

AIRPORT LINK

TJH CELEBRATE AIRPORT LINK MILESTONES

Construction of Australia's largest infrastructure project, the \$4.8 billion Airport Link project has reached significant milestones in recent months with the completion of all major tunnelling activities on 6 July 2011, 20 million hours worked in late June and practical completion of the Airport Roundabout Upgrade project on 1 July 2011.

This vital infrastructure project, which will meet the needs of Brisbane's growing population by providing a faster and easier way

to travel to and from Brisbane's city, airport and northern suburbs, comprises three separate projects: Airport Link, Northern Busway (Windsor to Kedron) and Airport Roundabout Upgrade which are being constructed together to achieve efficiency and better value for Queensland.

Under a Public-Private Partnership, BrisConnections, a stapled trust, has a contract with the Queensland Government to complete the three-projects-in-one and has contracted Thiess and John Holland, in Joint Venture, to undertake the design and construction.

Primarily underground, the 6.7km Airport Link toll road connects the CLEM7 tunnel, Inner City Bypass and local road network at Bowen Hills, to the northern arterials of Gympie and Stafford Roads at Kedron, Sandgate Road and East West Arterial Road leading to the airport and Australia TradeCoast.

The Northern Busway (Windsor to Kedron) project is a 3 km, two-lane road for buses only, which is underground between Truro Street, Windsor and Sadlier Street, Kedron, surfacing at Lutwyche and Kedron Brook at two architecturally designed Busway stations.

The Airport Roundabout Upgrade which was opened to traffic in February 2011, 9 months ahead of schedule, included a new four-lane flyover connecting East West Arterial Road directly to Airport Drive; a high capacity 'fast diamond' interchange; a new four-lane overpass

to replace the existing Gateway Overpass; and widening of East West Arterial Road to three lanes each way.

The projects are now 80% complete with nearly 15 kms of tunnels and ramps excavated between Bowen Hills and Toombul.

Airport Link's giant Tunnel Boring Machines (TBMs) have travelled a combined total of five kilometres from Kalinga Park to Lutwyche, working for 14,000 hours. Over the last year, the TBMs have moved through varying ground conditions from very hard rock to mud-like conditions. Using approximately 900 cutting wheels, they have excavated over 1.25 million tonnes of spoil which was transported to Nudgee Road via a two kilometre long overland spoil conveyor. A total of 22,000 pre-cast concrete segments were used to make up the rings that form the tunnel lining.

The projects have also surpassed their expected peak employment bringing the jobs total to more than 4,300. The projects are creating 12,000 direct and indirect jobs.

From July 2011, the Bowen Hills worksite will move into its final stage of construction, preparing the site for the creation of a 'hill-top park' for the local community. More than three-and-a-half hectares of new parkland will be provided for local residents upon completion of the projects, including the Bowen Hills hill-top park, which will have stunning city views and recreational and playground facilities for locals to enjoy.

In late June, the combined Airport Link projects reached 20 million hours worked, which is a momentous achievement for the team of workers who have been building and tunnelling since construction began in November 2008.

The Airport Link project is Australia's largest privately funded transport infrastructure project to date, requiring total finance of \$5.6 billion to be raised.

The project is on track with the Airport Link and Northern Busway due for completion in mid-2012.

On completion, BrisConnections will operate and maintain the Airport Link toll road and a separate Thiess John Holland entity will provide operations and maintenance services for the first five years of operations.

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MAIN CONSTRUCTION COMPANY : Thiess & John Holland
DEVELOPER : BrisConnections
COMPLETION : Mid 2012
PROJECT END VALUE : \$4.8 Billion
SURVEYOR : Surex Surveyors
ARCHITECTS : Cottee Parker



SURVEYING THE DEPTHS

The \$4.8 billion BrisConnections' Airport Link, Northern Busway project in Brisbane is Australia's largest road infrastructure project and a major landmark project for highly experienced survey practice, Surex Surveyors.

Surex specialises in major infrastructure projects, tunnels, roads, railways and pipelines and prior to taking on the Airport Link project, the practice had already proven its capabilities on projects including the Gold Coast Desalination Alliance, Southern Regional Water Pipeline, Lane Cove Tunnel Project, Priority Sewerage Project, Priority Sewerage Project 3 Towns, Priority Sewerage Project Hawkesbury Heights, Melbourne EastLink Project, Melbourne Main Sewer Replacement Flows Project, Northern Sewerage Project Stages 1 and 2, Victoria Desalination Project and the Sandgate Drain Stage 1 Project.

The Airport Link Project comprises two tunnels (one northbound and one southbound) with multiple underground on and exit tunnels up to 50m underground between Windsor and Toombul. Since tunnelling commenced at Truro Street in March 2009, a total of 17, 135 tonne

Roadheaders have been used to carve out the network of tunnels below Brisbane's Northside. This is the largest number of Roadheaders ever used on an Australian project.

Airport Link utilised two EPB TBMs (Equal Earth Pressure Tunnel boring machines), 12.48m in diameter and 195m long, weighing 3,600 tonnes. These are the largest TBM machines used to date in Australia. Each TBM excavated approximately 2.2km long segmental lined components of the tunnel, with Surex keeping the TBM within the tolerances stipulated by the client and achieving a breakthrough accuracy of 11mm.

Surex was engaged to provide all underground surveying services for the project on a 24/7 basis. This involved operating on 19 work fronts and five different site offices simultaneously and ensuring no delays due to survey. This represents one of the largest projects ever undertaken by Surex in terms of the quantity, length and diameter of the tunnels involved.

During construction, Surex has demonstrated its ability to effectively manage the logistical complexities of the project. They were able to do this

by having the skills, experience, staff and ability to successfully undertake the varied tasks required on a project of this size. At the peak of the project Surex had 33 survey staff working.

Along with the surveying services, Surex was also engaged to maintain and operate the guidance systems on all roadheaders and TBMs; provide real time as-built of rock and shockcrete build up, and monitoring of ground movement with a large monitoring data base being provided at all times.

Surex assisted and supported the designers and engineers to help solve complicated issues as well as provided expertise in solving complex geometry and shapes at various stages of excavation for such large excavation surfaces.

The knowledge of the Surex team helps to enable them to carry out the survey of large multi stage headings, positioning of transitional forms with the size dependent on the size of the tunnel and the survey management of all data and survey resources.

Surex Surveyors are QA compliant to the Standard ISO 9001:2008 and implement strict QA procedures and methods on each project. They are also national code compliant within the building and construction industry.

With offices in NSW, QLD and VIC, Surex brings together over 50 years of experience from both the local Australian and international arena and utilise the latest technology and state of the art equipment to reach the highest levels of efficiency and accuracy.

Surex consults in all facets of surveying including the design, development, delivery and evaluation of industry projects and innovative solutions to industry problems.

The team is thoroughly qualified in tunnel, engineering and construction surveying; project network surveys; automated positioning systems; detail and feature surveys; underground navigation of pipe jacking, TBMs and Roadheaders, monitoring and GPS. Surex prides itself on its long term relationships with all clients ensuring the successful completion of each project that it is engaged on.



HIGHLY REGARDED FOR HIGH RISK JOBS

Tunnelcorp was chosen by Thiess John Holland (TJH) to complete one of the most high risk sections of the Airport Link Project in Brisbane. The project involved the installation of a supporting canopy tube structure comprising 48 x 762mm steel casings averaging 53m in length totalling nearly 2600m of pipe. The canopy was to support 6 tracks of the main North Rail line and the Airtrain to Brisbane Airport. Up to 300 trains per day traversed the tracks therefore the focus was on minimising any subsidence and disruption to the train service.

At the outset Tunnelcorp worked closely with TJH in the design of the canopy structure relating to the construction of the thrust walls, drilling methodology and the clutch design that held the tubes together.

During the pre-tender discussions Tunnelcorp evaluated which drilling methodology would be adopted according to the geotechnical information available. The bores were expected to be completed in sandy clay with the possibility of striking an occasional obstruction such as a railway sleeper.

Tunnelcorp operate both Herrenknecht slurry microtunnellers and vacuum extraction microtunnelling machines. It was decided to utilise Tunnelcorp's custom designed vacuum extraction microtunnellers to install key laser guided bores and then use large American Auger auger

borers to complete the balance of the bores. The auger bores would be locked to the laser guided bores with clutches.

The vacuum microtunnellers may be retracted to the launch shaft through the steel casing in case an immovable object is encountered, leaving the casing in place to negate the risk of collapse under the rail line.

The first laser guided bore was undertaken in the centre of the 48 bores. The bore progressed through rubble and boulders until it came to a halt midway through the bore. The microtunneller was retracted to reveal a large vertical hardwood timber pile in the centre of the bore.

On further investigation it was discovered that spanning the width of the construction zone of 48 bores were three redundant bridges built on top of each other dating from 1846, 1865 and 1920. The 1920 bridge was built on 40 hardwood piles that may be encountered 47 times due to the oblique angle of the tunnel bores.

During the course of the project Tunnelcorp did strike the piles 47 times and encountered multiple reinforced concrete walls up to 6m thick, scrap steel, large steel bolts holding the bridges together and an old de-railed train carriage. Tunnelcorp and TJH realised these obstructions would have a detrimental effect on the program of the Airport Link project

and Tunnelcorp provided the resources to operate one microtunneller and two auger borers 24/6 for the duration of the project. Tunnelcorp assembled an arsenal of various rock cutters, mixed ground heads and manufactured two remote controlled timber cutting machines.

A safety and rescue plan was formulated by Tunnelcorp to remove many of the obstructions by hand from inside the steel 762 encasing pipe. Tunnelcorp's staff worked tirelessly for months on end working continuous shifts removing these obstructions with hydraulic chain saws, jack hammers, oxy acetylene for cutting steel, timber cutters and eventually they engaged 30,000 psi water blasters to cut through the 6m thick reinforced concrete walls. These brave souls were completely armoured, inserted into the pipes on trolleys and used as human cutting machines to penetrate the concrete. As the lances cut the concrete and the reinforcing removed with oxy acetylene, the cuttings and vapours were extracted using Tunnelcorp's powerful vacuum systems and the pipe slowly advanced to the exit side.

All this was accomplished attempting to keep to the +/- 50 mm tolerances required by the client. During the installation process the track settlement was monitored through a computerised remote survey system monitoring 160 survey points.

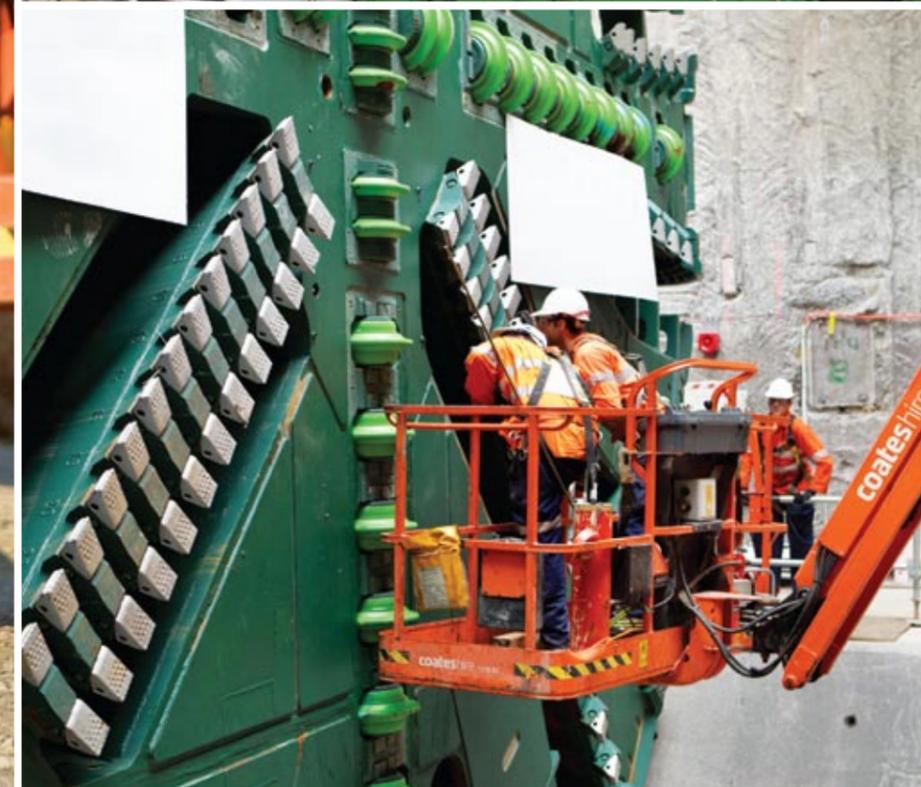
If the mass obstructions weren't enough to deal with, Tunnelcorp also encountered a live swamp/stream running along the centre of the tracks parallel to the rail line. This area required multiple grouting procedures to stabilise the drill face. As groups of bores were completed inclinometers were installed in designated bores and the bores filled with grout.

Despite enormous adversity and the worst imaginable drilling conditions Tunnelcorp provided their client with a useable finished product which allowed the client to successfully complete their box culvert jacking operation.

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THE NUMBER ONE CHOICE

The Thiess John Holland Joint Venture (TJH) is currently in the process of designing and constructing Australia's largest ever infrastructure project; the Airport Link Tunnel, Northern Busway and Airport Roundabout Upgrade.

The project involves the construction of 25 bridges, 15km of tunnels and 7km of additional roads. Valued at \$4.8 billion the joint venture began constructing this mammoth project in November 2008 and is scheduled for completion mid 2012.

COATES HIRE INVOLVEMENT

Coates Hire was successful in signing a Global Supply Agreement with TJH in early 2009 and has recently secured an extension of this agreement until the completion of the project. This agreement has seen Coates Hire become the number one supplier for all hire equipment to the project for both the major contractor TJH and also the majority of sub contractors on site. A key initiative has been the introduction of an on-site facility in March 2009. Our

on site manager is highly experienced in the workings of such a facility and has been able to build a very strong relationship with TJH staff due to the Coates Hire presence on site. Through the combined efforts of the Coates Hire sales and operations teams servicing this project, demand for equipment has continually increased to activity levels of approximately 800 pieces of Coates Hire plant on site.

The majority of plant stored at the on-site facility is high transactional equipment with a Coates Hire delivery truck doing daily rounds of the project to promptly deliver pre-ordered equipment. A dedicated team consisting of fitters, sales co-ordinator, delivery driver and on-site manager support the facility whilst also utilising local and specialist branches for support.

The project has recently reached several exciting stages with the Tunnel Boring Machines conquering their journey from Toombul to Lutwyche to complete the main tunnels. The mechanical and electrical fit-out of the tunnels is well under way and will

see Coates Hire fill the large demand for small tools and access equipment through to the completion of the project.

The project continues to meet key targets throughout, with the Airport Roundabout Upgrade completed ahead of schedule last December. Reductions in equipment delivery times, costs and the efficiency of the Coates Hire on-site team had a significant impact in assisting TJH with this achievement along with many others.

With a finish date of mid 2012, Coates Hire is well positioned to continue to support both TJH and their subcontractors. The upcoming stages of the project will offer new hire opportunities for the Coates Hire business.

The on-site facility Coates Hire has established on the Airport Link Project is a service that Coates Hire offers throughout Australia. The Dinmore to Goodna Upgrade, QAL Gladstone and Phosphate Hill Mine are amongst other establishments that also utilise this service. These dedicated partnerships add both value and efficiency

to the service Coates Hire provides, assisting major contractors deliver successful projects across Australia.

The Thiess John Holland Joint Venture has acknowledged that Coates Hire has a very important role to play in helping them deliver this huge project, the challenges have been large and the team are looking forward to helping this major project continue to be a success.

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Considered Australia's innovators in underground pipe and service installations, Rob Carr Pty Ltd was engaged to construct the sewer diversion works which enabled commencement of the Brisbane Airport Link infrastructure project.

Airport Link is a 6.7km toll road, mainly underground, connecting the Clem 7 Tunnel, Inner City Bypass and local road network at Bowen Hills, to the northern arterials of Gympie Road and Stafford Road at Kedron, Sandgate Road and the East West Arterial leading to the airport. However, the location for the proposed Airport Link Tunnel was directly in line with the Toombul Sewer tunnel.

Rob Carr Pty Ltd was contracted by Thiess John Holland to provide specialist tunnelling, deep shaft and excavation construction expertise to construct the DN800 sewer diversion around the proposed location for the new airport link tunnel. The works were critical as the diversion had to be completed prior to major portions of the construction work being undertaken so as to commence the Airport Link tunnel.

The company has completed a number of large infrastructure projects for both government authorities and private industry and was well positioned to provide its client with multifaceted skills which involved not only trenchless technology but total project management for each stage involving conventional excavation, deep shaft construction, live sewer connections, traffic control as well as community and environmental management.

The project involved the installation of 900m of DN950 steel casing pipe which Rob Carr installed via both conventional trench excavation and trenchless (microtunnelling) techniques. This involved working to critical timeframe tunnel bores for both alignment and grade and required construction of pipelines beneath a creek, roads, highways and rail lines.

Upon completion of the pipeline section of works, the company installed a DN800 HDPE pipe within the casing pipe and grouted the annulus between the two pipes.

Other major works included the construction of deep cast in situ concrete manholes for the sewer pipeline, deep excavation over and adjacent to existing services and structures along with multiple connections to existing sewer infrastructure.

The works required construction in highly sensitive urban/residential environments and as such, a high level of interaction with the community. Most of the pipeline installation and construction was undertaken in difficult ground conditions which consisted of wet soft to medium stiffness clays with depths of excavation ranging up to 10 metres.

Formed in Victoria in 1989, Rob Carr Pty Ltd has worked in many difficult locations and boasts an impressive client list of government authorities and major contractors across Australia. The company now operates primarily out of its central maintenance workshop and office complex in Yatala QLD, a facility which is the company's flagship centre for its entire fleet of machinery and equipment and complements their two other complexes in Welshpool WA and in western Sydney.

Rob Carr Pty Ltd has an impressive fleet of 14 microtunnelling control cabins which between them operate 29 microtunnelling machines, as well as ancillary equipment. The TBM fleet has the capability of installing pipe diameters between 150mm and 2100mm through varying ground conditions.

While the tunnelling business has expanded rapidly over the past 10 years, Rob Carr Pty Ltd has still maintained its capabilities within the conventional and specialty civil construction fields and owns an extensive list of civil construction equipment.

Their capabilities are showcased in projects throughout Australia including the Halls Head Infill Sewerage project in WA, the \$220m Beenleigh Merrimac Pimpama Alliance project on the Gold Coast and the Northern Networks Alliance Northern Pipeline Interconnector project on the Sunshine Coast. Projects which further enhance the reputation of Rob Carr Pty Ltd as a leader successfully deliver quality infrastructure projects through trenchless technology.

A LONG LINE OF SUPPLIES

With its focus on quality products and technical support, Parchem Construction Supplies has maintained its place as a key supplier of specialty concrete products to major infrastructure projects in Australia for over 50 years. Projects include the Adelaide, Melbourne and Perth Desalination plants, the new Brisbane Gateway Bridge and the Gorgon LNG project.

Parchem Construction Supplies has played a key role as a main supplier of concrete related construction products for the BrisConnections Airport Link Northern Busway project in Brisbane, which is currently Australia's largest road infrastructure project and due for completion in 2012.

Parchem's products are well-known and trusted in the industry and include brands such as Fosroc, Hydrotite and Max Frank. These products are used to provide long term durability and performance on projects that require proven materials with a long track record.

Throughout the entire project cycle, Parchem provides onsite support to ensure that contractors are able to work seamlessly with the products.

Parchem's products were used from the time the initial concrete was poured on the Airport Link project and will be used right up until the project is completed.

Parchem's range of PVC (Supercast) and swellable water stops (Hydrotite) are the market leaders and the first choice for use in

major infrastructure projects. In this particular project the PVC water stops were used for a unique dual purpose:- to both keep water out of the slab floor to wall joints and also provide a barrier to air, as it was an important requirement in this area.

With proven performance and approvals to Australian standards including AS3799, the Concure range of curing compounds offered a customised solution to site requirements by supplying the curing compound with a black tint in 1000L Pallecons for fast and efficient use on site.

Several kilometres of Jointflex, a closed cell polyethylene joint filler, was supplied with a unique zip strip on both the top and bottom of the joint filler for separation between the concrete slabs.

Parchem's Reebol WB non-toxic, water-based formwork release agent was applied to formwork on the project. The product provides quick, clean and easy stripping of formwork and ensures a high-quality, fair-faced, stain-free off-form concrete surface.

Parchem Renderoc repair mortars were used to provide long term protection and reinstatement to the smoke ducts as well as tunnel segments. The range of high performance, low shrinkage repair mortars are the market leaders for repairing major civil structures.

Over 600 tonnes of the Conbextra range of cement based grouts were used for back fill grouting behind the tunnel segments as well as pipe penetration infills. The Conbextra grouts have superior flow and shrinkage properties which is why it has consistently been the choice of engineers on major infrastructure projects for over 30 years.

The Airport Link project features a significant innovation with the use of concrete fibre spacers instead of its plastic alternative. The concrete fibre spacers have been approved for use by many of the state road authorities because they offer superior durability performance as opposed to plastic or cast spacers. They provide excellent bond to the in-situ concrete, have consistent compressive strengths and known durability properties. They also provide a quick and easy installation method either on site or in the pre-cast yard.

Parchem is committed to technical support and have developed their website, www.parchem.com.au, to be one of the best technical resources for engineers, designers, builders and end users. The information available includes Technical Data Sheets, Material Safety Data Sheets and Method Statements.

PARCHEM CONSTRUCTION SUPPLIES

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Products supplied to Airport Link include

Renderoc HB40 • Renderoc HB70 • Conbextra HF • Conbextra C • Conbextra HS • Conbextra HES • Conbextra CB • Concure A99
Reebol WB • Supercast PVC Waterstop • Surestop PVC Waterstop • Hydrotite • Patchroc C • Concrete Fibre Spacers – (AK Type)



QUICKCELL TECHNOLOGY SUPPLY AIRPORT LINK

As one of the leading prestressed and precast concrete manufacturers to the Queensland and Northern NSW market, Quickcell Technology Products Pty Ltd (QTP) has been contracted as a major supplier of octagonal piles and bridge deck units to Brisbane's massive Airport Link Project.

QTP's exclusive Quickcell system has revolutionised the manufacturing of precast components for the building industry, facilitating faster off-site assembly of components and significant cost savings to the project.

In compliance with a very tight construction program, the Airport Link project required that extremely high quality product be supplied and QTP's impressive range easily met these stringent requirements.

For QTP, this project has included the supply of over 800 # of 550 octagonal piles and a large number of bridge deck units. The supply of deck units included, amongst others, depth of up to 1200mm and units with various lengths.

Quickcell Technology's years of experience in prestressed and precast concrete manufacturing has led to numerous ground-breaking technological advancements through the development of lighter and stronger alternatives to conventional precast concrete and in-situ solutions.

The company is a supplier of various prestressed precast beam and flooring systems, including voided prestressed light weight floors. One of their recent projects included the design and supply of

specially designed voided floors for a Green Star project in Brisbane: the 12 Albert Street high rise building, under construction by Laing O'Rourke Construction.

The floor units were supplied in 2.4m and 1.2m width. Preference was given to 2.4m wide floors, as these were capable of accommodating the larger penetrations and at the same time considerably reducing the installation time.

The design included accommodation of hanger reinforcement into the units for the suspension of the floor system in its ultimate application. Further, anchors needed to be accommodated in to the soffit of the units that can be used for the suspension of loads up to 3.5 tonnes, individually.

Quickcell Technology Products operates from premises in Queensland, which include two factories equipped with complete manufacturing facilities and four storage yards.

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