

Architectural complexity took Hansen Yuncken on a roller coaster constructing Australia's largest privately owned museum, Tasmania's Museum of Old and New Art (MONA). Designed by Nonda Katsalidis to house the private art collection of owner David Walsh, it could easily be described as 'out there', except it's more 'in there', as in, tunneled into and underneath a sandstone bluff overlooking the River Derwent. As an added complication, the site is home to Moorilla winery, Moo Brew micro-brewery and two Heritage listed buildings designed by Sir Roy Grounds, who designed the National Gallery of Victoria.

MONA's exterior of raw steel and concrete panels, some weighing up to 15.7 tonnes, gives little hint of the richness of design, texture and inspiration inside. MONA contains 6,000m² of flexible gallery space spread over three levels, including 1,300m² of AAA-rated space, designed to overwhelm all the senses, and resonating to the theme of exploration and self-discovery. The construction challenges of this \$75 million project stretched to almost four years, and involved a notable team of expert consultants to resolve the myriad of design, engineering, services and fitout challenges.

In addition to international standard exhibition space and the permanent gallery, the MONA complex includes a theatre, administration areas and an art conservation area, plus a library in the refurbished Heritage-listed Round House, which is now connected to the museum by a 40m long tunnel constructed of 2700mm diameter concrete stormwater pipes. The complex is entered through the Heritage listed Courtyard House via an

internal circular glass lift shaft and tunnel created by an extensive underpinning and excavation process.

Obviously, this project's challenges were as unique as the artworks.

Underpinning of the two Heritage-listed buildings formed part of the overall geotechnical engineering for the project, undertaken by Coffey Mining. Coffey also advised on the huge task of saw cutting a 140m long and up to 13m high exposed sandstone wall, which required excavating 35,000m³ of sandstone from the cliff face. Seventy support piers were bored into the sandstone face, requiring close to 500m drilling.

MONA's concrete structure geometry was so complex, and cast-in services so extensive, there was little repetition from pour-to-pour, creating challenges for the structural engineer Felicetti and Hansen Yuncken alike.

"High reinforcement contents and concrete strengths of up to 65mPa ensure large live and point load capacities throughout the museum, all to create maximum flexibility for the client in terms of art placement," said Hansen Yuncken Operations Manager, Matt Cadle.

"There was a 21m long 7.5t fabricated steel footbridge installed under the exiting house with the assistance of the site tower crane and the use of a track mounted support truss, aka the Trojan Trestle. MONA has an Escher-like central feature stair and there was the late introduction to the design of a water filled gallery on the top floor. In one part of MONA, plasterboard walls are curved in two planes for the 'sex and death' corridor, and there is a custom made toilet."

And winding through everything, hidden like nerves in a body, is 10km of submain cabling, 30kms of data cabling and 70kms of optic fibre cabling. Innovative services design by JMG Engineers and Planners and WSP Lincolne Scott includes a displacement air delivery system which supplies air to the gallery spaces via plenums within 'floating' art display walls. The walls were extensively engineered and prototype tested to accommodate large hanging loads.

The winery has been rehoused in another newly constructed building, completed to program despite the Chile earthquake holding up delivery of the 40+ new wine storage tanks which were manufactured there. Construction of the new library building will continue through until April 2011.

Working a live site including both a winery and a micro-brewery (and the happy customers), with staged handovers and ongoing subterranean works, made program management very complex. Safety had to be absolutely scrupulous. Extensive noise and vibration monitoring was implemented throughout the process to ensure workforce safety and the amenity of Moorilla visitors.

The overall concept for MONA was entirely shaped by the art. Following the official opening in January 2011, it is expected around 250,000 domestic and international visitors annually will pass through the entrance to be uplifted, provoked, titillated, amused, confronted and consoled by the collection of antiquities and contemporary works by artists including Damien Hirst, Arthur Boyd and Sidney Nolan.

"Some of the pieces within the collection have had a major impact on the building's design, and new acquisitions saw the building continue to evolve throughout the construction process.

Creating optimal conditions for displaying art has been the primary focus of the project team," said Matt Cadle. The design is also forward looking, with a removable section of roof to allow any extra large future acquisitions to be lowered by crane directly into the gallery. Parts of the walls have been designed to be easily cut away and replaced to maximize the flexibility of exhibition space.

Overall management was aided by Project Superintendent Gallagher Jeffs Consulting, and QS consultants Rider Levett Bucknall.

Hansen Yuncken have been active in Tasmanian construction for 75 years. MONA provided the opportunity to demonstrate the company's ongoing commitment to the local market, and to showcase their local skills and capabilities. This is also a project bound to garner the kind of notice some of their other recent design and construct achievements have received, such as the multi-award winning Six Star Green Star SA Water HQ VS1, the Lyell McEwin Hospital redevelopment and the Wave and Edge buildings in Adelaide. Major projects currently underway on the mainland include over \$600m of the Federal Government's stimulus package BER Schools projects around the country, the \$238 Orange Hospital PPP project in New South Wales and the \$207m Education Works New Schools PPP project in South Australia.

MUSEUM OF OLD & NEW ART

MAIN CONSTRUCTION COMPANY : Hansen Yuncken
CLIENT : David Walsh
AREA : Hobart, Tas
PROJECT END VALUE : \$75 Million
COMPLETION : Museum opened January 2011
ARCHITECTS : Fender Katsalidis (Nonda Katsalidis)
BUILDING SERVICES : WSP Lincolne Scott
STRUCTURAL ENGINEER : Felicetti
CIVIL ENGINEER : JMG
LANDSCAPE DESIGN : Oculus
SUPERINTENDENT : Gallagher Jeffs Consulting
QUANTITY SURVEYING : Rider Levett Bucknall

HANSEN YUNCKEN GO UNDERGROUND FOR ART

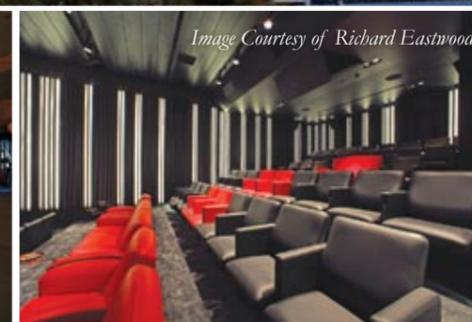
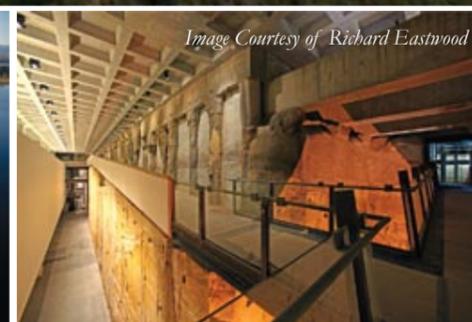
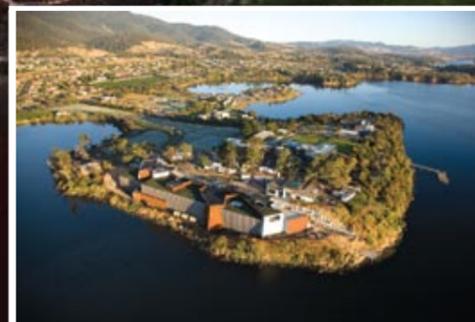
Image Courtesy of Matthew Newton

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BRADDON BUILDING SURVEYING

Braddon Building Surveying first became involved in his project in mid 2005 at the request of Phillip Chun & Associates, a large building surveying company located in Melbourne. Our involvement has been to look after the Tasmanian side of the development which has involved liaison with the Architects, Philip Chun & Assoc., Fire Engineers, Builders, Tasmania Fire Service and Glenorchy City Council to ensure compliance with the Tasmanian Building Act 2000 and Building Regulations 2004.

This also involves the issuing of the Certificate of Likely Compliance after required referrals to other agencies such as Tasmania Fire Service, inspections and on completion the issue of the Occupancy Permit and Certificate of Final Inspection.

The museum construction was staged to allow commencement on site as soon as possible. The stages were excavation and infrastructure as Stage One, footings and ground slab as Stage Two and the vertical construction as Stage Three. The main reason being unavoidable delays in the vertical construction design due alternative solution considerations.

The design involves a mixture of Building Code of Australia (BCA) deemed-to-satisfy (DTS) provisions and alternative solutions of which the main challenge was the deletion of the sprinkler system from the upper floor due to the unique design of the ceiling of that floor and extension of DTS travel distances, among other challenges.



Essentially a number of considerations such as occupant evacuation in the event of any emergency, fire fighting operations, the safety of fire fighting personnel all of which had to be weighed up against the unique operational requirements of the museum. Satisfactory design outcomes were achieved by taking the project team liaison approach.

There is no known reason why the final outcome will not meet and fulfill all expectations.

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ILS CREATES INDUSTRIAL ART FOR MONA

At MONA, even the lifts are ultra-modern works of art, custom designed and built by Independent Lifting Services Pty Ltd (ILS). Constructed in Melbourne, the three lifts are backed by ISO 9001 Quality Certification and the ILS commitment to ongoing 24 hour on-call maintenance and repair.

For one of MONA's central spaces, the architects required a glass round lift (Lift No 1) to be designed and constructed. ILS was awarded the contract to design and manufacture a lift to suit the architects requirements. The lift car was designed to be round and installed inside a circular staircase. The lift shaft was encased with curved glass panels therefore the lift car was manufactured with curved glass wall and door panels.

Due to low headroom requirement of the lift shaft and being a glass observation lift, the lift is powered by a three stage direct acting hydraulic cylinder. The cylinder is operated by a variable voltage variable frequency (VVVF) pump unit for smooth and energy efficient operation. The lift controls utilise the latest technology with BMS Link high level security interfaced with Honeywell building security system.

Another passenger lift constructed by ILS (Lift No 2) has a 17 person capacity and also designed to operate hydraulically due to the low headroom constraints of the lift shaft.

To ensure the safe and efficient movement of MONA's artworks, ILS constructed a goods lift rated at 5000 kg, with an internal size of 2800 wide

x 4200 long x 3500 high, enabling shifting of some of the Museum's extremely large artworks. The lift is powered by 2 roped hydraulic cylinders which are operated by two large VVVF pump units.

All the lifts were constructed at ILS premises in Melbourne, and then dismantled, shipped to Tasmania and refitted on site, ensuring an extremely high quality finish. The logistics of this trans-Tasmanian delivery process were a challenge ILS successfully resolved.

ILS have been designing and constructing safe, reliable and innovative technologies for moving people and goods since 1986, supplying projects across health, commercial, major residential, transport, cultural, retail and industrial sectors. Their capabilities include passenger, goods, vehicle and service lifts for either MRI, overhead traction or hydraulic solutions. ILS also design and install escalators and moving walkways. ILS continue to work with architects, designers and building owners to design the best solution for every project.

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PUTTING THE ULTIMATE GREEN GLOSS ON CONCRETE AT MONA

Outstanding workmanship and innovation has resulted in landmark opportunities for Ground Control. Their unique skills in making concrete floors gleaming, smooth and gorgeous caught the eye of the Architect for the MONA, who specified them as the contractors for a majority of the floor space - around 5,500m² of foyers, display areas and passages. The exemplary result is the perfect complement to the artworks and architecture.

“Polished concrete is flooring that makes sense,” said Ground Control Founder and Managing Director, Ami Chalfon.

“Every building has concrete for the slab usually, so you don’t have to expend energy to create new flooring. We take every necessary initiative in discussing the finish, and share the goals of the Architect and Builder to have the best looking result. For MONA, before the floor was laid we spoke to the builder and concreter about what we wanted to achieve.

“Our EcoGround is a Green process, much less harmful to the environment than many alternatives. Producing the one square metre of polished concrete consumes around 1.7kWh, an epoxy finish consumes around 60kWh to produce one square metre, and within six months to a year the epoxy floor collects dirt and will scratch. Polished concrete is the easiest floor to maintain, it only needs a neutral cleaner such as water, and it looks great and has a nice gloss for a very long time. The gloss increases ambient lighting’s brightness by up to 30 per cent.

“Because we mechanically polish, the result is better floors in terms of flatness. The floors are not dusty; when we polish we eliminate 100 per cent of the dust from the concrete surface, which contributes to a better indoor environment.”

Ground Control has been in business since 1998, and Ami invested considerable research into techniques for producing high gloss concrete floors without the use of added finishes. The company uses the latest available European equipment, and is constantly investigating new and improved methods and technologies. Their talents have been utilised on projects in Adelaide, Sydney, Melbourne, Perth and now Tasmania, and they offer a flexible, fast response to clients across the commercial, industrial, major residential and hospitality sectors.

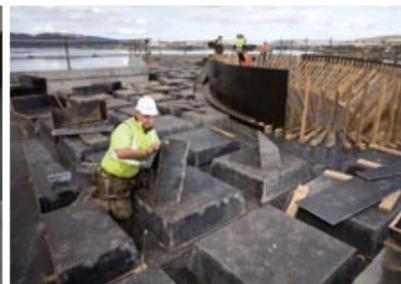
In addition to polished concrete, Ground Control offers flooring coating systems and is the Victorian Agent for Nuplex Architectural Terrazzite ZV, a VOC-free polymer resin based terrazzo which is anti-microbial, stain resistant, non-porous, joint-free and designed to last.

Other recent major projects include 2,400m² of EcoGround flooring for Woolworths Carnegie and application of a Green carpark seal which acts as a concrete densifier, eliminating dust. Ground Control also did 2,000m² of floor at the new building in Swinburne University (Kane Constructions) in Hawthorn; Doreen Shopping Centre’s Woolworths and foyer; and a 60 unit apartment block in St Kilda for ICON involving floors ground to expose aggregate and then given a matte finish with water-based NANO technology sealer.



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SETTING IT IN CONCRETE



Stephen Little Constructions was engaged by Hansen Yuncken on the MONA project as main structure subcontractor, to provide a complete structural package including; supply and installation of all formwork and in-situ concrete, project reinforcement, and pre-cast concrete in conjunction with their precast arm - Precast Tasmania. They also supplied a tower crane.

Stephen Little Constructions is committed to produce the best for the MONA project, ensuring the serviceability and appearance of the finished product is to a standard at least equal to, but in most cases above project specification and relevant Australian Standards.

The highly complex concrete structure is specified with an extremely high quality finish serving as a finished exposed feature, for example, suspended / cantilevered reinforced concrete slabs up to 10m high with high quality exposed waffle pod soffits. All roof slabs have multi directional integral slopes across their area. Reinforced in-situ columns rake in the horizontal and vertical planes up to 10m in height. Raking perimeter wall beams have extensive use of exposed grillage beams with concrete encased steel beams.

During construction, approximately 8000+m³ of concrete was poured and finished to in-situ slabs, walls and columns. Approximately

22,000m² of in-situ concrete slabs were put in over three internal floor levels and two roof levels. Total approximate tonnage of reinforced steel was in excess of 800 tonne with over 8500m² of reinforcing mesh. Stephen Little Constructions supplied 1940m² of plain precast panels and 1400m² of waffle pod precast panels with 332m² precast floor beams.

Stephen Little Constructions, highly regarded in the construction industry for twenty five years, has approximately fifty employees. Stephen, as General Manager, oversees all aspects of the business, the focus being on formwork, concrete and pre-cast trades, in which their foremen have extensive experience. Commercial projects undertaken in the past 24 months range from \$500,000 to \$10m.

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PUTTING IT ALL TOGETHER

Halton Joinery Pty Ltd is proud to have been selected to manufacture a large portion of the joinery for the MONA project.

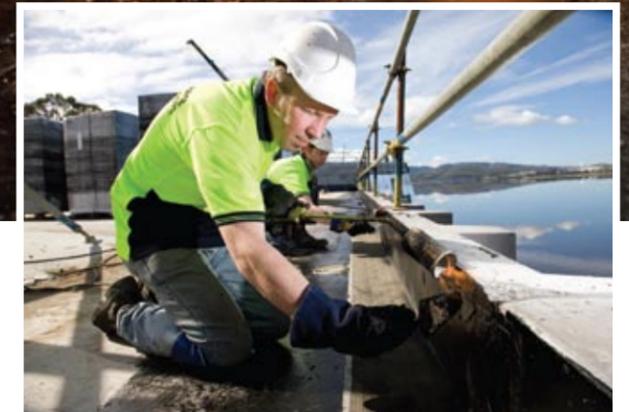
Their work in the Conservation area, B2 Administration West, B2 East Servery and Toilets, B3 East Servery/Bar and Toilets, B3 Theatre walls lined with timber panels and acoustic fabric. They manufactured doors and doors frames and recycled timber hand rail to the stairs. They also manufactured various items of joinery for the Moorilla Winery and the Courtyard House.

Halton Joinery, based in Huntingfield, Tasmania, specialise in joinery for commercial and residential projects. The family business has been running for 11 years. David and his son Adam (both directors) are highly skilled and qualified joiners, both working in supervisory roles. Judy (David's wife) controls the administration and customer service areas.

Six tradesmen, three apprentices and three office staff make up a skilled workforce.

Halton Joinery have recently purchased a CNC machine (overhead router) and drawing package to respond to market demands, enabling manufacture of joinery at greater speed. Currently working on Stage 7 Mt St Canice Apartments, Sandy Bay.

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THE ART OF KEEPING DRY

Terrace Projects P/L specialise in waterproofing, industrial floor finishes, concrete repair and insulation installation. The company has six full time and three part time staff with access to specialist subcontractors for very large projects.

With the MONA project, Terrace Projects are treating a 4000m² roof section. Waterproofing is achieved with double layer Ardex WPM150 heat applied sheet waterproofing membrane, chosen for its reputation as a premium waterproofing solution for critical applications requiring long term protection, as in the case of MONA housing priceless works of art.

Dow Corning Roofmate SL extruded polystyrene was selected to insulate the roof section due to its imperviousness to water, high load bearing capacity and profile which allows complete thermal coverage of the area. This will reduce energy usage for heating and cooling within the museum which must be critically temperature controlled to protect the art works.

Drainage of the roof area is accomplished with Atlantis 30mm Flo Cell. It has high flow capacity, load bearing ability and excellent compatibility with all types of subsequent soil profiles and vegetation as required for the roof garden in this project.

Also 1000m² of trafficable Ardex WPM185 heat applied sheet waterproofing membrane has been selected for the very substantial plant room areas and a similar amount of WPM 150 in conjunction with Tremco Tremboard polyethylene protection board and Atlantis Flo cell for below ground retaining walls.

Other works on this project include sealing of the concrete loading bays, storage areas and gallery floors, waterproofing of internal wet areas (bathrooms etc), pools, rock faces, planter boxes and construction and waterproofing of a 'green wall' to provide an indoor vertical garden feature. We have also refurbished the rooves of the Library building and the original Courtyard House.

Terrace Projects are very proud to be associated with such a prestigious project and thank our suppliers, employees, fellow contractors and project principals Hansen Yuncken for their efforts and cooperation.



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The interior of Tasmania's Museum of Old and New Art (MONA)



COOL ART

Weatherfoil was established in 1979 to continue the domestic heating and sheet metal fabrication divisions of R.M Cannon Pty Ltd. that had been acquired by the current director. With over fourteen years experience working with national companies in commercial air conditioning contracting it is not surprising that by 1985 management decided the company should focus attention on the commercial market.

During 30 years of operation the company has progressively expanded. Diversification in the fabrication area with expertise gained in stainless steel and aluminium fabrication has played a key role assisted by a program of continual improvement including the modernization of equipment and methods covering all aspects of the business.

Weatherfoil appreciates the opportunity to bring their capabilities, experience and imagination to the demanding and exciting MONA project welcoming the opportunity to gain valuable experience in administering and completing a very complex and extraordinary project. Over 3 kilometers of copper pipe and 100 tones of sheet metal ducting have been installed in the distribution systems. With over 20,000 man hours attributed to the project and a total value approaching \$4 million this is a very significant Tasmanian air conditioning project.

The main plant consists of 3 air cooled high efficiency screw chillers providing 1125 KW of cooling. Heating is provided by 3 natural gas fired condensing type hot water boilers located in the plant room providing 470KW of capacity together with an electric boiler for emergency backup. Associated variable speed duty/standby heating and

chilled water pumps provide circulation to 21 air handling units and 19 fan coil units that are mainly located in the plant rooms. The AHU's have variable speed drives and are fitted with economy cycle dampers and distribution ducting incorporating packaged steam injection humidifiers.

The distribution to the exhibition galleries is via false walls and utilizes the air displacement principle to minimize temperature variation and transient air streams within the space that could be potentially detrimental for the priceless exhibits.

The entire plant and temperature control is under the control and supervision of an extensive Honeywell BMS system.

Other prestigious projects that Weatherfoil has worked on included various Royal Hobart Hospital buildings, the Vodafone Call Centre, Burnie Regional Hospital, Australian Antarctic Division Kingston to name just a few.

Weatherfoil, currently employs 23 personnel with a similar number employed by sub contractors. They demonstrate a strong commitment to quality and the process of continuous improvement, their reputation being built on integrity and customer satisfaction.

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