

# THE NEW ROYAL ADELAIDE HOSPITAL

The new Royal Adelaide Hospital will be Australia's most advanced hospital & the single largest infrastructure project in the history of South Australia.

In undertaking the new Royal Adelaide Hospital, which is the largest infrastructure project Adelaide has ever seen, the Hansen Yuncken Leighton Contractors Joint Venture (HYLCJV) has developed innovative Building Information Technology (BIM) applications. These could potentially change the way major projects are managed in the future, just as the new RAH will change the face of healthcare in South Australia.

The scale of the project is nothing short of colossal. The site itself is 10 hectares in size, and the 10-storey new RAH building footprint occupies 175,000m<sup>2</sup> of the site, with an additional 76,000m<sup>2</sup> of car parking space and extensive landscaping and public open space.

The newRAH will provide 800 single bedrooms including 100 same day beds, 40 operating theatres, some with inbuilt MRI facilities and an emergency department capable of treating 25% more patients every year than the existing RAH. In the basement there will be a fleet of automated vehicles to help move equipment and supplies around the hospital which are linked into the newRAH's state-of-the-art ICT system to enable tracking of equipment via digital technology.

This will also be one of the greenest hospitals in Australia, with extensive use of natural light and ventilation, including windows that open in patient bedrooms. Integrated green spaces throughout will improve staff, patient and visitor wellbeing. These spaces will also allow for future expansion if required. Modelling of the newRAH hydraulic and electrical systems predicts the newRAH will be extremely water and energy efficient, and achieve a 40% reduction in CO<sub>2</sub> emissions.

HYLC commenced construction of the \$1.85 billion PPP Project in June 2011 and has a five year program mapped out to complete construction, commissioning and fit-out. To manage the projects' extraordinary level of complexity throughout such a lengthy construction program and ensure thorough information sharing between all stakeholders. HYLC, the client, consultants and subcontractors has seen the adoption of building Information modelling (BIM).

Collaboration was key in establishing a common approach to the delivery of BIM of which all stakeholders has adopted the implementation of the Project BIM Execution Plan (BEP), which provides a cohesive approach to the required systems, the required standards, methods and protocols to help deliver the project.

The traditional boundaries of collaboration have been challenged throughout the project's design process. HYLC in coordination with the lead architects and design teams have facilitated more than 450 client user groups meetings during a 14 month period and a biweekly exchange of more than 220 3D Revit based models during the design stage including issuing Navisworks models for each of the 240 State Discrete Packages.

The collaboration of design data for all forms of design analysis included seismic, solar studies, wind, cooling loads, cfd, lighting, energy and used the base object data to help manage both functional area sizes and numbers of FFE items against the State's functional brief.

Integrated within BIM, HYLC has utilised 4D construction sequencing, by importing base Revit model data to provide detail workflows and the planning and monitoring of the final design and construction deliverables. This data has also been utilised by the cost team for checking 5D base quantities and in parallel with the traditional costing exercise to evaluate the future business potentials.

To ensure added value, HYLC has now integrated specialist contractors into the process to help develop the required seismic solution, remove duplication and improve the overall build ability by the incorporation of offsite manufacturing opportunities into the final design process.

As of January 2014, the HYLC Federated BIM model has issued 1200 3D models and generated 14,518 2D drawings.

Onsite, field BIM is driving innovation via mobile tablets using 3G cards providing access to all the appropriate 2D installation drawings via a link within the 3D model from



JOINT VENTURE: Hansen Yuncken & Leighton Contractors  
PROJECT END VALUE : \$1.8 billion  
COMPLETION : Mid 2016

each functional area. Each sub contractor has access to live real time data allowing data to be input, reviewed and analysed in the field. The HYLC team estimate this advance and the other BIM-related innovations will reduce the need for rectifications, with up to 12% saving on waste caused by clashes, defects and unforeseen design issues.

According to Dr. Dominik Holzer, Chair of the National BIM Steering Group of the Australian Institute of Architects and Consult Australia, the newRAH Project is the first in Australia to implement Field BIM in Conjunction with Motion Tablets.

HYLC also developed an in-house project-dedicated single point of truth newRAH information centre (SPOTNIC) system, to streamline the management, development and operation of design and construction data across the team of 51 subcontractors and consultants.

It is the only software application available that incorporates a QC Management system, 3D BIM Model, a document management

system and an intelligent reporting system in one place. It is an integrated and collaborative project delivery tool, embedded as part of the project's BIM management process.

Developed in house, SPOTNIC is an industry first management system that brings a cutting edge step change to the Australian construction industry. Integration of the SPOTNIC into systems and processes provides access for subcontractors to consistently capture, manage, maintain and report all completion data in a highly efficient way. Further, it will ensure QC records are accessed from a central location with capacity for retrieval from a 3D model. A glimpse into SPOTNIC's data files gives an indication of the sheer enormity of the management task – with the system storing more than 18,280 documents, 254,798 FFE objects, 675 models and more than 400,000 3D architectural objects alone.

The result of all that data is a hospital which is taking shape and changing the skyline of Adelaide's West End. The footings are complete, and ground floor slabs are largely completed.

Suspended formwork for higher levels is progressing and now are over 50% complete.

The lower south side of the structure and some of the lift cores topped out near the end of 2013 and services installations, fit out and facade are now progressing. The newRAH cogeneration plant has also been installed. The plant comprises two units which between them will generate heat for all of the newRAH hot water supply and also meet an expected 35% of peak load electricity demand.

The workforce is expected to peak with approximately 1,800 workers on site at any one time.

One of the goals of the new RAH project is to build in efficiencies where the old hospital site was lacking – a goal that involved assessing the shortcomings of the former hospital and finding ways to bridge those gaps.

"We tried to step forward in time as to what our world class facility would be in years ahead," says HYLC Development Director, Chris Pratt.

"In every facet of the facility, one test has been: what are the world's best practices now and what will be the world's best practices in the future? The other test has been: what will allow the facility to still operate under world's best practice standards in the future, when we don't know what those standards will be?"

The innovative BIM approaches and sheer depth of consultation and stakeholder engagement the HYLC team and the designers, engineers and specialist consultants have been through is certainly the most effective way to ensure in the years ahead, their work now will still represent a leading-edge design and construction achievement.



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## EXPERTISE ENSURES DYNAMIC DESIGN DELIVERS A FIT RESULT

As a dynamic design combining high performance specifications and sustainability qualities, the façade of the new Royal Adelaide Hospital required specialist advice during the detail design phase to ensure the design was both buildable and would comply with the required standards.

Hansen Yuncken Leighton Contractors Joint Venture's Façade Project Manager, Herme Rabl and Development Director Chris Pratt identified a need early in the design stages for a specialist consultancy to assist. BG&E Façades were contracted alongside other specialist consultants based on their demonstrated expertise in proving and refining designs for ground-breaking façades. BG&E worked closely with HYLIC, the architect and the façade contractor to resolve the complexities and initiate the appropriate research to ensure the potential technical risks were managed and compliance requirements met.

BG&E commenced work in the project in mid-2012, and their first task was to review the existing façade documentation for compliance with the key brief requirements for the health-care setting. These included infection control, condensation, window openings, climate change, acoustic, thermal, safety and seismic requirements, in addition to the standard requirements for any building of waterproofing, air permeability and structural soundness.

The façade is predominantly comprised of Unitised Curtain wall with double glazed units, the majority with a jockey sash for acoustic purpose, and fire rated A2 aluminium cladding. The façade also includes window walls at lower levels, a skylight and glazed cloister.

Public art is a key part of the overall newRAH design vision, and all internal garden courtyards feature art which will be incorporated into the glass composition. The main "faceted" wall has graphic frit on the glass which will be used to project images onto. Part of BG&E's scope was to develop the glass specifications for these unique parts of the façade, while also overall simplifying the numerous glass compositions and spandrel make ups.

Verifiable data was required to prove the cutting-edge design could meet the acoustic and seismic standards required by SA Health. The key challenge in terms of acoustics comes from the helipad on the south-western corner, which will result in noise levels of over 100 decibels from 20m away. To ensure patients would not be disturbed, the façade's external windows needed to be capable of blocking the sound, and testing during the detail design stage was required to demonstrate it would be so.

"Two tests were carried out. First, in conjunction with CSIRO, we had the various façade types tested for acoustic compliance. There were five major façade types with various RW ratings which were tested for compliance," said BG&E Project Manager, Oliver Ng,

"The second test carried out was the AS4284 test. Three prototype samples were tested, which included the major façade types comprising the majority of the building façade.

"Due to specific brief requirements such as increased wind loads due to climate change and a 1 to 2500 year earthquake return period, the specimens had to pass a seismic test. To simulate this, two hydraulic rams were employed to rattle the specimen to a predetermined speed and cycle and that no elements fell or failed. The specimens were then tested for water penetration and air to determine its performance after an event. All tests were passed.

"This was probably one of the most comprehensive façade tests carried out for a building in Australia."

"Apart from the stringent requirements such as acoustics, thermal, and seismic, the façade was also required to be flexible and to accommodate room size and functional changes internally. Details for sills and inter room partition walls had to be developed to accommodate these changes."

"newRAH also has operable windows in each inpatient unit room. This made infection control issues such as cleaning and maintaining pressure in high containment areas difficult, therefore operational controls had to be incorporated."

The entire process of refining and proving the façade design took six months, and resulted in BG&E delivering final shop drawings and technical specifications to the façade contractor which were demonstrably compliant with environmental, aesthetic and performance requirements.

The project was entrusted to senior BG&E staff including Simon Barnes (Design Director), Peter Smithson (Managing Director and Material Specialist), Oliver Ng (Project Manager) and Stefan Brey (Technical Director), who peer reviewed the thermal and comfort issues and technical aspects of the proposed glass and testing requirements.

"It was a complex brief which had to be understood. Through streamlining the process, and value engineering the solutions, we were able to efficiently manage the façade types and enhance our deliverables. The end result was a robust façade which was cost effective," said Oliver.

BG&E Façades have a range of high-level expertise in-house which enables them to develop whole-of-building design solutions for challenging projects. The company's staff includes architects, material specialists, detailers, structural engineers, mechanical engineers and industry based personnel including fabrication and site specialists. The consultancy has recently been involved with a number of iconic high-performance building projects, including The Fiona Stanley Hospital in Perth and the Royal Melbourne Children's Hospital. They are now currently working on the Midland, St John of God and Geelong Hospital projects.

*For more information contact BG&E Façades Pty Ltd, Level 2, 37-41 Little Bourke Street, Melbourne, phone 03 9652 3900, website [www.bgeeng.com](http://www.bgeeng.com)*





## AN OUTSTANDING PARTNERSHIP

Set to open in mid 2016 and described as the State's flagship public hospital, the new Royal Adelaide Hospital will harness the latest in architectural design to provide a world class health care facility. It is only fitting that the design for the new Royal Adelaide Hospital is being undertaken by joint venture partners Silver Thomas Hanley and DesignInc, (STHDI).

Silver Thomas Hanley Health Architecture managing director Ernest Girardi said the joint venture was created specifically for the design and delivery of major health projects across Australia.

"It commenced with the \$260M Orange Hospital in New South Wales which was completed in 2010. STHDI are also completing the Victorian Comprehensive Cancer Centre in Melbourne (\$1B), in association with MCR," he said.

"The partnership brings together outstanding creative and technical knowledge through dedicated health facility design teams with extensive local and international design experience.

"STHDI work closely with health care users, management, patients and stakeholders to create facilities that contribute to wellness and healing in world class facilities."

Silver Thomas Hanley, is the pre-eminent health care architectural practice in Australia, employing over 130 people in offices across Australia and has over \$5 billion of health projects in progress internationally.

The hallmark of these projects is humanist environments support by efficient and rational planning solutions.

STH are also currently leading the industry in the application of BIM technology specifically tuned to the delivery of major health care projects.

DesignInc is an international architecture and design practice with a focus on creating quality environments that reconcile natural, social and economic imperatives.

Diversity of talent enables their involvement in a wide range of projects with successful long-term client relationships.

Across Australia and the Asia-Pacific region the practice employs over 200 architects, interior designers, urban designers, and supporting professionals.

An integral part of the DesignInc approach is environmental sustainability, as well as an innovative and client focused process, resulting in over 70 major awards for design and construction excellence.

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## HIGHEST STANDARDS OF SAFETY, SKILL AND SERVICE

**Fleurieu Cranes, one of Adelaide's leading crane hire companies, have the experience and the fleet to respond quickly to the needs of complex building projects like the New Royal Adelaide Hospital.** They have committed to providing mobile cranes on an as-needs basis to the project for its entire duration, for general lifting and for the erection and dismantling of the project's tower cranes.

The cranes have been provided on a wet hire basis, with Fleurieu committing a crew of up to 30 to the project including the crane operators, riggers and dogmen. The scale of the project and the multiple work fronts all within close proximity has been a challenge, with their cranes continually on the move around the site. This has made logistical management and safety awareness extremely important.

"We have had to be very flexible and responsive," said Fleurieu Cranes Spokesman General Manager Brandon Freer. "We have had up to eight mobile cranes on site, and quite often have needed to undertake work after hours for tower crane erection and maintenance."

Fleurieu's cranes at the site have included up to 400 tonne capacity with a luffing fly jib allowing for maximum capacity at the greatest radii whilst remaining below the overall ceiling height set by the local aviation authority.

"This is a landmark project for Adelaide and we are proud to be associated with it and with the HYLIC Joint Venture team. Projects such as this are important for the growth of our business, which has been continuing to grow through difficult times in the local industry," said Brandon.

Other current local projects include the Southern Expressway Duplication Project, Urban Superway, Various Utilities Maintenance and Wind Farm Maintenance and Goodwood Rail Grade Separation Project.

Fleurieu Cranes have been supplying crane hire solutions to projects through South Australia since 2005. Their fleet of wet and dry hire cranes includes mobile cranes, City Cranes (for tight access), All-Terrain cranes and crawler cranes, ranging from 12T to 400T together with materials handling equipment and transport equipment. The company also provides steel fabrication services and labour hire, including highly experienced and ticketed operators and riggers.

Their capabilities encompass all tasks where lifting is required, including tilt up panel erection, structural steel erection, stage erection for events including Adelaide Festival and the Big Day Out. The company has more than 60 staff working on projects including commercial construction, infrastructure and mining sector projects.

With a keen awareness about the importance of safety within their high risk industry, Fleurieu Cranes are thankful for the shared safety experience and knowledge of their mining customers which have enabled them to apply this high level of safety to their everyday lifting procedures

**For more information on how Fleurieu Cranes can assist with your next project or lift, contact Fleurieu Cranes Pty Ltd**, 7-9 Lafitte Road, Wingfield SA 5013, phone 08 8260 5122, fax 08 8260 5922, email [service@fleurieucranes.com.au](mailto:service@fleurieucranes.com.au), website [www.fleurieucranes.com.au](http://www.fleurieucranes.com.au)



## HEALTHCARE GOES DIGITAL ON A MASSIVE SCALE

As part of the first digital hospital in South Australia, the Information and Communications Technology (ICT) system Visionstream is delivering for the new Royal Adelaide Hospital (RAH) is an extraordinarily complex and lengthy undertaking, with one network carrying all electronic traffic, including voice, data, BMS, HDTV, videoconferencing and security.

This next-generation ICT network is designed to support the South Australian Government's model of care, focussed on utilising technology for the provision of safe care.

"The network is the glue that holds all the systems together in the hospital," explained Visionstream General Manager, Ric Oldham.

There are three discrete ICT works packages for the hospital: a high availability network infrastructure including all core, distribution and edge switching; a Cisco IP Telephony platform, delivering a unified communications system including wired and wireless handsets; and a Real Time Location System (RTLS) for wireless tracking and management of patients and assets.

The RTLS system is a relatively new technology which provides both active tracking of patients, personnel and assets through the wireless network of the new RAH and passive tracking for pathology samples, blood products, pharmaceuticals and equipment.

"Nurses and orderlies typically spend a lot of time looking for assets and equipment to perform their work. The RTLS will assist them to locate these items quickly via a search function on their wireless phone or PC," said Mr Oldham.

"It will also be used for tracking at-risk patients, raising mobile duress alarms and to manage patient flows, so staff can spend more time with patients."



"The volume of network traffic goes through the roof with the move to a digital hospital. Visionstream's in-house design team has put extensive effort into ensuring the design and security architecture of the network is suitable for operation in such a complex operating environment."

In an enormous specification, procurement and installation marathon, Visionstream will be managing the logistics of shipping and installing more than 35 tonnes of packaged Cisco equipment into 240 racks throughout the Facility. This includes 800 active network devices, more than 30,000 physical network connections, 3,200 wireless access points, 4,200 fixed phones, 550 wireless phones and 2,000 RTLS devices. It is one of the single largest ICT installations undertaken in Australia, involving 2 high availability data centres and 62 distribution rooms.

"The logistics of this project is no small undertaking. We will have a series of teams working in parallel, undertaking works sector by sector and we have just (in February 2014) commenced detailed planning with the builder, Hansen Yuncken Leighton Contractors Joint Venture, for the commissioning of the Facility" said Mr Oldham.

Visionstream is part of the Leighton Group and combines advanced capabilities in the design engineering and implementation of ICT systems with a thorough understanding of the whole construction process, including safety and the specific complexities of the work site environment. Other major projects Visionstream has been working on include the NBN, projects for Telstra, Optus and Vicroads, projects in the Intelligence space and IT backbones for mining sites in the Pilbara.

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