



REACHING FOR NEW HORIZONS

DEVELOPER : University of Wollongong
MAIN CONSTRUCTION COMPANY : Richard Crookes Constructions
ARCHITECT : Denton Corker Marshall and Jacobs
STRUCTURAL ENGINEER : ARUP and Robert Bird Group
CONSTRUCTION VALUE : \$80 million

The University of Wollongong’s Molecular Horizons is a cutting edge research facility equipped with world leading technologies, and designed to put science on display, with a custom glass façade and large digital display screens.

The University of Wollongong (UOW) has added to its Science Precinct with the construction of an incredibly complex structure, the Molecular Horizons, an \$80 million centre for molecular and life sciences research.

The remarkable facility is designed and built to accommodate world leading technologies including two ultra-high resolution Transmission Electron Microscopes (TEMs): the 3m tall Titan Krios Cryo-EM microscope, one of only two in Australia, and a smaller version the Talos Arctica.

Along with lecture and meeting facilities, offices and research laboratories focused on visualisation of biological structures at the minutest detail, the building contains a small animal housing facility and roof platforms set up to accommodate astronomical telescopes and instruments to measure greenhouse gas levels in the atmosphere.

Richard Crookes Constructions commenced onsite works in mid 2017, building a structure comprising three parts: the services building to the south, the research block housing the microscopes to the north and a 3-storey glass atrium linking the two.

“Due to the highly sensitive nature of the microscopes the design of the facility has been centred on their operational requirements. This facilitated particular ‘zones of influence’ areas, where building materials were carefully

selected to ensure the successful functioning of the microscopes,” said Project Manager, Aarin Cole.

In zones 0-3m, the microscopes were required to be completely isolated within rooms lined with non-magnetic and non-ferrous materials, while in zones 3-7m, non-magnetic stainless steel reinforcement was required, hence a different way to reinforce the concrete structure was required.

“A glass fibre reinforcing polymer (GFRP) reinforcing bar was selected to provide reinforcement. This was a product typically utilised in Canada for building bridges to combat water egress. The Canadian and Australian building codes were overlaid, with additional materials and reinforcement features added to ensure compliance with Australian Standards. Over a million plastic cable ties, rather than steel ties wire, were utilised to ensure that not only were the microscope standards met, but also that the building met earthquake zone standards,” said Mr Cole.

The ground floor that houses the specialist equipment has a custom façade of U-framed glass with a frit pattern that eliminates the need for external sun shading devices. The glass façade was an important design consideration for the university, part of having ‘science on display’.

“Activity within the ground floor labs is visible through floor to ceiling glass allowing

students and staff to look inside and see science in action,” explained UOW’s Senior Manager of Project Delivery, Blake Preston. “Design aspects based on open spaces and transparent glass structures enable visitors to be engaged with the cutting edge research happening in the building.”

A video wall has been included to continue this theme and displays a live feed of the microscopes. Warm colours and materials have been selected specifically to break down the barriers between the general public and high tech science.

Due to the sensitive nature of the equipment installed on the site, special considerations and testing needed to occur to ensure the design negated any unwanted effects.

“When additional drainage was installed within the Level 1 laboratory – a reasonably simple request in any other building, checks had to be completed with design consultants to ensure no additional vibration, electro-magnetic interference or temperature changes would be induced within the Electron microscope suites,” explained Mr Preston. “Other tests involved consulting with researchers and UOW’s maintenance teams to ensure accessing and servicing the building, including the use of motorised equipment such as mowers and vacuum cleaners, didn’t affect experiment results.”

“A remarkable component of this project has been the dedication, collaboration and trust shown by the university. The Molecular Horizons building was first conceived five years ago and the time and effort put in by the professors and university staff to explain the specific parameters of the building contributed enormously to a successful construction,” added Mr Preston.

For more information contact University of Wollongong, University of Wollongong, Wollongong NSW 2522, phone 02 4221 4227, website www.uow.edu.au



Below Tecniplast Australia supplied specialised equipment for the animal departments at Molecular Horizons.



Below Frame-Tek Group supplied cold formed steel support framing for the project which resulted in a speedier delivery.



Tecniplast Australia specialises in the design, development, supply and installation of housing and washing equipment for animal models used in medical research. They focus on developing technology and automation to address the evolution of a facility's requirements.

The company started working with the University of Wollongong in late 2015 to formulate a brief and develop the design for the equipment needed at the Molecular Horizons research facility.

Tecniplast were contracted to supply and install new equipment, such as a machine for washing the cages that house rodents and a dedicated aquatics system for *Xenopus* frogs.

"The washer is a large machine, floor to ceiling in height; capable of washing and decontaminating up to 100 plastic cages at a time. The *Xenopus* Aquatics System incorporates automated monitoring to help maintain water quality, temperature and pH at the optimal levels," said Regional Sales Manager, Peter Snitch.

The design was finalised through consultation with the university and Richard Crookes and shop drawings were sent to Tecniplast SpA,

the parent company in Italy, for manufacturing. Installation took place at the end of 2019.

"It was fortunate that we were able to work with Richard Crookes in the early stages of the design and the installation. It was a complex job – there were specific requirements for the successful operation of our equipment. We found the site workers and project manager extremely cooperative and open to our needs," said Peter.

"We are often asked to create tender documents for animal laboratory equipment projects," added Peter, "We also offer advice to architects and technical staff, giving them design options and innovative solutions for the housing and care of laboratory animals."

Tecniplast Australia have also supplied and installed equipment to other universities such as ANU and UNSW and are considered the 'Gold Standard' in animal laboratory equipment. Currently Tecniplast are working with Richard Crookes on a facility similar to Molecular Horizons at the University of Newcastle, due for completion in 2020.

For more information contact Tecniplast Australia, phone 02 8845 6500, info@tecniplast.com.au, website www.tecniplast.it

Frame-Tek Group specialises in the design, engineering, and supply of prefabricated steel framing systems for façade support. In November 2018, Frame-Tek Group started design work for the Molecular Horizons building at the University of Wollongong.

Frame-Tek Group were contracted to supply cold formed steel support framing and worked with the Richard Crookes project team to look at options to speed up the job. With manufacturing beginning in early 2019 a final delivery was made in June.

"We offered our solution of pre-fixing rain screen sheeting to the framing. We were able add this system to our Optim Series framing chosen for the job, resulting in a much faster closing up of the building," Designer and Project Manager, Peter Wallace explained.

"We enjoyed working with Richard Crookes," said Peter. "Bondclad Facades installed our frames and also the sheet aluminium cladding. Total Glass & Aluminium fixed the windows to our framework. The teamwork certainly contributed to a successful outcome."

Frame-Tek Group welcomes being involved in design meetings and discussions with project engineers and consultants to ensure a positive

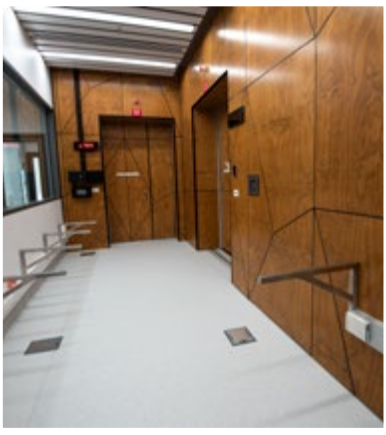
engineered solution for façade support framing. They also supply full calculations and engineering data, drafting and documentation as well as full frame set out drawings and fixing details.

In August 2019, Frame-Tek Group completed the supply of the support framing for the façade, roof and plant room walls of Dubbo Hospital. As at Molecular Horizons, Frame-Tek was able to use the method of pre-fixing galvanised sheet to close up the building as the frame was installed.

Frame-Tek Group have offices in Sydney and an acre of manufacturing space in Lawson. Recently they acquired a new roll forming machine to produce a vast range of different sections, sizes and gages from locally supplied materials. Using their prefabricated systems means a reduction in the size of the onsite labour force, a quicker build and a focus on a quality finish.

For more information contact Frame-Tek Group, Level 6, 10 Herb Elliot Avenue, Sydney Olympic Park NSW 2127, phone 02 4759 2211, email sales@ftgau.com.au, website www.frametekgroup.com.au

Below Offshore Carpentry detailed the design for the TEM suites, as well as completing landscaping works.



Below Total Glass & Aluminium worked on bringing the U-shaped glass on the ground floor of the northern building to life.



Offshore Carpentry specialises in the design and construction of structural framing for new work, extensions and internal fitouts across Sydney and regional New South Wales.

The company were awarded the design and construction contract to build the structural framing for the TEM suites at the University of Wollongong Molecular Horizons in 2016.

“I worked with my engineer to detail the design for the TEM suites from supplied specifications,” Owner and Director, Brad Wiggins explained. “We changed the beams from hardwood to laminated veneer lumber (LVL), a more resilient material that enabled a quicker and easier build and reduced the cost by about a third.”

They started onsite work in May 2019 with a team of 12 carpenters carrying out initial site works, hoardings, walkways, ramps and roofing as well as construction disability approved and safe access for the general public.

“In and around the TEM suites all the nails, screws and fitting we used were stainless steel to avoid any electromagnetic interference with the microscopes,” said Brad. “We were further contracted to install

the stainless steel lining for the rooms. After the internal work we were engaged to build decking on the rooftop and further seating and landscaping works outside the building.”

Offshore Carpentry are backed up by over 20 years experience within the construction industry. They undertake work in a variety of sectors, predominately apartments, clubs and some offices and have recently completed retirement village projects in Moree and Scone.

In 2017, Offshore Carpentry completed structural carpentry including installing external cladding and door joinery work at the Thomas Holt Retirement Village in Kirrawee, a 7-storey building of 120 rooms.

Brad has established a second company, Offshore Projects, for new building work, homes as well as alterations and additions. Recently they completed a \$2 milion renovation of a pub with new restaurant and kitchen.

For more information contact Offshore Carpentry, phone (Brad) 0403 184 256, email info@offshorecarpentry.com.au, website www.offshorecarpentry.com.au

Total Glass & Aluminium (TG&A) specialises in the manufacture, supply and installation of aluminium framed windows, doors, glazed curtain walls and unique glass façades.

For the Molecular Horizons building, TG&A worked from architect’s specifications to adapt the design to their manufacturing system and to create shop drawings. Manufacturing took five months, and the elements were ready for onsite delivery in March 2019.

“We manufactured aluminium framing and installed imported glass for all the windows as well as supplying and installing the external glazed walls on the research building,” said Director, Dennis Lysek. “We also supplied and installed two frameless glass curtain walls with spider fittings to the 5-storey structure that links the research and services buildings.”

A special feature of the research building is the U-shaped glass on the ground floor of the northern building where the electron microscopes will be housed. “The glass was made in Germany and it was a challenge communicating with overseas suppliers,” said Dennis. “There were eight months between order and delivery, the longest lead time I’ve ever experienced. The U-shaped glass arrived as 424 pieces, 5.5m tall and 330mm wide with a frit pattern.”

“We’ve been working with Richard Crookes for more than 20 years,” said Dennis. “The project managers and site supervisors contribute to a well organised site and Molecular Horizons was an exciting project.”

TG&A excel at high end jobs that involve a challenge. They are experts at working around complex designs and creating custom elements.

“In August 2017 we completed a project called the Khartoum Corporate Centre at Macquarie Park for Richard Crookes. We manufactured and supplied aluminium frames and glass for the four sided façade of the 5-storey office building”

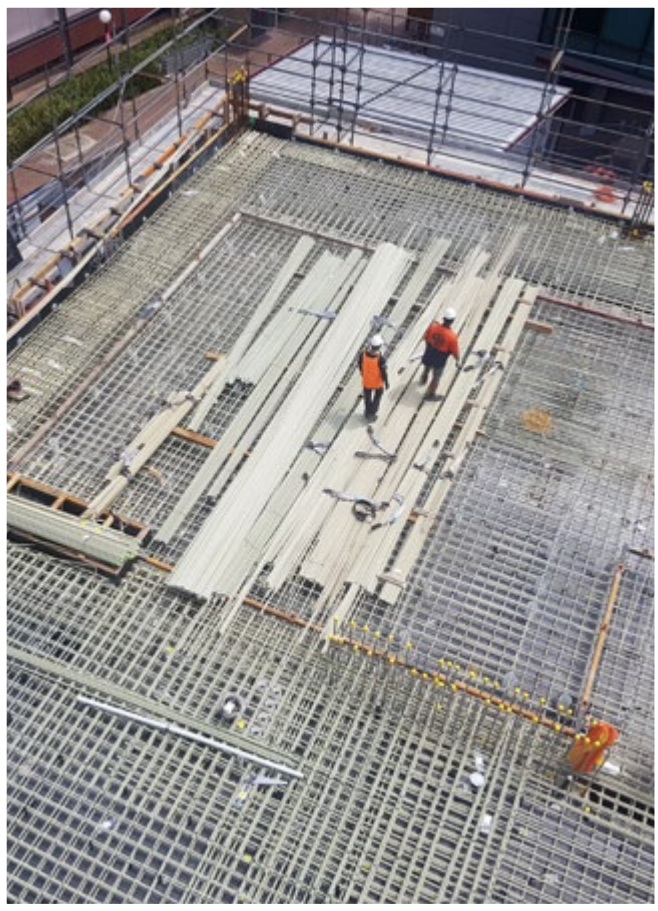
Currently TG&A are at work on Stage 2 of St Vincent’s Private Hospital where they designed an aluminium sun shading system that was integrated into the façade.

For more information contact Total Glass & Aluminium, 28 Lincoln Street, Minto NSW 2566, phone 02 9603 9888, email admin@totalglass.com.au

Below DMF International installed high speed PVC RL3000E roll doors for the laboratory closures.



Below V-ROD™ was specified for reinforcing the zones of influence around the world's most powerful electron microscopes.



DMF International Pty Ltd (DMF) has been trading for over 50 years, and is expert in the design, manufacture and installation of custom made rapid speed roller doors for specialist commercial applications. For the Molecular Horizons project, engineers worked with specifications formulated by Richard Crookes to custom make three rapid speed roll doors for the animal house and laboratories.

“The doors were custom designed PVC panel doors, 2.5m by 2.5m with an opening and closing speed of over 1.0m per second. A design feature of the RL3000E doors was the requirement for sealing the laboratories firmly and quickly to prevent the escape of laboratory specimens. We also had to ensure a tight seal to maintain a clean environment within,” said DMF Director, Stephen Fell. “Manufacture occurred in our 2,000m² Sydney facility and installation was completed onsite within three days.”

“Richard Crookes were great to work with, we coordinated with them to ensure we met specification, and had the required clearances for installation, and they were a highly professional outfit, practical as well,” added Stephen. “Throughout 2019 we worked with them on another large project for Snackbrands in western Sydney, manufacturing and installing 13 large custom designed high speed roll doors.”

DMF supply a large number of rapid roll high speed doors at facilities for the packaging, processing and storage of food, preventing excessive air movement that can interfere with the internal climate. Our doors help maintain interior conditions in areas of high traffic flow, keeping out air-born contaminants, like dust and vermin.

For years, DMF has been manufacturing and installing doors to a number of pharmaceutical manufacturers in clinical applications, such as GlaxoSmithKline and AstraZeneca, installing many custom made high speed roll door solutions to suit their stringent cleanroom production areas.

“We are a family owned company and take pride in the fact that we are an Australian owned, local manufacturer,” said Stephen. “Our product is installed across the country and we export product to many countries, including throughout South East Asia, New Zealand, India, America, parts of Africa, and the United Arab Emirates, with partners in many of these locations.”

For more information contact DMF International Pty Ltd, 88-90 Magowar Road, Girraween NSW 2145, phone 1800 281 170, email sales@dmf.com.au, website www.dmf.com.au

V-Rod Australia are suppliers of a Glass Fibre Reinforced Polymer Rebar (GFRP) for concrete reinforcing, trademarked V-ROD™. The engineering capability of V-Rod made them the obvious choice to reinforce the critical areas for this multi-story, technically challenging project, possibly the first of its kind in the world, requiring specific GFRP design expertise.

The sensitivity of the TEM Microscopes required the concrete structure and its surrounding environment in the zones of influence to be constructed of non-ferrous materials to not cause any interference during the operation of the microscopes.

A total 127,228m of the 60GPa GFRP was incorporated into these critical zones including straight, bends and ligatures for the reinforcing. Areas included 14m deep piles, pile caps, beam, slabs columns, walls and first story suspended slabs. The reinforcing was assembled with plastic chairs and cable ties ready for a traditional concrete pour.

“We visited the site twice to oversee the delivery and to familiarise the steel fixers with the new product,” explained Director, Michelle Lutze. “Trades adapt quickly to lightweight product, being four times lighter than steel. Steel fixers swap tie wire for cable ties. GFRP is easy

to use, no special tools or methods are needed and the lightweight product means easier handling resulting in a quicker job, with less worker fatigue.”

“The Molecular Horizons building as far as we know, is the world's first project using GFRP in a multi-story building. It proves the structural capability of full international code compliant GFRP reinforcing and showcases yet another first for the industry,” said Michelle.

Manufacturing GFRP bars is around 50% the carbon footprint to that of steel. GFRP will never rust or corrode, it has been aged accelerated to 200 years retaining 95% of its original performance. Field studies, now after 20 years, have shown that on the same time lines, the product is not breaking down at all, when embedded in concrete in the very harsh environments. Our company was established 10 years ago, with introducing GFRP technology to Australia, it is now accepted as choice of material where steel will rust, corrode or conduct electricity. Many landmark projects have been completed throughout Australia.

For more information contact V-Rod Australia, 240 Victoria Road, Largs Bay SA 5016, phone 0402 179 173, email info@incommat.com.au, website www.vrodaustralia.com.au



Uni of Wollongong Molecular Horizons,
New South Wales

Below Austral Air Conditioning provided the delicate conditioning, ventilation and exhaust, cooling plant and water reticulation equipment.



Austral Air Conditioning (Austral) are experts in the engineering and construction of HVAC systems and specialise in unique and complex projects such as at the **Molecular Horizons building at the University of Wollongong**. In early 2019, Austral started detailing the design for the HVAC services from supplied plans and specifications for the research block where the electron microscopes are housed.

“We provided the conditioning, ventilation and exhaust, the cooling plant and the necessary water reticulation equipment,” explained Services Manager, Sumen Pillay. “It was an intricate building with tight tolerances and specific materials due to the sensitivity of the microscopes. We had a project team made up of engineers, project manager and site supervisor onsite overseeing the installation for various works including electrical and ductwork.”

“We have a good working relationship with Richard Crookes and worked with them as part of their joint venture at Tamworth Hospital designing and installing HVAC services in 2017, as well as Inverell Hospital.”

Austral has an inhouse engineering department of 10, experienced in the design of HVAC system for the technically challenging and critical

environments in laboratories and hospitals. They have successfully completed design and installation jobs for five buildings on Wollongong University campus including the IMHR, developments at the Newcastle and Macquarie universities as well as at The Childrens’ Medical Research Institute at Westmead Hospital.

Austral is an Australian owned company which provides a wide range of services across the mechanical services sector. Residential projects included the design, supply and installation of mechanical services at One Central Park in 2013, design, supply and installation of mechanical services at DUO One Central Park in 2018 and the design, supply and installation of mechanical services for three residential towers in North Ryde. Austral have designed, supplied and installed HVAC systems for sporting arenas, shopping centres, cinemas, commercial and high rise projects. Austral offers service and maintenance contracts on their own installations and for existing systems as well as providing estimates, audits and initial plant assessments.

For more information contact Austral Air Conditioning, 56A Myoora Road, Terrey Hills NSW 2084, phone 02 9999 6644, email reception@australaircon.com.au, website www.australaircon.com.au