CPB Contractors, a member of the CIMIC Group, was awarded the contract to design and build a modern nine-storey hospital that will contain 488 beds, 1,400 car park spaces and a helipad.

The Northern Beaches Hospital development is a Design and Construction Project for the operator, Healthscope. Healthscope will operate the entire hospital for 20 years, after which the public portion will be handed back to the state. They will then continue to operate the private hospital for a total of 40 years.

The CPB Contractors project scope included:
- Design of facility from concept
- Environmental approvals
- Construction of 70,000m² hospital
- Construction of 40,000m² car park – 1,400 car spaces
- Construction of campus wide roads, support infrastructure
- 50 space emergency department
- 14 operating theatres, 2 cardiac catheter labs and 4 procedure rooms
- State of the art intensive care and six surgical suites
- Landscaping
- Services augmentation
- Commissioning and training
- Facilities.

The hospital is the first to be built on a greenfield site in Sydney in 20 years.
OUTCOMES ACHIEVED AGAINST PLANNED TARGETS FOR KEY PROJECT PARAMETERS

Workplace Health and Safety

The team achieved an outstanding level of safety performance over 2.5 million man-hours, exceeding the targets for the Total Recordable Injury Frequency Rate and Lost Time Injury Frequency Rate. The following achievements were recorded:

<table>
<thead>
<tr>
<th>MEASURE OF WORKPLACE HEALTH &amp; SAFETY</th>
<th>TARGET</th>
<th>ACHIEVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatalities</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Serious incidents and injuries</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>High Potential Incident Frequency Rate (HPIFR)</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>Total Recordable Injury Frequency rate (TRIFR)</td>
<td>2.5</td>
<td>1.18</td>
</tr>
<tr>
<td>Lost Time Injury Frequency Rate (LTIFR)</td>
<td>.45</td>
<td>0</td>
</tr>
</tbody>
</table>

The Project implemented a safety management strategy that included the following initiatives:

- Slower speed Elevated Work Platforms (EWPs) - endorsed by the EWP Association.
- Temporary Works Procedure and validation of design and construction of temporary works - this has since been adopted by some NSW Government clients as a standard requirement in their contracts.
- Mental health awareness - promotion of mental health and providing access to mental health experts on the Project led to over 20 referrals for preventative clinical treatment.
Time

The Project was tendered in only five months, and the team exceeded all major program targets:

- Preferred tenderer to contract close achieved in eight weeks
- Contract close achieved in less than six weeks
- Construction on target for completion three months ahead of schedule
- Interim Occupancy Certificate on track to be obtained six months ahead of schedule.

Cost

The lump sum contract has been delivered within budget and in line with the original tendered cost plan, despite escalation challenges in the market since commencement of bid in December 2013.

Quality

There are strict regulations and standards for hospital facility design and fit-out, aimed at optimum infection prevention and control and patient safety. No permanent expansion joints were used in design and construction of the 70,000m² hospital structure. Electromagnetic Field (EMF) and radiation shielding was used in the construction and validation of medical imaging spaces to meet third party operator requirements.

The team’s commitment to quality ensured the hospital maintained its Approval in Principle Private Hospital Licence during the design and construction phases.
Environment and heritage

Effective environmental management was achieved using consistent processes and methods that reflect best practice. The team prepared the development consent for submission by State and maintained the Conditions of Approval during design and construction.

Sustainability (in the context of construction)

The Northern Beaches Hospital will be the first Green Star hospital constructed in NSW, with the team in the process of achieving a ‘4-star As-Built rating’. This achievement includes an integrated Energy Management System (EMS) which provides billing and energy management for the commercial operating phase of the hospital and flexibility to accommodate future changes to hospital functions.

A co-generation base-load plant was installed and sized for maximum efficiency base-load, with modular expansion of cogeneration plant possible, should demand increase.

Innovation and new technologies utilised

The team pioneered the use of a room data sheet system and library, which has since been adopted by NSW Government as standard practice on all its major health projects.

The State’s vision for a digital hospital was met through the provision of backbone infrastructure:

- Microwave line-of-site link for transfer of large medical imaging files between other local health campuses
- Digitally integrated theatres, including AV and communications adaptability
- Modern medical imaging technology, including Magnetic Resonance Imaging (MR), Computed Tomography (CT), fluoroscopy, endoscopy and inter-operative imaging
- State-of-the-art cardiac catheter laboratories
- Real Time Location System (RTLS) for medical equipment and utensils
- Patient wandering technology for mental health.

The team developed a streamlined stakeholder and design management process which allowed design changes to take place concurrently with user group reviews, ensuring minimal disruption to the development of the Building Information Modelling (BIM) design.

A Design Status Schedule (DSS) was used to track design changes and approval stages from tender through to the Construction Design Report and the As-Built documentation.

As the first health facility to cater for public, private and shared health services within one facility, a sophisticated Building Management System (BMS) and metering design was developed to address the possible future segregation of the facility beyond the concession period of the Project.

A newly developed and innovative car park façade system known as Atmosphere was used to integrate the façade and car park barrier system (supported at the slab edges).

Stakeholder satisfaction

Over 130 clinical user consultation meetings were performed to determine specific stakeholder requirements. These requirements were incorporated into the design to ensure high levels of satisfaction.
How was this project difficult or complex?

**Logistics**

This was a complex large-scale greenfield project delivered on a 6.5-hectare site with no road infrastructure in place. It was surrounded by road construction to north, east and south and a large high-school to the west. These conditions placed difficult limitations on truck movements with only 'left in' and 'left out' allowed from Warringah Road. The team overcame these logistical challenges by obtaining early planning approval for the enabling works. This allowed acceleration for construction of the difficult permanent stormwater infrastructure and introduction of loop roads to move materials around site prior to main hospital construction.

There were limited resources available during construction. To solve this major logistical challenge the team optimised the available resources through resource levelling and concurrently excavated the hospital and the car park. The sequential construction of the structures which followed ensured maximum delivery efficiencies.

**Interfaces**

The challenges brought on by the surrounding road construction described above were further exacerbated by the interface with existing and installed infrastructure including roads, sewer, stormwater, communications, 11 and 33Kv electrical, water ring mains and natural gas.

These major interface risks were successfully managed by:

- Obtaining planning approval to install new traffic lights into Warringah Road – allowing permanent signalised entry and exit to the site.
- Using permanent pedestrian controllers at vehicle entry to manage safety interface risks between local school children and construction traffic
- Attending a regular coordination meeting with the interfacing roadwork contractor
- Developing interface protocols and programs with the hospital operator for:
  - Client supplied Furniture & Fittings, Fixtures & Equipment (FF&FE)
  - Client supplied and installed FF&FE including Major Medical Imaging Equipment (MMIE)
  - Third-party operators including pharmacy, pathology, medical imaging, consulting suites and retailers.
Constraints

Primary Project constraints included:

- Surrounding RMS upgrades to the north south and east of site which needed to be coordinated
- Segregating and identifying hospital works from RMS works
- Presence of local High school to west, with limitations on work activities nearby and management of students walking across construction entries
- Limited to using Warringah Road (south boundary) for vehicular access and egress
- Restrictions placed on project working hours, noise and stormwater runoff as part of the statutory environmental planning Approval
- Operating in a political environment, where the majority of the local community was against the development.

Community

The works required intensive and real-time communication with all stakeholders. The initiatives undertaken by the team to overcome these challenges include:

- Community open day and site tours
- One-year hospital opening celebrations
- Sponsorship and fundraising for adjacent high school
- Local medical/professional tours of site
- Staff engagement sessions for transferring staff.

Risk management

The successful delivery of the Project required robust risk management processes executed by experienced construction management professionals. The risks associated with the site constraints and multiple interfaces on the Project are described in the previous sections.
Innovative approaches to project issues and use of new technologies

A strategic review of the design solution for the main eight-storey car park structure (approximate area of 40,000m²) used advanced design tools to complete gravity, earthquake and wind analysis. The core walls were omitted from the earthquake and wind analysis, and allowed the frame to resist the lateral loads.

The review included detailed analysis of constructability and the proposed formwork solution. A smarter and more efficient formwork solution was developed by orientating the band beams in a transverse direction.

The redesign of slab structures reduced the amount of materials by:

- Concrete savings = 30 per cent
- Reinforcement savings = 55 per cent
- Pre-stressing savings = 46 per cent
- Deletion of all structural core walls.

Other challenges overcome include:

<table>
<thead>
<tr>
<th>CHALLENGE</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future flexibility, including separate expansion strategies for public and private patient portions during the operating term</td>
<td>Battered wall to east allowing easy in-ground expansion. Siting of hospital to allow expansion of full ward configuration towards, but inside set-backs to boundaries. Alignment of corridors and layouts to allow for future link connections.</td>
</tr>
<tr>
<td>Large riser openings creating fall risks</td>
<td>Use of one metre concrete upstands constructed using plastic lost formwork system. This created a permanent safety barrier for people and plant while riser was fully decked out. Services were installed within riser from extendable Elevated Work Platform (EWP) tray deck. Use of speed panel off EWP to close riser, virtually eliminating fall risk.</td>
</tr>
<tr>
<td>Efficiency of generator backed up power</td>
<td>Essential power provided by co-generation and diesel generator systems reduces maintenance and capital cost of dual diesel sets and allows use of sustainable co-generation asset.</td>
</tr>
<tr>
<td>Façade flexibility</td>
<td>Use of lightweight metal clad façade system allowed ease of window adjustment (stud wall with punched windows).</td>
</tr>
</tbody>
</table>
LEADERSHIP AND MANAGEMENT OF THE PROJECT DELIVERY

Tell us how you managed to achieve your outstanding performance?

Project team relationships

The leadership team focused on staff retention and creating a culture of objective alignment by:

- Sharing experiences from previous projects to ensure a better way going forward.
- Encouraging open minds – things will be different to what others have previously experienced (different client, contract, people, culture and processes).
- Focusing on project development, not corporate restructuring.
- Completing annual alignment sessions with all staff to define principles and ‘scorecard’ of the Project – staff defined the components to be measured against, to determine if they had been successful or not. Scorecard elements became the Key Result Areas (KRAs) individuals were measured and reported on.
- Having monthly staff briefings for all project team members on progress, including upcoming work.
- Reward and recognition scheme in place for safety and corporate principals each month.

These initiatives contributed to staff turnover of less than 10 per cent during a period of creation of the CPB Contractors business. For two years turnover was less than 3 per cent, and a new culture emerged different and improving on past experiences.

The Project Team is outlined below:

<table>
<thead>
<tr>
<th>ROLE</th>
<th>PERSONNEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Director</td>
<td>Anthony Armstrong</td>
</tr>
<tr>
<td>Construction Manager</td>
<td>Steve Garzo</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Chris Buchan</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Jason Ryan</td>
</tr>
<tr>
<td>Project Manager</td>
<td>Frank Sgambellone</td>
</tr>
<tr>
<td>Project Manager - Design</td>
<td>Raz Favotto</td>
</tr>
<tr>
<td>Senior Design Manager</td>
<td>Chris Billinghurst</td>
</tr>
<tr>
<td>Senior Services Manager</td>
<td>Les Sorn</td>
</tr>
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<td>Commercial Manager</td>
<td>Scott Brewin</td>
</tr>
<tr>
<td>Site Manager</td>
<td>Mark Foster</td>
</tr>
<tr>
<td>SHEQ Manager</td>
<td>Pat Newcombe</td>
</tr>
<tr>
<td>Senior Project Engineer</td>
<td>Con Kolovos</td>
</tr>
<tr>
<td>Senior Project Engineer</td>
<td>Mark Mittiga</td>
</tr>
</tbody>
</table>

Generating a legacy for the construction industry

The contracting process is the first injection of private sector funding into major health infrastructure. The redesign will deliver health services to private and public patients on behalf of the NSW Government. It has enabled reduced facility and service duplication in a single integrated hospital, improving clinical outcomes for patients and managing health service demand.

RDS Management System

CPB Contractors optimised the use of dRofus to control change during the User Group/Stakeholder process. CPB Contractors incorporated the images and specifications of various Fitments Furniture and Equipment (FFE) items into dRofus that provided improved understanding of the items to be coordinated into the design. The interface of this information with BIM (Revit) integrated FFE with our design coordination computing platform.

CPB Contractors also used dRofus to assist with procurement of various types of joinery. Specific coding of joinery facilitated the procurement of various types in various trade packages, seamlessly limiting scope gaps.
Entrant’s contribution in the design process

CPB Contractors led the concept and design development process and ensured Healthscope always had full visibility of the process, to ensure the developed design met Operators Brief requirements. This included:

- Development of the masterplan for the health campus, and development of the concept and schematic design including architectural, structural, civil, façade, landscaping and building services.
- Preparation, submission and management of the Development Application on behalf of Healthscope.
- Management of all user group reviews including the development of all third-party user group requirements and retail areas. The design team carried out 91 user group sessions over six months.
- 70 per cent of detailed design completed in the first six months of construction (including submission of 27 detailed design reports) and 90 per cent of detailed design completed within 12 months of construction (including submission of 27 construction design reports).

Workplace Health and Safety

The leadership team actively led a culture of safety and accountability in the workplace through:

- Effective and robust safety management systems focused on identifying and controlling hazards and risks.
- Compliance with all requirements relevant to health and safety, including legislative, regulatory and internal.
- Continuous training and development of workers to ensure they perform work safely and contribute to the continuous improvements of health and safety systems and culture.

The team achieved an outstanding level of safety performance across 2.5 million man-hours, including a Lost Time Injury Frequency Rate (LTIFR) of zero.
Planning and control of design and construction operations

- Design of facility from concept
- Large scale design and construction project
- Design processes capable of handling whole-of-life considerations during design
- Works carried out in a hospital brownfield environment required extensive investigation works to safely progress the design and construction activities
- Works carried out in a brownfield environment required extensive planning and staging
- Works carried out in a brownfield environment required intensive and real-time communication with all Stakeholders to ensure integrity of the Hospital’s ongoing operations including emergency services; Safe public access (pedestrian and vehicular) to and from the hospital; and, integrity of the retailer’s operations.
- Construction of 70,000m² hospital
- Construction of 40,000m² car park – 1,400 car spaces
- Construction of campus wide roads, support infrastructure.

Industrial relations

The project has complied with the NSW Code of Practice for Procurement as well as The Federal Building Code. The project has been audited on numerous occasions with positive findings and feedback. The project has lost no time due to industrial matters and has maintained positive and cooperative relationships with employers and unions.

Training and development initiatives

The NBH Project has committed to 20% of the Project workforce participating in structured training. This is a whole of project target (in terms of time), which we can measure at a certain point of time to manage our compliance, conducted on a monthly basis via the Monthly Report.

<table>
<thead>
<tr>
<th>TRAINING TYPE</th>
<th>NUMBER OF WORKERS ON SITE WHO HAVE RECEIVED THIS TYPE OF TRAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentices and Traineeships</td>
<td>44</td>
</tr>
<tr>
<td>VOC on HRWL (not including Apprentices)</td>
<td>62</td>
</tr>
<tr>
<td>Other training</td>
<td>8</td>
</tr>
<tr>
<td>Total of all Structured Training</td>
<td>114</td>
</tr>
<tr>
<td>Total of workers on site</td>
<td>500</td>
</tr>
<tr>
<td>Structured Training Participation</td>
<td>23%</td>
</tr>
</tbody>
</table>
## Project Team

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Client</strong></td>
<td>Healthscope Limited</td>
</tr>
<tr>
<td>Architectural, Health Planning and Interior Design (Lead Consultant)</td>
<td>BVN Architecture</td>
</tr>
<tr>
<td>Structural, civil, façade and traffic engineering services</td>
<td>Arcadis</td>
</tr>
<tr>
<td>Project Director</td>
<td>Anthony Armstrong</td>
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