birdcage Scaffold to Construct New Technical Zone

The new technical zone over the stage has been designed to improve acoustics and conceal technical equipment such as stage lights and speakers.

The technical zone contained equipment within a discrete housing and allow specific elements to be lowered through a series of panel doors for a range of various performance styles - including orchestral and amplified concerts. The brass panels also act as acoustic reflectors, assisting with sound reflection across the platform for performers, and supporting the Halls other acoustic improvements to provide better sound for the whole audience. This is a major component of the auditorium improvements for both the audience and the artists.

In order to construct the new technical zone, a birdcage scaffold was specially designed to be used as the platform to build the new technical zone 20m above the stage. The scaffold was designed and built to accommodate the weight of a three tonne crawler crane. Prior to any work commencing, numerous inspections and sign-offs were undertaken by Work Safe, engineers, the scaffolding company, and project and Union OH&S representatives.

To construct the new technical zone, over 80 tonnes of steel was installed (4.75m high trusses), over five tonnes of bolts used, and a three tonne crawler crane was placed on scaffold to install steel operating on the engineered birdcage scaffold. The birdcage scaffold contained over 100 tonnes of scaffolding. An independent birdcage scaffold was also required underneath the stage (which needed to be erected in and around the under-stage hydraulic lifting system) to accommodate the birdcage scaffold above. This had to be directly under the birdcage scaffold on the stage, which was a precise operation.

The scaffold was constantly monitored by engineers during the installation of the technical zone steel elements.

### Materials Handling to Construct Technical Zone

During the process of planning the construction of the new technical zone, the issue of material handling became a significant buildability and safety issue to be resolved. Working within such a confined space and needing to maintain continuity of other works in the auditorium was a focus for the team. As a result of significant planning, it was decided to create a penetration through existing concrete façade of the Hall, which enabled over 80 tonnes of structural steel required for the technical zone to be passed through penetration using a fork lift. If this solution had not been devised, all material would have had to be delivered two floors below river level then hoisted up 20 meters above auditorium floor creating significant risks that were eliminated by this solution.

## **Relocation of Services**

The location of the new escalator penetrations conflicted with existing power cables running from the substation. As the new location of the escalators could not be moved, extensive relocation of services had to take place, which was a high risk activity that needed to be carefully planned and executed by subcontractor, Elecraft.

#### Application of Acoustic Render and Scenic Paint

To assist with improving the acoustics in the Hall, an acoustic render (foam-like material) has been applied to most of the existing walls. This was an exacting process, as the render needed to be between 1.5mm and 3mm thick. Once complete, the team of Scenic Artists from Scenic Studios, re-painted the render to match the existing walls – recreating John Truscott's original intent of the cave-like illusion. Scenic Studios were the artists who undertook the original painting in the Hall nearly 33 years ago.

To enable the application of the acoustic render, and the follow on painting of the walls, and extensive scaffold system was used to safety undertaken these activities, while enabling site works to continue elsewhere in the auditorium.

## **Removal of Hazardous Material**

Recognising that considerable demolition would be required within and around the 33 year old heritage listed building, before any works commenced on site, a Division six audit was undertaken. Using the results, the OHSE Manager, Safety Committee and consultant, Noel Arnold and Associates. developed procedures on how to manage hazardous materials discovered on site. During the course of works on site, if any questionable substance was discovered works would cease and the material tested and removed as per the plan. Within the entire construction period to date, all hazardous material has been identified and dealt with in an appropriate manner.

#### Demolition of Old Concrete Deck

As part of the redevelopment, the existing deck structure needed to be demolished before the new terrace could be constructed. Over a period of five months, approximately 3,939 tonnes of concrete and 1,645 tonnes of steel was removed with no safety issues. It was a major accomplishment to undertake this significant demolition work, while still enabling the public to continue to move around the precinct safely. Strategic management of stakeholder expectations and requirements regarding public access to the adjacent retail, office and restaurant precinct (Southgate) was extremely important during the early planning stages of the project. A gantry structure was installed along the river front, and pedestrian/bicycle access diverted underneath the gantry.

Access was reinstated for major events such as Christmas, Moomba and New Year's Eve, when the precinct experiences particularly high levels of visitation.

#### **Escalator Penetrations**

Once the old escalators had been removed from the old foyer space, a catch deck needed to be constructed (2 floors high) to enable the new escalator penetrations to be broken through the existing floors. Once this was complete, the catch deck was removed and a new formwork scaffold was built to enable the reinstatement of floors and the penetration openings for the new escalators to take place. When curing had taken place, the new escalators could then be delivered and installed.

#### **Riverside Lift Shaft**

The riverside lift shaft was constructed from precast concrete in lieu of in-situ, which was suggested by Champion Structures in agreement with Alliance team. This enabled time saving in the duration of the riverside construction program, and had significant safety benefits for the team working within the area.

#### **Redesign of New Toilet Layout**

The toilet layout was redesigned to simplify and reduce scope of excavation and retention works. As well as maintaining the integrity of St Kilda Road and ensuring no damage to significant trees on St Kilda Road, it reduced the time required to undertake the job, and reduced the amount of contaminated soil required to be handled and disposed of, reducing the safety risks.

## Redesign of Footing System to Riverside Structure

Along the riverside, strip footings were replaced with bored piers for the foundations for the new river façade wall. This modification minimised the safety risks, by reducing the removal and disposal of significant amounts of contaminated soil, in addition to reducing the risk of disturbing underground services.

#### Slab Strengthening System in Plenum Space

Simplification of slab strengthening system in plenum space under the stalls level seating in the auditorium reduced significant risks associated with the degree of difficulty working in a restricted work zone (approx 1m high). A steel column propping system was used instead of the original solution of an applied carbon fibre mesh system.

#### **Dismantling of 'Arcturus'**

During the redevelopment, Arcturus (the light sculpture by Michael Santry) needed to be removed from its existing position to enable the re-design of the foyer spaces. A rigorous process was undertaken to select a qualified contractor with the required experience and understanding of the art work. International Conservation Services (ICS) was commissioned to assist with the planning and storage of the sculpture. 730 pieces were removed individually - each with a bar code applied so individual pieces could be located at a future time.

#### **Stage Floor Joist**

In order to mitigate risk in lowering the existing floor joists to the stage, a revised detail was agreed which eliminated this requirement by introducing perpendicular joists.

#### River Level Foyer Stainless Steel Inserts

With the river level foyer designed to be striking and theatrical, elements of the design, such as the stainless steel "ribbon" snaking its way through the walls, required significant discussion and planning to ensure they were built as planned, and in a safe manner. After testing a variety of different methods, a solution was achieved whereby a 3mm x 6mm ribbon that could be bent and rolled to achieve the desired curves was used, and then render applied over the top.

## HEALTH, SAFETY AND ENVIRONMENT

#### Safety Index

One of the key initiatives implemented by Baulderstone on the project has been our Safety Index assessment tool which measures project safety performance combining both Lead and Lag indicators, allowing monthly evaluation of "safety critical" events and aspects.

The Safety Index has provided an excellent safety performance barometer, combining critical lag and led "behavioural" elements. It has been central in providing genuine impetus for the promotion of line management accountability and involvement activities and actions.

Key performance areas where the Safety Index has provided real and tangible impact:

- Site supervisors actively engaged and participating in "Safety Behaviour Observation" program and site OHS consultation forums, eg. toolbox talks and Safe Work Method inductions
- Site middle management involvement and participation with project safety committee functions and activity
- Engagement with key subcontractor representatives both on-site and off-line
- Project compliance to the OHS Line Management Accountability matrix, a matrix which sets out minimum standards for participation and involvement in "safety critical" areas and forums
- Helping to bring monthly focus and perspective to key injury prevention programs eg. Hand protection program
- Internal compliance to measured elements of the project safety management system i.e. submission, review and implementation of key subcontractor safety planning documents

- Corrective action implementation and close-out post site assessments and audits
- At Practical Completion there were over 800,000 man hours worked and only one minor lost time injury (LTI), that being dust in eye (even though safety glasses were being worn).

Although there was no measureable safety objectives in the project KRA's this was still a good result, considering the extent of high risk work involving demolition and work at height. Baulderstone always strive for NO lost time injuries on any project and were thankful that this single issue complied with the specific safe work method.

## Health and Well-Being

With the support of WorkHealth and IncoLink free WorkHealth checks were offered to all project and site personnel. These checks provided the opportunity for each individual to learn more about their state of health while at work and understand the risk of heart disease and Type two diabetes.

Over 200 people participated in the WorkHealth checks on the project over a period of five days. The program has also included health awareness toolbox talks and feedback debrief sessions regarding health risk areas and preventative health awareness.

Project personnel have also been involved in the pilot of a Young Construction Worker Healthy Eating Initiative also being development by WorkHealth.

## INDUSTRIAL RELATIONS

There was no lost time due to industrial activity for the duration of the project. This was achieved through a good working relationship between Baulderstone Site Management and workforce representatives and organisers by keeping them informed of what was happening on site.

One invitiative was to invite the safety representatives of the unions to visit site to inspect the birdcage scaffold and witness the workmanship prior to placing the three tonne Maeda crane.

Safety was a key aspect and open communications existed between Baulderstone management, the Site safety Committee and the broader site. Regular toolbox meetings were held with the whole site in addition to the daily ones.

## TRAINING

Apart from the routine safety induction and quality training performed on any project, there were specific initiatives introduced to help achieve the project KRA's. These included:

- History and standare of workmanship for original trades explained in Quality Tool Box Inductions
- Specialist trades training Baulderstone and Architects on how to manufacture and apply projects:
  - Patina Brass finish
  - Gold Leaf
  - Bluestone quarry and manufacture process
- Open Day to general public with videos, demonstrations and personnel from the project presenting. Over 30,000 people attended this and other public buildings offered in June 2011.
- Functions provided for directors of subcontractors to take an active part in the project
- Flying system technical control panel training performed by Waagner Biro (Austria) and Australian personnel now compliant.
- Enviroflex acoustic spray, specialist applicator from USA trained Australian applicators.
- Tour groups from universities and institutions and organisations welcomed for regular site tours to demonstrate work practices.

## INNOVATIONS AND INITIATIVES

Our approach to identifying opportunities for innovation has involved providing the right environment to inspire innovative thoughts and ideas. The pursuit of innovation has extended from the implementation phase of the project through to construction.

## **Staging Technology**

Prior to the redevelopment, Hamer Hall's shortcomings included its outdated technical zone and flying system. The old technology meant touring shows were required to install their own supplementary rigging equipment, a task made difficult by restricted access to the stage ceiling cavity. The new integrated theatre technical zone and flying system provides an innovative solution to the Arts Centre's objective of attracting a wider range of performances, more often. The new system provides Hamer Hall with the technical staging and lighting equipment required of today's world class concert venues and performers. The construction methodology and "gull-wing" acoustic reflectors are truly innovative work practices which are the promary legacy of the project.

#### Construction of Concrete "Belly Wall"

Challenging and unique formwork structures were required to be installed for the construction of the building's façade. The varying shape, height and thicknesses of these concrete walls presented various unique considerations which were overcome by using boat-building formwork techniques. In some areas each sheet of ply was individually computer modelled and laser cut to suit exact positions within the system. Elements were constructed and laid-out on the adjacent floor and erected individually using elevated work platforms, scaffolds and mobile cranage. In addition to the "belly-wall" are the other curved insitu concrete walls, formed using traditional techniques. This is an example of what three dimensional shapes are possible with careful planning.

This complex work was completed without safety incident. Many of the inherent risks associated with typical formwork construction were overcome by thorough job pre-planning and design.

## **Removal / Installation of Escalators**

Working within the extremely tights confines of the existing 30 year old building created extremely challenging dilemmas on how to remove the old and install the new escalators. Due to the size of the old escalators, there was no possibility in removing them as one entire unit, so they were dismantled into smaller sizes before being removed. In order to do this, the escalators needed to be backpropped to ensure they did not collapse once the first section was removed.

Once this had been complete, the new escalator elements were able to be installed. The six new escalators (weighing a staggering 7.5 tonne each) arrived and were in a precise exercise that took five days to unload and position the twelve pieces using two seven tonne forklifts.

Through significant planning and prework, all of this would was undertaken within designated operational inclusion zones during normal working hours, while other works on site were still able to safely continue.



## SITE PLAN AT RIVER LEVEL

## **BAULDERSTONE DELIVERY TEAM**



#### PETER CRANWELL Construction Manager

**AMT REPRESENTATIVE** Overall responsibility of the financial and delivery of the project.



#### JOHN ANGELOVSKI Delivery Manager

Overall responsibility for the delivery of the project focusing on subcontractor management.



#### JACLYN GOW Project Manager – Auditorium

Overall responsibility for the delivery of the Auditorium (theatre technical zone, stage and seating).



#### MATT HEDGER Site Manager

Overall responsibility for the daily site management with a focus on safety, quality and supervision of subcontractors.



#### DENNIS DEVESON Site Manager – Procurement and Interface Works

Overall responsibility for procurement of materials and Art Centre transition at completion.

## Southbank Cultural Precinct Redevelopment – Stage One, Hamer Hall







LOCATION Southbank, Victoria

**CONTRACT VALUE** \$135.8 million (Alliance) \$93.4 million (Baulderstone)

CONSTRUCTION PERIOD Jul 2010 - Jul 2012

TYPE OF CONTRACT Alliance

#### CLIENT

Arts Victoria, Victorian Arts Centre Trust and Major Projects Victoria

#### CONSULTANTS

Architect Ashton Raggatt McDougall

Structural & Services Engineer Aurecon Quantity Surveyor DCWC Theatre Planner Schuler Shook Acoustics MDA/Kirkegaard JV

Creating what matters

The \$135.8 million redevelopment of Melbourne's iconic Hamer Hall was delivered under an alliance between Baulderstone, Arts Victoria, Major Projects Victoria, the Victorian Arts Centre Trust, and architects Ashton, Raggatt, McDougall (ARM). This was the first building alliance in Victoria, and only the second in Australia.

The refurbished Hamer Hall features improved acoustics, new seating, cutting edge staging systems and technology in the auditorium, new and expanded foyer areas; as well as exciting new connections to the city and the river bank.

One of the key challenges was the need to balance the building's existing heritage elements with the state-of-the-art technology required to ensure the venue stays relevant for another 30 years.

The refurbishment has made Hamer Hall more accessible, providing a better experience for audiences, and ensuring that it can continue to present a wide range of top international and local performers.

The renovation has created a new outward facing venue, incorporating a riverfront entrance that opens to Melbourne's popular Southbank promenade, complete with an exciting new external façade.

In July 2012, Hamer Hall was reopened to the public with a spectacular four-day festival featuring local and international artists and musicians, roving entertainment and guided tours of the new facilities.



1. Demolition of Riverside concrete deck showing dust control.



2. Demolition of Riverside concrete deck showing dust control.



3. Birdcage scaffold erected on stage.



4. 3 tonne Maeda Crane founded on Birdcage scaffold lifting truss element.



5. Erection of technical zone steel work from Birdcage scaffold.



6. Completion of technical zone steel work from Birdcage scaffold.



7. Escalator installation through three level void.



8. Escalator installation at ground floor level.

#### 9. Image Description



9. Acoustic reflector panel prototype in up positition.

10. Acoustic reflector panel prototype in open positition.





11. Installed acoustic brass reflector panels above stage in open position.



12. Curved "belly-wall" formwork.



13. Completed "belly-wall after stripping.



14. Raking concrete wall formwork.



15. Completed raking concrete wall after stripping.

![](_page_30_Picture_1.jpeg)

16. Riverside Foyer – eg. curved Renderoc to walls and ceilings with inlaid stainless steel ribbon.

![](_page_30_Picture_3.jpeg)

17.New gold leaf to ceilings.

![](_page_31_Picture_1.jpeg)

18. New gold leaf coffer ceiling and brass finish to new bar.

![](_page_31_Picture_3.jpeg)

19. Scenic painting to auditorium walls.

![](_page_32_Picture_1.jpeg)

20. Public walkway maintained through construction site.

![](_page_32_Picture_3.jpeg)

21. Gala Opening Night in the Auditorium.

![](_page_33_Picture_0.jpeg)

# Creating what matters

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southgate

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