Lynnwood Bridge Phase 3:

Modelled to perfection

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The latest development phase of Attacq's Lynnwood Bridge Retail and Office Park has achieved a 5-Star Green Star SA Office v1 Design rating, a first for Tshwane

The final phase of the Lynnwood Bridge Pretoria precinct has earned the proud green badge for two A-grade office buildings, Kaaimans and Bloukrans, having a combined 12 000m² with a shared podium, parking basement, visitor parking and security site. Each building comprises six storeys, served by five basement levels and a central atrium.

Owned by Attacq, developed by Atterbury Property and designed by Studio 3 Architects International, with sustainability consultants Aurecon, the iconic office towers are the final phase of the now 75 000m² Lynnwood Bridge mixed-use commercial precinct.

The towers have been thoughtfully constructed with lots of smart, green tactics incorporated. They include rainwater harvesting which will collect, store, treat and use large quantities of rain from the building's roof and also from surrounding paving to be used for tasks like toilet flushing. The building's façade details are not only attractive, but control heat from the sun entering the buildings through full-height glazing, yet let in plenty of natural light. Instead of water-cooled chillers air-cooled ones are used. The buildings are also designed to have lots of fresh air, efficient lighting, occupancy sensors, and a fine tuned building management system.

HVAC system description

The air conditioning system consists of a chilled water zoned Variable Air Volume (VAV) system. Chilled water is generated by air-cooled chillers located on the roof. Two chillers are provided per building, each with 50% of the total design capacity of the building.

1. *One of the two air-cooled chillers..*
2. *The chilled water pipeline and pumps.*

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Air-handling units (AHUs) serving the perimeter zones are located in two plant rooms on each floor and block. These AHUs supply conditioned air to ceiling mounted variable air volume diffusers on the perimeter, via externally insulated sheet metal ducting. Electrical heaters in the perimeter section variable volume diffusers cater for the façade heat loss in winter conditions.

The supply air temperature is controlled by supply air temperature controllers operating chilled water control valves. Static pressure controllers control the supply air fan speed. The supply temperature is re-set from the hottest room in each air handling unit zone. Fresh air is provided at 10ℓ/s per person. The room design temperature is set to 22,5±1°C.

> Computer modelling was used by the Aurecon team to estimate the energy usage of the buildings to comply with Green Star SA tool methodology

The temperature in each room or thermal zone is individually controlled by central control system addressable room temperature controllers. Temperature sensors, mounted on master diffusers with specially designed room air induction systems vary the amount of cool air supplied by the diffusers or operate the integral electrical heater in accordance with the room or zone thermal requirements.

The interior zone is conditioned from two central air handling units on the roof serving all floors in each block via ducting and variable volume diffusers. Under normal recycle mode, the units provide the minimum fresh air required for the buildings.

The minimum fresh air quantities are controlled by floor CO_2 monitors. Air returns to the plant rooms via ceiling voids. The air escapes from the full height offices via return air light fittings or ceiling grilles.

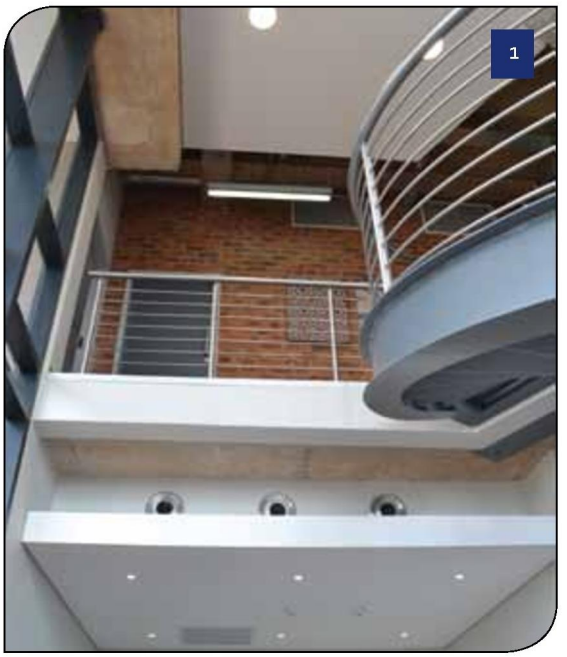
The toilets are mechanically ventilated to meet SANS requirements. The basements are mechanically extracted at a rate of 7,5ℓ/s.m². The extract system also acts as a smoke extract system.

Airgro were the main HVAC contractors on the job.

Sustainability

A green building is a long-term investment. Paybacks such as increased productivity and decreased sick rates, although difficult to quantify, represent significant ongoing future gains. Both Aurecon's current offices and this 'green' office building in the same precinct demonstrate that it's possible to deliver a superior,

1. *Semi-concealed site wall outlets for tenant atrium.*
2. *Hot water heatpump system.*



integrated end product that is an asset to the people who use it and the natural landscape which surrounds it for a similar cost to that of a conventional building.

Aurecon was able to drive an energy efficient agenda throughout every phase of the project lifecycle due to the integration of conventional engineering disciplines with

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sound knowledge of ESD principles. This integration was key in terms of making design decisions that positively impacted on the building's performance at the very outset of the project, as opposed to simply designing the building and then awaiting feedback on how to optimise its performance at a later stage.

The optimisation of the performance of the building during design phase included detailed modelling of all building services using complex modelling software which helped the team understand the building's use of energy and enabled them to check the sustainability of each decision and then tweak the design to ensure enhanced performance.

Just some of the key optimisations that resulted from this modelling included:

- A basement monitoring system that controls ventilation to the various basement zones based on the carbon monoxide concentration, only providing ventilation when and where it is necessary. The design of this system required strong collaboration between the traffic engineer, the mechanical engineer and the energy modelling team.
- An air side economy cycle on the fresh air system, allowing the air-conditioning system to take advantage of free cooling when outdoor conditions are conducive.
- CO_2 demand control of fresh air to the offices, allowing only the necessary amount of free air to be supplied during peak operation conditions.
- Optimising the mix of glazing properties, external shading and building insulation.

Energy modelling

It was thanks to Aurecon's knowledge of the impact of design decisions on performance that enabled the team to achieve 12 points for the 'energy' category during round one of the team's submission to the Green Building Council of SA (GBCSA). Because of Aurecon's integrated design approach, the project achieved higher points for energy than initially expected. This enabled the project to target a 5-star rating with minimal additional investment.

Computer modelling was used by the Aurecon team to estimate the energy usage of the buildings to comply with the Green Star SA – Office Design v1 rating tool methodology. The results of the analysis were then used to determine the potential emissions of the proposed office building once operational.

Based on the Green Star Office v1 energy calculator, the annual *base building* benchmark for the building is 223,2 $kgCO_2/m^2/yr$. The actual annual *base building* emissions value for the building is 85,6 $kgCO_2/m^2/yr$. This results in a 62% reduction in base building annual CO_2 emission, and may therefore achieve 12 points within the ENE-1 criterion.

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1. *Exposed services for the tenant.*

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Challenges

The project team has tackled multiple challenges, including an adjacent wetland and the two podiums being rated as a single development.

The wetland, in close proximity to the building, threatened registration with GreenStar SA, unless a viable solution of mitigating potentially harmful water run-off which could negatively affect the surrounding flora and fauna was found. Aurecon's building makes use of various species of plants affixed to the building's northern car park façade to act as a natural filtration system. This system, although effective, was too costly a solution for these offices which now make use of a mechanical water filtration system integrated with the building's other water systems.

Because the building consists of two towers, many of the tower's systems could not be fully integrated. The two towers were submitted as one development with a single rating, which means both towers were jointly required to achieve a high level of performance. This was achieved through careful modelling of the towers' performance and constant tweaking of the building systems to achieve desired performance levels. RACA

Portion of the AHU plantroom.