A NEXUS FOR A HEALTHY FUTURE

DEVELOPER : Plenary Health consortium
MAIN CONSTRUCTION COMPANY : Grocon / PCL joint venture
ARCHITECTS : Silver Thomas Hanley, DesignInc and McBride Charles Ryan

Photos this feature: Stephen Woods, Peter Glenane and Peter Bennetts

The Victorian Comprehensive Cancer Centre is a purpose-built facility to support and deliver integrated treatment, research and education, facilities dedicated to the next generation of cancer research, education, treatment and care.

The $1 billion Victorian Comprehensive Cancer Centre (VCCC) will deliver a state of the art facility for the treatment and care of patients affected by cancer, as well as cancer research and education.

Located in Parkville, Victoria, the project co-locates the Peter MacCallum Cancer Centre with new cancer research and clinical services for Melbourne Health and The University of Melbourne. In addition to the new facilities, a powerful partnership of 10 success organisations have come together to share knowledge, resources and guide the next generation of cancer research, education, treatment and care.

Jointly funded by the Victorian and Commonwealth Governments, the VCCC development is a Public Private Partnership (PPP) between Plenary Health, part of leading infrastructure developer Plenary Group, and the Victorian Government. Australian construction giant Grocon and Canadian construction company PCL were awarded the contract for design and construction of the project working for Plenary Health.

"Given the scale and complexity of the project, Grocon formed a joint venture with PCL, who have extensive PPP and health infrastructure construction expertise, to create an aligned joint venture team to ensure delivery was second to none in Australia," Grocon's National Construction Manager, Andrew Merriel explains.

"Construction started in December 2011 following an extensive period of concept design, competitive assessments and presentations to the state government and health providers."

After more than four years of construction the VCCC opened to staff and patients, on time, in June 2016.

The VCCC is effectively two separate projects running concurrently, the first being the South site that involves the creation of a new clinical and research facility for Peter MacCallum Cancer Centre, The Royal Melbourne Hospital and The University of Melbourne. The second being the North site, which includes a four level clinical and plant room extension of The Royal Melbourne Hospital.

"The North project required the extension be completed while the existing four level hospital remained in operation – literally, as this area accommodates the operating theatres," Andrew adds.

As with any project the size and calibre of the VCCC development, challenges were to be expected. "For a PPP project, once delivery begins, documentation, user group meetings, design development and the construction delivery are managed concurrently and in a very high degree of detail," Andrew says.

"The long term interest of the facility manager, Honeywell, makes the design and decision making processes unusual compared to traditional design and construction delivery. When all of those are complete, the process of testing then begins.

"The pressure to achieve sign off of the various processes requires a highly dedicated and focused team. There is a further advantage if that team has control of the journey from the beginning of the process until the end."

Andrew explains that given the highly technical nature of the research and treatment facilities, there are several new systems and medical facilities. One of the most complex pieces of work has been the development of the basement "bunkers" that enable radiology treatment in a safe atmosphere while ensuring the highest level of containment.

"While the spaces are located below ground level and surrounded by the massive structure, they have been designed with lots of lights and space to feel anything but constraining."

Andrew acknowledges the value of Grocon's joint venture with PCL on the project. "Without the participation of our joint venture partner PCL, this project may never have been built as safely and efficiently as it has," he adds.

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Below Silver Thomas Hanley, DesignInc and McBride Charles Ryan (STHDI+MCR) worked collectively to design the VCCC.

The Victorian Comprehensive Cancer Centre (VCCC) is the new $1 billion facility purpose-built for cancer research, treatment, education and care, part of the Parkville Biomedical Precinct in Melbourne.

The project includes the main 13-storey building bordering Grattan Street, Flemington Road and Elizabeth Street, and also includes a 4-storey extension atop the existing Royal Melbourne Hospital (RMH). The two facilities are linked by covered bridges across Grattan Street that allow patients, visitors and staff to move between the buildings.

Opened to patients in June this year, the VCCC provides a new home for the Peter MacCallum Cancer Centre (Peter Mac), new cancer research and clinical services for Melbourne Health, new research facilities for the University of Melbourne and education facilities for all partners. In addition, 10 leading cancer organisations have come together to form the VCCC Alliance to share knowledge and resources and drive the next generation of cancer research, education, treatment and care.

The Architectural Response

The building needed to inspire hope, courage and shared belief that progress will come readily if a centre of excellence is created to bring the right people together. The architectural response engages with the city and community across a number of levels; from the pedestrian scale through to the iconic civic building that signifies the entry to the Parkville Biomedical Precinct. The key was to provide a welcoming environment for patients, families, students and visitors and a sense that on arrival, you can see the researchers, see what they are doing, and get a strong sense that you are in the best possible place to have cancer treatment. It also will provide an inspirational place for clinicians and researchers. The spiralling design of the external ribbon represents the nexus of partners all coming together into the building – the spiral continues into the atrium, representing a collaboration of minds.

Innovation and Creative Accomplishment

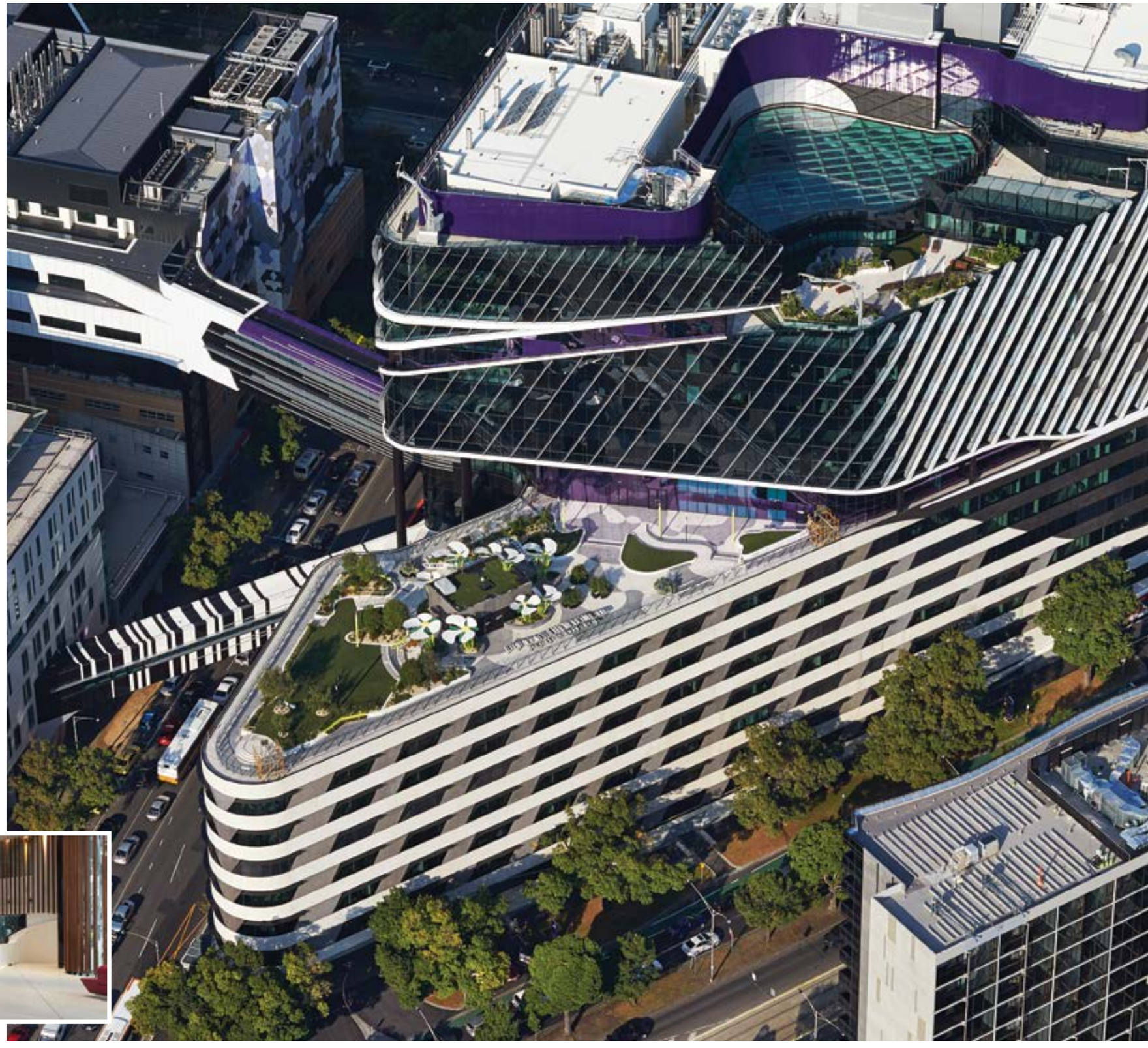
We used the unique triangular shape of the site to our advantage. The apex worked for the inpatient wards, the other corners worked well for larger departments. Light, air and views were key in our design. Three key zones per floor with "destination hubs" around a central atrium were created. It's also unique in its accessibility, and its connections to a critical care acute hospital across the bridge links.

The centre's final design and layout was derived from the vision of the facility, to be one of the top comprehensive cancer centres (CCCs) in the world, and:

- to include individualised treatment plans;
- to increase clinical trials;
- to foster collaboration;
- to support translational research; and
- for the patient journey to be seamless and comfortable.

Integration of research and clinical is not a new concept, nor is translational research – Peter Mac had been practising it for 40 years (developed in the US). Translational research transforms scientific discoveries arising from laboratory, clinical, or population studies into clinical applications to reduce cancer incidence, morbidity, and mortality (Source: National Cancer Institute www.cancer.gov/trw).

A study tour informed us that collaboration occurred best in centres that had a mix of informal and formal "bump" spaces where



Below STHDI + MCR handled the unique requirements of the VCCC.

clinicians and researchers could literally bump into each other, discuss a case, and create new clinical trials and improved outcomes for the patients.

Building Form and Planning

The building form and planning, combined with the creation of a central atrium, supported this collaboration.

Basement B1 to level 6 co-located clinical floors, for patient centred-care, are linked by open stairways, dedicated lift cores (public, research, inpatients and services) and separate inpatient and public travel, all creating a smooth patient journey. The central atrium was a key wayfinding tool that orientates you on the floor, and allows light throughout the building. Clinical trials and pharmacy are embedded in clinical floors – fostering translational research.

Dry research is embedded throughout and as a floor between the clinical floors to encourage researchers out of their office and into the clinical environments. The research laboratories are all located from level 8-12, housing up to 1,200 researchers.

The placement of the education floor and cafe in the centre of the building creates a 'mixing floor' – where researchers, clinicians, staff, educators, students and public can come together.

Collaboration among patients was an important driver in the design – fostering places that give people choice of socialisation or reflection, of sharing their experiences with other patients, for example a mix of single and double rooms, bays for outpatient areas, lounges, patient support, gardens, and food and beverage offerings.

Atrium

The atrium is a key feature of the design for the VCCC – acting as the centrepiece of a simple and functional wayfinding strategy.

The atrium is the heart of the facility and brings a sense of light, air, space and movement into the building. Given the deep floorplate and the proposal of one cohesive building, this was essential to reinforcing connections to nature and light through the centre of each level. It also facilitates for patients and visitors a visual connection to researchers working on the upper floors as they circulate around the atrium.

A pedestrian bridge spanning the atrium at Level 7 also doubles as a gathering space outside of the facility's lecture theatre that will help to facilitate training for the next generation of cancer specialists, clinicians, researchers and educators in Australia and beyond.

The Project and Architectural Partners

The project created a buzz in the industry and many architects wanted to work on it. This building, due to the aspirational brief, had a sense of social importance. All hospitals have a community importance about them, as an architect you feel a sense of accomplishment of creating buildings that encourage and foster healthcare treatment for people. This project though, was unique, first in the sense of scale, and secondly, in the combination of clinical, research and education pillars coming together in the one building.

CCCs are unique facilities that require a sensitive approach. They should inspire hope, reduce fear, and encompass care for the physical, mental and social wellbeing of its occupants. CCCs should be facilities that are accessible to all, have a connection to nature, provide choice for the client and have an overall ambience of reassurance.

A joint venture partnership brought together STH and DesignInc (STHDI) with the addition of McBride Charles Ryan to collectively create a vision for this new endeavour. All architectural teams were in the same project office for the duration of the project, and worked together in their respective disciplines with the Department of Health and Human Services, users of the building and the builders, to complete the design. STHDI + MCR had up to 65 staff across the design phases. The whole project was documented using Revit which at the commencement of the project was unique at this scale.

To be fully committed and involved in a project of this scale and social importance for over six years is a huge achievement and one that the team is very proud of. We believe we have met the vision of creating a facility that should foster translational research and ultimately be in the top CCCs in the world.

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Below ShapeShift Design Technologies created the cladding and colonnades, and covers 2,700m² of the new building.

ShapeShift Design Technologies, a 15-year-old Australian business that is now a worldwide concern, constructed the impressive façade on the new Victorian Comprehensive Cancer Centre (VCCC).

The company provides all elements of concept to delivery in-house, from initial concept development, through design, engineering, documentation, manufacture, installation and certification. The practice specialises in collaborations with architects, artists and builders to deliver the most challenging structures within agreed quality, budget and timeline parameters.

Co-founder of ShapeShift, Toby Whitfield, said his staff started working with the architect on the project three years ago. "We began collaborating with the design team in the very early stages even before they went to tender – that's quite normal for us. We worked with the architects, help them find a built solution for their façade design," he said. "[The VCCC project] was definitely a new challenge. Extensive R & D investment was required to deliver the design intent without compromise."

ShapeShift's façade work was delivered in two finishes over 5,700m². The upper section features over 100 different complex curving panels in a high gloss finish. The lower section forming a perimeter colonnade was originally specified as GRC however the high complex and organic shape was unbuildable in more traditional materials.

"We had to demonstrate the materiality of concrete, the random look, the texture and solid sound of concrete, while combining it with the light weight strength of structural composites. It had to sound solid when you tapped it," said Toby.

ShapeShift, through its bespoke digital manufacturing company, mouldCAM, developed the façade material called ShapeShell – an advanced composite material of structural fibre held in a polymer matrix. ShapeShell was able to guarantee gloss retention for the VCCC project for 25 years.

ShapeShell has also recently been tested to the new Australian standard AS5113 (limiting the spread of fire across external walls) and the British standard 8414 (fire performance on external cladding). The large panels span up to 12m between fixings, engineered for minimal deflection. ShapeShell uses a monocoque build system where by the skins of the structure take the load so it doesn't need an internal steel skeleton.

"We did the weight studies and engineering calculations and designed all of the brackets and were there to supervise the installation. Because the panels are light weight compared to concrete, there's a theme of increased safety," said Toby.

Through our manufacturing arm mouldCAM we have access to some of the largest CNC machines in the world, with working envelopes of 45m x 5 m x 3 m. The complex curve panels come to site in sections up to 12 meters in length. The accuracy of the CNC manufacturing method means panels are literally jig sawed back together to deliver a seamless finish. "It's a complex job to reassemble the more organic shapes, but with 15 years of experience we know that it's all going to fit once on-site."

ShapeShift and its manufacturer, mouldCAM, employ 220 people in Australia, the UK, USA, Indonesia and Holland. MouldCAM, a 3D CNC manufacturing business, can deliver millimetre accuracy across even the most organic shapes. About 55 staff worked on the VCCC project.

Iconic projects ShapeShift and mouldCAM have completed include the Penrose Façade at RMIT University in Melbourne and the Sydney Cricket Ground's Bradman & Noble stand. They're currently working on a 22m-diameter, 2-storey disc to feature at the Commonwealth Games village in Brisbane. There's also developing an ornate complex arch structure to celebrate Vietnamese culture in the City of Maribyrnong, Melbourne.

Also in Melbourne, ShapeShift is working on a luxury apartment block in St Kilda on a balustrade structure which "enables the whole building to be lighter," said Toby. "It will have a concrete look and be similar to the colonnades of the VCCC project."

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Below Bonacci Group provided structural and civil engineering services to the VCCC.

Having been involved with a number of prestigious challenges and rewarding projects for more than 30 years, Bonacci Group, whose philosophy is imagine, design, deliver was always going to be a fitting choice for the revolutionary Victorian Comprehensive Cancer Centre (VCCC).

The award-winning company provided full structural and civil engineering services for the building's main facility and the north facility through all phases of the project – from pre-bid to construction.

Bonacci Group Director Stephen Payne explains that the VCCC's main facility adopted a fairly conventional solution involving post-tensioned band beams and one-way slab construction. This provided speed and material economy.

"As this type of construction is common in Melbourne, it reduced the risk of material procurement and allowed large teams of construction personnel familiar with the solution, to work on multiple areas concurrently," says Stephen.

"The 'inherent' strength and stability of the triangular building shape was taken advantage of in the design by using deep narrow-edge beams around the full perimeter, rigidly connected to blade façade columns."

"The beam elements and the perimeter columns were constructed as precast elements to increase the pace of construction and was also utilised as part of the perimeter safety screen. This perimeter frame system provided a significant portion of the total building's lateral stiffness with the lift and stair cores making up the balance," he adds.

This design and construction approach resulted in reduced reliance on the lift and stair cores to resist lateral earthquake and wind forces, and produced material cost savings of the cores and other lateral resisting elements. "The deep beams also provided marked response improvement to the vibration performance of all the adjoining internal slabs compared to a shallow band beam edge support."

The triangular shape of the building's main facility site did present some challenges to the company in terms of the grid arrangement, which was dictated by basement car parking and ground plane layout, clinical and accommodation on the lower levels and research in the upper levels. "Following intensive planning, an 8.7m by 8.7m building grid was adopted in the lower levels and basements with an 8.7m by 10.2m grid in the research levels," explains Stephen.

This required a transfer structure at level eight in one direction, with the building also to be transferred over the large, clear span underground loading dock – requiring a second significant transfer structure. "This latter transfer structure was eliminated by re-planning and re-locating the nine radiotherapy bunkers to the first basement level and utilising the thick concrete dividing walls to carry tower columns over the loading dock," says Stephen. "This effectively delivered another large section of floor which would have otherwise been lost with transfer beams."

The project saw a number of Bonacci Group's technical team working on individual phases. This varied from two project directors at the pre-bid phase, expanding up to 15 technical delivery staff and two project directors during the design and documentation phase.

The VCCC's northern facilities, located above the adjoining Royal Melbourne Hospital, was originally designed with the capacity for three additional concrete-framed levels. "By adopting a composite steel-framed solution, the self-weight saving allowed five additional levels to be constructed," says Stephen. "This strengthened the business case proposition and eventual outcome for the Royal Melbourne Hospital – Bonacci Group were the original designers for the Royal Melbourne Hospital Emergency Building."

In addition to the VCCC, Bonacci Group continues to work on projects across Australia and New Zealand. Their current projects include the Epworth Hospital Richmond Redevelopment, Flinders Street Station, Defence Force Projects nationally, a number of Victorian schools and residential developments at 420 Spencer Street (Melbourne), Hopkins Street (Footscray), 85 Spring Street (Melbourne) and 300 George Street (Brisbane).

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Below Permasteelisa provided exterior wall glazing, purple glass, aluminium curves and curved sunshades to the VCCC.

It's rare companies are granted permission to utilise the image of such a prestigious world landmark as the Sydney Opera House. However for Permasteelisa, after completing the building's 6,500m^2 of bronze extruded custom made curtain wall in 1973 – which showcased the use of innovative and futuristic design, the Sydney Opera House Trust gave its consent for the company to depict the building on its logo.

Serving as a reminder of one of Permasteelisa Group's first ground-breaking projects, the company has since gone on to feature its technology on some of the most renowned buildings across the world, including the Guggenheim and The Shard.

The Victorian Comprehensive Cancer Centre is an example of Permasteelisa's exceptional use of technology and its ability to provide innovative architectural and design solutions.

The company completed all the exterior wall glazing for the building from the ground to the roof. This included supplying custom made purple glass, completing the building's unique aluminium curved and double curved sunshades. Permasteelisa also provided the steel connection plates for the building's outside curved fibre-reinforced plastic panels. Permasteelisa also supplied and installed the large, jockey sash's and supplemented components for the curtain walls and the cladding glazing for the centre's link bridges.

In terms of its works on the VCCC, Permasteelisa oversaw the entire process from start to finish – including the design, testing, manufacture, assembly and installation.

The result is high performance, double glazed and custom body glass with double curved external sunshades on the building. "The sunshades on this project were very unique," Project Manager Matthew Wickens explains.

"They varied in size from 150mm, 450mm and 600mm in depth, which was created using one large die. These were then able to be curved and double curved to achieve the required architectural intent.

"The sunshades were a difficult component of this project, both in types, size, complexity and being able to curve and double curve these sunshades to achieve the design intent. This was overcome by carrying out many trials, samples and testing to achieve the required outcome. "In addition to this, we had to come up with an actual fixing method for these sunshades that would cater for all the varying scenarios and types of sunshades on the project, which took months of design and development to achieve the desired result."

Matthew adds that the glass on the building's façade is another unique aspect of the project for Permasteelisa. "The purple glass used on the FT4 façade was developed specifically for this project to obtain the purple colour required externally and also provide the performance criteria specified by the client, as well as colour neutral light internally. The overall façade system, both strip window and curtain wall systems, was a thermally shielded system to provide a more energy efficient façade system to assist in the overall efficiency of the building."

Permasteelisa's advanced technology can also be seen at Sydney's 200 George Street by Mirvac, which features the first use of a closed cavity façade in Australia.

Achieving a double skin performance with traditional single skin section depth has resulted in extremely transparent triple-glazed glass, traditionally a European technology.

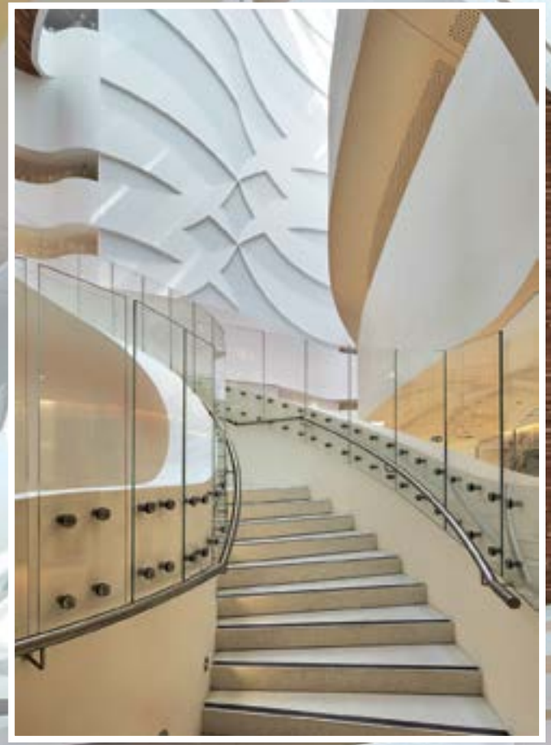
Modified to suit the Australian market, the Permasteelisa system pumps a very low volume of air into the cavity, eliminating the risk of condensation. Integrated timber blinds have also been incorporated into the cavity – another first for a building in the world. The result is a warm timber building in the middle of Sydney's CBD that provides a successful energy efficient system during hot and cold temperatures.

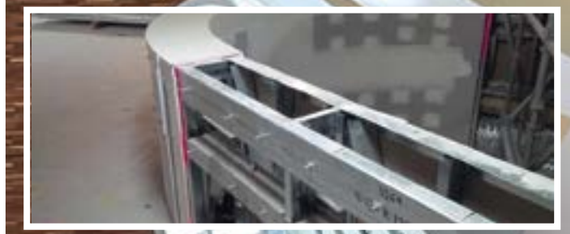
As can be seen by the Victorian Comprehensive Cancer Centre, 200 George Street and its many landmark buildings across the globe, Permasteelisa continues to push exceptional technology into the world market, benefiting its clients, architects and developers.

For more information contact Permasteelisa Pty Ltd, 13-15 Governor Macquarie Drive, Chipping Norton NSW 2170, phone 02 9755 1788, email info.syd@permasteelisagroup.com, website www.permasteelisagroup.com

Victorian Comprehensive Cancer Centre, Victoria

Below SBS Group provided a number of pre-fabricated elements throughout VCCC including the 13-storey atrium feature.





SBS Group is a forward thinking innovative manufacturing company, creating smarter alternative solutions for conventional construction methods. By manufacturing off site utilising lightweight steel and aluminium, SBS strives to remove the traditional construction limitations associated with many projects. Potential designs costs, flexibility and time savings are evaluated, with the common goal of improving productivity for builders and contractors alike.

SBS Group's expertise continues to grow with each new project taken on. Of unique standing to their vast list of projects was the successful re-design, re-engineering and pre-fabrication of curved lightweight balustrade frames for the VCCC.

The project scope included pre-fabricated curved framing and 3D end infill wall sweeps, forming part of the stunning sun filled 13-level atrium feature. As a one-piece smart frame construction, SBS utilised lightweight durable cold formed sections, creating balustrades of engineered structural capacity.

Incorporation of glass, rebates, mountings and other fixtures were also part of the streamlined design. With over a dozen or so radiuses per floor and each floor subtly different, this proved a formidable feat as tracing the as built concrete edge. Frames were detailed into manageable sections for install, enabling quick and easy fixing by the carpentry trades.

The curved end wall sweep modules were fabricated off-site ensuring precise layouts. Plasterboard linings were simply fixed directly to the framing, increasing on site productivity. This included isolation mounting of the frames to stop vibration and accurate cad shop detailing and layouts.

SBS also completed the Place of Peace elliptical 3D coffered ceiling framing and façade/ladder cladding support for the VCCC's bridge link using powder-coated aluminium engineered framing.

SBS is fully committed to providing ongoing innovative and smarter building solutions for their clients and has again invested in the latest new production equipment and in house cad technology. This will further benefit customers with smart frame design capabilities and greater competitive solutions.

For more information contact SBS Group VIC, 3 Bessemer Road, Bayswater North VIC 3153, phone 03 9761 7095, fax 03 9761 7035, email sales@sbsgroup.com.au, website www.sbsgroup.com.au