A Space for Contemplation – Dudley Denny City Library, Mackay

2017 Winner
AGGA Queensland – Commercial Over $50K

> Text by Tim Roberts, Photography courtesy of G.James

G.James Windows & Doors recently completed work on an expansive glazed dome for the Dudley Denny City Library in Mackay, Queensland. Already known by its appreciative audience simply as 'The Dome', the project has swiftly won pride of place in the public's heart.

G.James' exceptional work has been widely acknowledged, both by its many visitors and industry recognition, having been the winner of the prestigious 2017 AGGA QLD Commercial Project Over $50K award.

The G.James project team of Scott Harris and Neville Donald, detail some of the major challenges involved in the project, including the bold move to open up the existing library space. 'The dome was an entirely new structure constructed to replace an existing one,' Scott says. 'The library's ground floor originally featured a Perspex dome; we took the replacement to the next level by extending it right up to the building's roofline.'

G.James' early planning on the project called for close consultation with Council. 'They had drafted an idea of the dome they wanted,' says Scott. 'We took this back to our in-house engineers and draftspeople, who then commenced undertaking the extensive drafting and engineering requirements. After everything had been drawn up exactly as specified and approved, we proceeded to construction.'

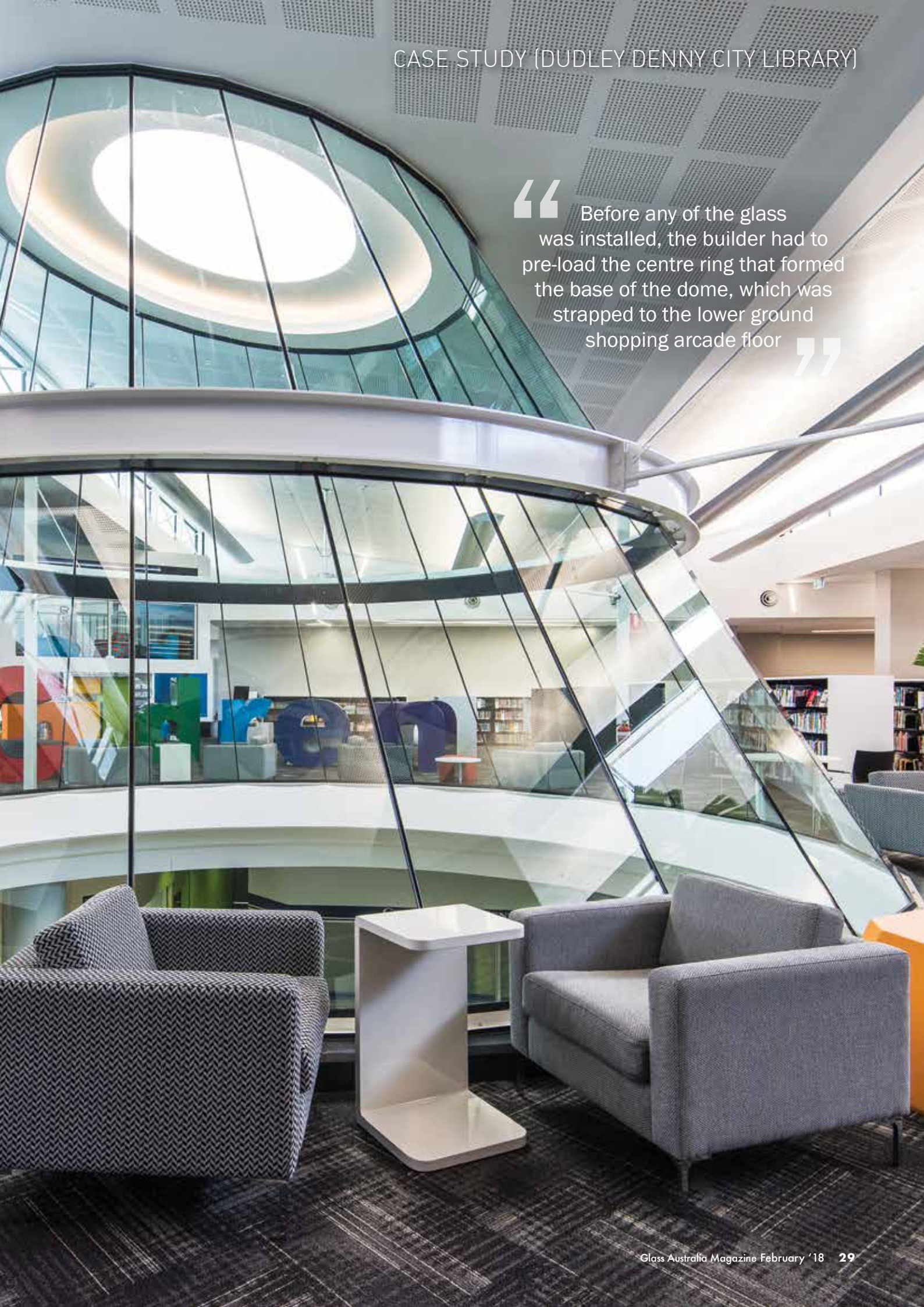
Completing the dome within the existing public building involved significant engineering challenges. 'The new dome is constructed of clear heat-strengthened laminated glazed panels – the top half being 25.52mm in thickness, and the bottom half 21.52mm,' Neville notes. 'The glazed dome is situated in the heart of the library on the first floor, directly over a void looking down onto the shopping arcade below.

'To ensure that the dome fitted with absolute precision on the site, there was no room for error with our calculations, and our engineering also extended to include the structure of the existing building. The first floor area needed to be surveyed extensively to ensure its structural integrity would not be compromised and that it could hold the increased weight of the new glazed dome.

'Our engineers, in consultation with the steel fabricator and builder, determined the exact positioning of the dome's central ring in relation to the roof above,' Scott says. 'The entire dome was designed and put into production from the resultant CAD drawings prepared by G.James, which included the floor, the centre ring and roof brackets which hold the glass, and each of the different-sized glazing panels.

'Before any of the glass was installed, the builder had to pre-load the centre ring that formed the base of the dome, which was strapped to the lower ground shopping arcade floor,' Neville continues. 'This provided the correct daylight opening so that the glass in the top half would fit correctly, as the ring was expected to move due to the sheer weight of glass once it was in position.'

Preparing the site for construction was onerous. 'Working on a restricted site with the bottom level open to the public caused access issues, which we remedied by creating a fenced-off area with trolleys and a spider crane at the top to lift up the glass with mechanical suckers,' Neville recalls. →



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(Dudley Denny City Library, Mackay continued)

The spider crane used during construction had to be agile and responsive to the site's challenges. 'Our main issue was obtaining a crane sufficiently small and flexible enough for our purpose and the site restrictions,' Scott explains.

'Lifting the glass with the library's sloping roof created another challenge, because the roofline fell lower on the side where we were able to get the crane in,' says Neville. 'To gain a purchase, the crane operators made a small "knuckle" which allowed the glass to be lifted up to that height. (At one point, the top of the ceiling one metre outside the dome's centre is actually lower than the top of the dome.)

'We had a sizeable team carefully guide the glass into each space and tap it into the opening very slowly. Once the crane was inside the library, it carried glazed panels and equipment through the gaps in the glass. The crane table went right down through the dome to the bottom floor, picked up each piece of glass and lifted it.'

Close collaboration of the team and every possible resource was called on for this to happen. 'As well as a crane operator and a rigger/spotter, we had two glaziers in a scissor lift down in the shopping arcade, extending inside the dome to position each panel as it was lifted. Another two glaziers were positioned in the shopping arcade below, manoeuvring each panel to be lifted by the crane, says Neville.'

To hold the dome's glazing in place, brackets were machined individually to different profiles from single blocks of aluminium manufactured by G.James. Similarly, the glazing itself is highly specialised. 'The "lean" on the dome required each pane of glass to be of a particular size and shape, making the finished structure resemble a massive jigsaw puzzle that had to be assembled onsite. Fortunately, the CAD drawings made it relatively straightforward to assemble all the components,' Neville remembers.

The specifications of the glazing are daunting. 'With absolute precision required, it took approximately one week for a fitter to install every bracket,' Neville states. 'There are 48 pieces of glass to be fitted, each weighing in the vicinity of 170 to 180kg – 24 on the top of the dome and 24 at the bottom, each of which was CAD-cut and numbered. These comprise the completed dome of approximately 5m high and 9m wide, which now forms the library's centrepiece.'

During installation of the glazing, the top panes were loaded first in a staggered formation. 'This allowed the strapping to be removed later, and ensured the weight was distributed correctly across the span of the ring,' Neville points out. 'Releasing the pre-tension of that centre ring was a dramatic moment, because everything had to stay in place afterwards.'

Calling all this a logistical headache would be an understatement. 'It took approximately two days to lift the top half of the dome into position, due to having to move the crane to lift these panes in the required order,' Neville remembers. 'Another day and a half was then needed to glaze the bottom half, which didn't have to be installed in a particular sequence. Finally, it took approximately two full days to seal the butt joints, with one fitter working inside the dome and another outside.'

Queensland's dramatic weather conditions made the dome's specifications particularly challenging. 'We had to allow for 40mm of lift with the roof in a worst-case scenario in the event of a cyclone, to enable the roof to expand if necessary,' Scott says. 'Although the dome is inside the building, it is pressurised to allow for expansion of the roof.'

The response from the public and visitors to the shopping centre and library has been enormously gratifying. 'The project was featured in the Master Builders Awards, won the AGGA State Awards in 2017, and is now a prominent feature in the city's architecture,' Neville reflects. 'It was a privilege to do something so out of the ordinary. This was definitely a high-blood-pressure challenge, and one of the most difficult projects I've worked on in 30 years – but we were all high-fiving at the end!'

This imaginative renovation of Mackay's library has resulted in a light-filled and unforgettable reading space for all to enjoy. GA