

## Key Design Features: Szencorp Building

Key design features include:

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### Building Envelope Efficiency

Scope of Works	The building efficiency was improved using a range of initiatives including: <ul style="list-style-type: none"> <li>• Styrofoam insulation, 35mm to the ground car park ceiling, 30mm in the walls and 50mm for the roof.</li> <li>• Increased ceiling height (reclaimed from the old ceiling plenum) which also allowed the use of the thermal mass of the building for improved Energy efficiency</li> <li>• Double glazed facades</li> <li>• By recycling &gt;90% of the original building, embodied Energy savings were made (although these are not recognised in the Green Star – Office Design tool, which only recognises recycled concrete if it is new and additional).</li> </ul>
NABERS Energy Impact	The addition of the insulation and the double glazed facades equates to approximately a 4MWh saving per annum, or 5.3 tonnes of CO <sub>2</sub> per annum.
Green Star	By recycling the building, embodied Energy savings were made (although these were not recognised in the Green Star rating which only recognised recycled concrete if poured new onsite.  ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 9.
Cost to Implement	Estimated at \$70k, \$50k For Double Glazed façade and \$20k for Styrofoam \$20/m <sup>2</sup> for 100m <sup>2</sup> . Initial figures can't be obtained.
Savings	The savings of this initiative are seen as part of the building Energy consumption in heating and cooling.
Simple Payback	N/A

## Building Management System

Scope of Works	<p>A pre-requisite of the Building Management System (BMS) was to ensure a fully integrated management system that can be fully utilised by the building manager, with integration of:</p> <ul style="list-style-type: none"> <li>• monitoring and verification system (M&amp;V)</li> <li>• the lighting control system</li> <li>• the weather station</li> <li>• the Mitsubishi VRV system</li> <li>• the access control system</li> </ul> <p>With this high level system integration, the BMS assumed control over the Mitsubishi variable refrigerant volume (VRV) system and all associated fans/ fan coils, the DryKor unit, the natural ventilation system, car park ventilation, and domestic hot water re-circulation system.</p> <p>Another important facet was web based access to the system, for maintenance and control, from either the building intranet, or internet. With public access (read only) available via the internet.</p> <p>After assessing the various BMS systems available, and the associated on maintenance/ upgrade costs, an Alerton BMS system was selected, complete with a Tridium front end for management and web access/control.</p>
NABERS Energy Impact	<p>The NABERS Energy report and all associated calculations are based on complete building integration, and the strict control of all operating parameters. The BMS also enables enthalpy control, set point adjustments based on seasonal change, and peak demand strategies as required.</p> <p>The importance of integration cannot be over-emphasised. Substantial savings are available if simple interfacing is done at the time of implementing the BMS and associated systems.</p>
Green Star	<p>MAN-3, Building Commissioning. Possible credits 1, credits achieved 1.  MAN-4, Commissioning Agent. Possible credits 1, credits achieved 1.  ENE-1, Energy. Green Star conditional compliance.  ENE-2, Energy Improvement. Possible credits 15, credits achieved 11.  ENE-3, Electrical Sub-metering. Possible credits 1, credits achieved 1.  ENE-4, Tenancy Sub-metering. Possible credits 1, credits achieved 1.  WAT-2, Water Meter. Possible credits 2, credits achieved 2.  EMI-3, Refrigerant Leak Detection. Possible credits 1, credits achieved 1.</p>
Other Considerations	<p>Improved comfort control for tenants, ease of operation.</p>
Cost to Implement	<p>\$90k Provided a high level of system integration, graphical interface and web based access. Considered cost effective in larger buildings</p>
Savings	<p>The original building was extremely simple, using time based controls, with no natural ventilation, OA or enthalpy strategies. Therefore the savings, versus original are unable to be calculated.</p> <p>However, sufficient evidence does exist to indicate a fully integrated BMS can save around 5-25% of building HVAC Energy costs, over time based systems with poor integration.</p>
Simple Payback	<p>Modernisation and compliance issues to be addressed. &lt;5 year payback if implemented in conjunction with standard BMS control system and excluding the Tridium system integration features and web interfacing</p>

## BMS Occupancy Control & Car Park Ventilation

Scope of Works	<p>Utilising inputs from the access control system and CO sensors in both ground and basement car parks, and the lighting controls as well as utilising the BMS to control internal temperatures and ventilation based on occupancy. Based on the access type granted by the building management to each of the access control cards in the building, the system will:</p> <ul style="list-style-type: none"> <li>• Enable a floor(s) HVAC system and central plant, including domestic hot water reticulation upon entering the building.</li> <li>• Disable a floor(s) HVAC system and central plant, including domestic hot water reticulation upon leaving the building.</li> <li>• Heating/ cooling will be enabled based on the card status, i.e. cleaners' ventilation only.</li> <li>• Car park ventilation based upon CO levels.</li> <li>• The car park exhaust ventilation will be enabled when a valid card is used for either pedestrian or vehicle access to each of the car parks.</li> <li>• CO monitoring sensors will detect rising levels of CO, thus activating the first stage of the respective 2 stage fan for the car park. Continuous rise of CO levels lead to the fan operating at 100% of its power. When levels are stabilised and in decline, the process will work in reverse.</li> <li>• Heating/ cooling and ventilation based upon occupancy sensing from the lighting controls.</li> <li>• Levels 1-4 have five fan coil units with the three in the centre zone having outside air (OA) ducted to the unit. The two perimeter zones use return air only.</li> <li>• The lighting controls on each floor have been designed into these 5 HVAC zones for occupancy control. When the floor HVAC and central plant are activated as a result of a validated card to initialise the system, the following rules apply: <ul style="list-style-type: none"> <li>○ If activity is sensed within a designated HVAC zone(s) the respective system will maintain conditions between the design set points, 19-25 degrees Celsius. Adjacent fan coils (if these zones are unoccupied) will only come on to supplement the 'active' zone should conditions not be met.</li> <li>○ After a preset time of no activity in a zone, nominally 10 minutes, the set points will be further relaxed to 17-27 degrees Celsius, and the OA damper to the fan coil (on internal zones only) will be closed. Fan speed will be set at minimum speed to maintain the relaxed set points.</li> </ul> </li> </ul>
NABERS Energy Impact	<p>The BMS controls the natural ventilation of the building, night purge and cooling of the building. By utilising features Optimum Start/Stop of the BMS, 40A is able to control the temperature of the Building. The BMS also controls the Car Park Exhaust Fan, and the Outside Air Fan (OAF) Variable Speed Drive (VSD).</p> <p>The BMS is used for the occupancy control of lighting and HVAC, and daylight linking for perimeter lighting levels have not been factored into NABERS Energy or Green star. All NABERS Energy calculations are based on fixed levels of occupancy, and fixed hours of operation.</p>
Green Star	Refer to NABERS Energy.
Other Considerations	Whilst the design team have estimated greater reductions in Energy and CO <sub>2</sub> than calculated for by the NABERS ENERGY tool, there are further savings through reduced run times and loading on the systems and associated equipment.
Cost to Implement	\$40k, included in the BMS/ lighting/ access control/ HVAC packages.
Savings	Energy/ CO <sub>2</sub> savings to be calculated on an ongoing basis, versus the NABERS Energy calculations, results to be published when available. Other savings are utilised through reduced run time and loading on the systems and associated equipment. There will be significant savings to both the building owner and tenants in operating costs.
Simple Payback	5.26 years CP Ventillation - \$1k annual savings OAF - \$600 annual savings

	Natural Ventilation - \$2k annual savings Optimum Start/Stop - \$4k savings
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## Building Users' Guide

Scope of Works	<p>Most often a building user is not aware of the buildings design intent, functionality and the associated benefits to them as the user, their team, the environment and the wider community.</p> <p>To address this, a Building Users' Guide has been published for all tenants. It will form part of the wider education program undertaken by Szencorp and the the Szencorp Building website, and will follow, and expand upon the credit criteria for Green Star – Office Design, MAN-5, Building Users Guide.</p> <p>The Building Users' Guide will contain information on the following building attributes, their benefits and a guide to operation where applicable:</p> <ol style="list-style-type: none"> <li>1. Energy and Environmental Strategy.</li> <li>2. Monitoring and targeting.</li> <li>3. Building Services.</li> <li>4. Transport Facilities.</li> <li>5. Material &amp; Waste Policy.</li> <li>6. Expansion/ Re-fit Considerations</li> <li>7. Reference and Further Information.</li> </ol> <p>In addition this guide will also contain:</p> <ol style="list-style-type: none"> <li>1. Fire and Emergency procedures.</li> <li>2. EH&amp;S Guidelines and Procedures.</li> <li>3. Basic First Aid instructions.</li> <li>4. Security/ Access Control Protocols and Procedures.</li> <li>5. Maintenance and Call out Procedures.</li> </ol> <p>By having this guide cover more than just the Green Star compliance to MAN-5 will reduce duplication in systems and publications, giving one central point for all essential building related matters. The Building User's Guide will be accessible from the internet, with paper copies only available upon request, to minimise the impact to the environment.</p> <p>Lastly, a major factor in issuing any guideline, procedures, and any relevant information is the actual dissemination and understanding of the information available. Therefore it will be a management initiative that all present employees will attend a structured workshop (to be initiated and run by ECS) to be formally inducted in the building and its operation, encouraging understanding of the Building Users' Guide, and enabling the tenants to assist the Szencorp Building to achieve its long term goals for energy efficiency and sustainability.</p> <p>All new employees are to be inducted by their manager at the time of their employment, with all employees to be refreshed on an annual basis as to the Building User's Guide intent and use, complete with updates on the various system additions/ deletions and enhancements.</p>
NABERS Energy Impact	5 star NABERS ENERGY compliance. Minimise discretionary Energy/ water use.
Green Star	MAN-5. Building Users Guide. Possible credits 1, credits achieved 1.
Cost to Implement	N/A
Savings	5k
Simple Payback	More efficient use of building facilities through better understanding and behaviour by occupants.

## Central Vacuuming System

Scope of Works	<p>A detailed review was undertaken for the operational requirements of any after hours activities, in particular cleaning. This was coupled to IEQ improvements for the occupants, and preservation of finishes.</p> <p>The first initiative was for any cleaning that required after hour attendance. The access control system will only enable ventilation for any cleaning activities after hours, locking the heating and cooling cycles out.</p> <p>The second was a review as to how to enable cleaning during normal working hours thus preventing after hours activation of the ventilation, and the occupancy controlled lighting. This posed a problem where noise was a contributing factor, in particular the noise from portable vacuum cleaners. Therefore the decision was made to install a central vacuum cleaning system, with the central unit located in the ground floor car park, with the following benefits:</p> <ul style="list-style-type: none"> <li>• Vacuum cleaning can be done during normal working hours, with the central system being some 40% faster than portable machines. Resultant energy savings from reduced lighting, ventilation and faster cleaning estimated at 4MWh per annum. **Note that cleaning is still undertaken after working hours due to occupants' preference**</li> <li>• Carpet longevity – extended intervals between carpet replacement (typically 5 years), therefore with improved cleaning (stronger, more consistent suction), and less recycled grit and soils (exhaust air from the central unit exhausts into the ground floor car park, not recycled on the floor), it is expected the life of the carpet will be doubled, thus reducing the environmental impact of replacing the carpet, and the disposal.</li> <li>• Indoor Environment Quality - central vacuum systems are up to 40% more effective than portable ones and substantially reduce residual dirt, dust and grit, which can contribute to poor IEQ. As stated previously the air from the system is ducted outside thus preventing 're-cycling' of the particulates that can remain after filtering.</li> <li>• Noise – Portable equipment typically 80 DB(A). The central system indoor noise levels are in the order of 57 dB(A).</li> <li>• Mould and Moisture – The central system could be utilised to rapidly remove moisture from wet or damp carpets, substantially reducing a source for mould pollutant. There is also research that indicates a 300% elevation in airborne particulates when using portable vacuums relative to a central system.</li> </ul>
NABERS Energy Impact	A 40% reduction in energy consumed utilising a central vacuum system. This was not factored into the NABERS Energy calculations.
Green Star	N/A – the Green Star Office Design rating system does not recognise the benefits of a central vacuum cleaning system
Other Considerations	Localised controls to allow floor by floor remote control of the central system located in the car park area were required to be retrofitted to help minimize motor run times.
Cost to Implement	The saving will be due to the carpet replacement, increasing the carpet life from 5 to 10 years will halve the replacement cost. The carpet replacement is estimated at \$70k for the building.
Savings	\$25k for the vacuum system
Simple Payback	Potentially the carpet replacement cost of \$70k.

## Dedicated Tenants Exhaust Riser

Scope of Works	As part of Green Star – Office Design, the design team had to provide a dedicated tenants general riser to provide no less than 0.2L/s/m <sup>2</sup> for 100% of the NLA of the whole building and with the capacity of 0.5L/s/m <sup>2</sup> for 100% NLA on any individual floor.  In addition all tenancies have a dedicated exhaust to each floor, including ground, should the tenant(s) decide to have a dedicated printing/ photocopying area or room in their respective tenancy.
NABERS ENERGY Impact	Should the tenants decide to install a dedicated room/ area in their respective tenancies this will require a dedicated fan and controls, integrated to the Building Management System. This will have slightly negative impact on the Energy performance of the building.
Green Star	IEQ-13, Indoor Air Pollutants. 6 Credits available. 5 credits achieved.
Cost to Implement	\$10k
Savings	N/A
Simple Payback	N/A

## Dual Flush Toilets

Scope of Works	Selection of the most water efficient dual flush toilets available. The latest generation Caroma 4.5/3.0 litre specified and installed.
NABERS Energy Impact	N/A
Green Star	WAT-1, Occupant Potable Water Efficiency. Possible credits 5, credits achieved 5. EMI-6 Reduced Flow To Sewer. Possible credits 4, credits achieved 2. Had 40A adopted black water collection and treatment, further credits would have been available.
Cost to Implement	Design and selection, \$1.3k/ Unit a total of \$16.9k
Savings	The Szencorp Building uses 70kL/annum for toilet flushing. This contributes to a saving of 70kL when compared to the average water consumption for toilet flushing in a commercial building. This initiative contributes to a saving of \$120 per annum.
Simple Payback	This initiative helps reduce the amount of water used, thus conserving our water resources.

## Electronic Taps

Scope of Works	Trial of electronic taps as water savings devices to eliminate the unnecessary waste of potable water by having the low flow taps/ mixers operated by infra red sensors, as opposed to manual operation by the users.
NABERS Energy Impact	Minor saving. Reduced domestic hot water consumption.
Green Star	WAT-1, Occupant Potable Water Efficiency. Possible credits 5, credits achieved 5. EMI-6 Reduced Flow To Sewer. Possible credits 4, credits achieved 2. Had 40A adopted black water collection and treatment, further credits would have been available.
Other Considerations	By utilising infra red sensors to activate the taps and associated flows there are also enhanced hygiene aspects, as the user is not touching the taps for operation.
Cost to Implement	Showcase only.
Savings	Total cost \$4k. Level 4 hand basins only.
Simple Payback	>10 years.

## Embedded Generation and Demand Management Initiatives

Scope of Works	<ul style="list-style-type: none"> <li>Gas VRV air-conditioning for reduced peak electric demand.</li> <li>Energy efficiency for reduced peak and total demand, including occupancy control of all lighting and HVAC.</li> <li>PV arrays for installed capacity embedded generation.</li> <li>CFCL Fuel Cell trial.</li> </ul>
NABERS Energy Impact	<p><b>Embedded Generation and Demand Management Initiatives</b></p> <ul style="list-style-type: none"> <li>PV Arrays and the Fuel cell reduce imported electricity requirements</li> <li>The VRV Air-conditioning system reduced CO<sub>2</sub> emissions by 10 tonnes/annum.</li> <li>Lighting controls reduce lighting energy consumption by 60%.</li> </ul>
Green Star	ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11. 10% overall reduction in CO <sub>2</sub> emissions. ENE-7, Peak Energy Demand Reduction, 42% reduction. 2 credits available, 2 credits achieved.
Other Considerations	N/A
Cost to Implement	Included in other initiatives and base building costs.
Savings	Aside from savings already noted under the individual Initiatives no network Demand Management (avoided generation capacity or avoided transmission network upgrades) benefits accrued to 40 Albert Rd Pty Ltd.
Simple Payback	Embedded generation initiatives have been put in place to help minimise greenhouse gas emissions to the atmosphere. These also help with Green Star and NABERS Energy ratings.

## Environmental Impact

Scope of Works	<p>The environmental design goals for the Szencorp Building included:</p> <ul style="list-style-type: none"> <li>• Minimise waste to landfill</li> <li>• Zero greenhouse emissions</li> <li>• Zero grid energy consumption (long term goal)</li> </ul> <p>To achieve this the building utilised:</p> <ul style="list-style-type: none"> <li>• Climate Friendly offsets for all building emissions including energy generated by gas, operational emissions including office paper, and all business travel.</li> <li>• 100% Green power electricity used onsite.</li> <li>• Waste management, including a 3 bin separation system for organic waste, recyclables and landfill.</li> <li>• Introduction of cycle racks and choosing a building located close to major transport hubs and public transport.</li> </ul>
NABERS Energy Impact	The purchase of 100% green power immediately provides a 5 star NABERS ENERGY rating (though the Szencorp Building's NABERS Energy rating was calculated without factoring in the use of green power).
Green Star	<p>By recycling the building embodied energy savings were made (these were not recognised in the Green Star – Office Design tool, which only recognises embodied Energy saved by the amount of recycled content of structural concrete) used on site. However the following were recognised under Green Star:</p> <ul style="list-style-type: none"> <li>• Mat-1, Recycling Waste Storage 2 credits available 2 achieved. Waste management strategy</li> <li>• Mat-2&amp;3, Reuse of façade (2 from 2) and structure (4 from 4). Minimising waste to landfill through re-use.</li> <li>• Tra-3, Cyclist facilities, 3 from 3</li> <li>• Tra-4, Commuting Public Transport, 5 from 5</li> <li>• Water efficiency, reduced flow to sewer, Emi-6, 3 from 4.</li> </ul>
Other Considerations	N/A
Cost to Implement	This will depend on the technology used to generate electricity in the building.
Savings	This initiative reduces waste to landfill and will potentially decrease demand on the grid.
Simple Payback	The payback can only be calculated once the technology is implemented. This initiative at this stage has no monetary payback, however it does reduce waste to landfill and the use of energy.

## Flow Control Aerators (all taps and showers)

Scope of Works	All taps and showers installed in the building are low flow. These are fully compliant with Victorian Government regulations for flow and temperature. A pressure reducing valve has been installed to keep supply pressure below the required 500 kPaL.
NABERS Energy	No impact. The only savings are due to reduced hot water use. The usage of Hot-water from the taps is minimal.
Green Star	<p>WAT-1, Occupant Potable Water Efficiency. Possible credits 5, credits achieved 5.</p> <p>EMI-6 Reduced Flow To Sewer. Possible credits 4, credits achieved 2. Had 40A adopted black water collection and treatment, further credits would have been available.</p>
Other Considerations	Low flow taps create less grey water available for reuse.
Cost to Implement	Cost neutral. Compliance required.
Savings	57kL per annum ( \$127 per annum)
Simple Payback	1.6 years

## Green Star - Office Design (v1) 6 Star rating

Scope of Works	To document and submit a Green Buildings Council (GBCA) Green Star - Office Design rating, to demonstrate how to achieve a 6 star green star rating for an office refurbishment and to provide an open case study for the industry. A COBEII Grant from the Sustainable Energy Authority of Victoria (SEAV) was obtained to help document and submit the rating application.
NABERS Energy Impact	Various aspects of the Green Star rating increase energy use and greenhouse emissions. The NABERS Energy modelling included in Green Star does not match actual NABERS Energy operational ratings. There are no minimum energy and greenhouse requirements within Green Star.
Green Star	<p>The following observations and recommendations are made following Szencorp's experience in applying for a Green Star rating for the Szencorp Building. These are given with the intent of improving Green Star and making it more relevant to the property and construction industry. (Please note they were written around the time of application.)</p> <p>Szencorp (owner of 40 Albert Rd) is the first owner and occupier of a 6 star Green Star building in Australia. 40 Albert Rd also received the highest Green Star Office Design rating to be awarded by the GBCA (to date).</p> <p>Green Star - Office Design is a rating of design intent, so without post occupancy measurement and verification it is impossible to verify the accuracy of the rating. Post-occupancy verification of modelling is necessary, also any modelling should also make explicit any assumptions it is based on.</p> <p>Experience from the Szencorp Building indicates that for Green Star office design to be relevant, it is essential that performance metrics which are currently not included are incorporated. This is especially true for Green Star - Office Asset which relates to 95% or more of the total building stock, existing buildings. Office Asset assesses the upgrade potential of a building while performance based metrics such as NABERS Energy and NABERS Water which measure the actual environmental performance of existing buildings.</p> <p>Open and transparent processes are essential for how metrics are developed and for how a specific building is rated. The submit-and-respond approach adopted by the GBCA to date is sub-optimal in terms of engaging stakeholders and producing optimal outcomes. The GBCA precluded consultation between the GBCA and the building design team during the rating process. This prevented developers and designers from modifying and improving designs to achieve even higher rating outcomes.</p> <p>High costs and long turnaround times for the rating process were a concern.</p> <p><b>Other recommendations for improving Green Star are:</b></p> <ol style="list-style-type: none"> <li>1. Removing the subjective nature of evaluating innovation or other credits so as to provide the certainty that the property industry requires. Improvement of transparency, evaluation, turnaround times (see above) is critical. There should be ready access to the GBCA Technical Committee, with guaranteed turnaround times for queries where there is no prior experience or success on specific credits, or where ambiguity still exists.</li> <li>2. Correcting technical deficiencies in Green Star e.g. those in the water/sewage calculator, daylighting, etc.</li> <li>3. Amending Green Star Office Design to account for refurbishments when whole buildings are recycled. For example, Green Star – Office Design did not provide credits for recycling the complete concrete structure yet offers credits for using recycled concrete in a new building.</li> <li>4. Making Green Star Office Asset relevant to the MCE mandatory performance disclosure requirements that have resulted from the national Framework on Energy</li> </ol>

	<p>Efficiency by including actual performance metrics.</p> <p>5. Providing less prescriptive solutions to achieve certain ratings so as to avoid reliance on specific technical and design solutions.</p> <p>6. verifying modelling and simulation accuracy through post occupancy measurement of predicted results</p> <p>7. To be effective, Green Star – Office Design should be contractually linked to Green Star – Office As-built. This will reduce the financial costs of having two ratings over the design, construction, commissioning, and initial 12 month operating period.</p> <p>8. Ratings scales should be reviewed. Experience at the Szencorp Building indicates that the current 5 star Green Star rating is too easy to achieve.</p> <p>9. There should be at least two Accredited Professionals on the Design Team with the principal Green Star Accredited Professional having have been through the rating process successfully to the level to be targeted (i.e. if on team that achieves 5 stars the professional can only be principal on another 5 star, not 6, and so on). The second must be at a minimum accredited. They should be from two different disciplines. 40 Albert Rd utilized Dean Whiteley from CMM for Services and Paolo Pennacchia from SJB for architectural issues. Finally there is a need to ensure qualified Accredited Professionals. At present this only requires a one day GBCA training course and in itself is insufficient to ensure the complex skills sets required for successful green buildings are on hand during the design phase.</p> <p>10. The GBCA Technical Committee should be advisory only with no right of veto in assessing credits. A minimum of 2 Accredited Professionals should be able to sign off the credits as independent assessors (the same as the commissioning agent is able to do). They should have professional standing (other than Green Star Accreditation) such as engineering qualifications and be part of an engineering consultancy (or like) with the relevant insurances. This will ensure designers/ developers, in the first instance, go to those with the qualifications and experience, therefore reducing costs for achieving Green Star ratings.</p> <p>11. All questions should be tabled on the GBCA website together with answers, and should be accessible to all Accredited Professionals, via a secure web portal. By using this 'buddy' system brings newly accredited people up along side experienced, passing knowledge on, minimising time and money wasted.</p>
Other Recommendations	<p><b>Green Star - Office Design 6 Star Rating</b></p> <p>The 6 star Green Star rating and associated world leadership rating is an excellent promotional tool for the building and for establishing the building as an iconic sustainable, leading edge building.</p> <p>Green Star Rating timetable for 40 Albert Rd was as follows:</p> <ol style="list-style-type: none"> <li>1. Round 1 submitted to the GBCA 24/3/05</li> <li>2. Preliminary evaluation received 30/5/05– approximately 10 weeks including help from the office of the Minister for DSE.</li> <li>3. Round 2 submitted 20/7/05 to GBCA</li> <li>4. GBCA advised final rating 16 August 2005 (4 weeks)</li> <li>5. Total time from first submission – approximately 5 months</li> </ol> <p>Total of 14 weeks plus time to re-compile – over 5 months after initial submission prepared</p> <p>Green Star – Office Interiors rating was considered but rejected due to the high costs of Green Star – Office Design</p>
Cost to Implement	<p>&gt;\$150,000 with documentation and submissions COBEII Grant of \$26,000 offset some costs</p>
Simple Payback	<p>N/A</p>

## Grey Water and Rainwater Harvesting

Objectives	<ol style="list-style-type: none"> <li>1. To recycle the grey water from the hand basins in the toilets, and the tenant showers on ground floor. The recycled water will be used to flush the toilets in the building.</li> <li>2. To collect the rainwater from the roof and mix it with the treated grey water to be used for toilet flushing.</li> <li>3. To reduce the potable water consumption in the building.</li> </ol>
Scope of Works	<ul style="list-style-type: none"> <li>• Installation of waste pipes for the separate collection of the grey water streams from the toilet hand basins and showers.</li> <li>• Installation of a grey water treatment unit and sterilisation of the grey water for re-use. Supplementary potable water make up complete with back flow prevention.</li> <li>• Amalgamation of the existing two down pipes from the roof area into a single point of collection.</li> <li>• Installation of two 2,200 litre storage tanks in the basement car park with supply pump and mains water top up System which has the capability to integrate with grey water harvesting scheme.</li> </ul> <p>Metering of:</p> <ul style="list-style-type: none"> <li>• Grey water</li> <li>• Rainwater flow</li> <li>• Potable water make-up flow.</li> <li>• Combined rain and grey water reuse flow to toilet cisterns for flushing.</li> </ul>
NABERS Energy Impact	Minor impact. Additional electricity consumed for pumping/ disinfection.
Green Star	<p>WAT-1 Occupant Amenity Potable Water Efficiency. Possible credits 5, credits achieved 5.</p> <p>WAT-2 Water Meters. Possible credits 2, credits achieved 2.</p> <p>EMI-5 Watercourse Pollution. Possible credits 1, credits achieved 0. Note, under Green Star all rainwater on site needs to be collected to achieve this credit. This was not deemed viable as a new pump would have been required to capture the water off the ramp to the ground floor car park with major civil works given the layout of the existing building. Also revisions would have been required in the ramp down to the basement car park, and associated sump.</p> <p>EMI-6 Reduced Flow To Sewer. Possible credits 4, credits achieved 3.</p>
Other Considerations	<p>The system was the first grey water system fully approved in Victoria. Obtaining required approvals was a long and daunting process with no single point of authority having clear ownership of the process.</p> <p>Wastewater separation needs to be clear, without black-water.</p> <p>Greater reuse could have been achieved by connecting the rainwater tank to the hot water tank. This would not have changed the Green Star or NABERS Energy assessment, but it would have reused more rainwater and saved more potable water.</p>
Cost to Implement	Including design and builder's works - \$123k.
Savings	Negligible
Simple Payback	> 25 years. This initiative helps reduce the amount of potable water used.

## Lift Upgrade

Scope of Works	<p>40 Albert Road has a single lift which travels from basement car park to L4, 6 levels in total. The existing lift had a control system with an estimate age of 17 years. This estimate is based on mechanical relay controls.</p> <p>The lift controls and lift car required complete modernisation, both for code compliance, smoother/ safer operation, and to reduce energy consumption. The lift controls were upgraded to a Variable Frequency Drive, and digital controls. Lighting in the lift switches off automatically when the lift is inactive for 1 minute.</p>
NABERS ENERGY Impact	Combined saving per annum 1.3 MWh. A 15% saving over the original energy consumption. Estimated CO <sub>2</sub> saving of 1.13 tonnes per annum.
Green Star	ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11.
Other Considerations	<p>Whilst the lift (due to size) will never be fully compliant for disabled use, additional consideration was made to making the lift car interior and controls more user friendly for disabled access:</p> <ul style="list-style-type: none"> <li>• Additional lift control panel added to the car, including tactile buttons.</li> <li>• Landing buttons upgraded including tactile buttons.</li> <li>• Hand rail added to car interior.</li> </ul> <p>In addition the lift controls are now fully interfaced to the access control system, improving the safety and security of the building and tenants.</p>
Cost to Implement	Cost of modernisation, including enhancements for disabled use and access: \$60k.
Savings	Electricity, maintenance and CO <sub>2</sub> emissions. A saving of \$1.1k per annum in comprehensive lift maintenance. Total savings estimated at \$1.3k per annum. This does not include improved floor to floor control, smooth operation, and increased availability of the lift service.
Simple Payback	N/A

## Lighting

Scope of Works	<p>Lighting and controls design by ECS.</p> <p>Designed to AS 1680.1, AS 1680.2.1, AS 1680.2.2, Amendment no.1 dated 21 December 1992 and Amendment no.1 dated 14 June 1993.</p> <ul style="list-style-type: none"> <li>• Over 90% of all lights New Generation Triphosphor T5 (16mm) lamps.</li> <li>• High Frequency dimming ballasts for all fluorescent lamps.</li> <li>• Luminaires. Ultra low brightness fixtures with a glare index of less than 19 and a total light output ratio of greater than 70%.</li> <li>• Maximum light output (uncontrolled) less than 400 lux.</li> <li>• 5.24 watts per square metre, base building.</li> <li>• 1.4 watts per 100 lux, base building.</li> <li>• No upward waste light (sky glow), glare (TI, GR and maximum intensity), or light trespass (vertical spill light) as there are no external flood lights, or internal luminaires contributing in anyway to external light pollution.</li> </ul>
NABERS Energy Impact	This system is integral to achieving the NABERS Energy targets as per the design, and calculations.
Green Star	IEQ-6. HF Ballasts. Possible credits 1, credits achieved 1. IEQ-7. Electric Lighting Levels. Possible credits 1, credits achieved 1. ENE-1, Energy. Green Star conditional compliance.

	ENE-2, Energy Improvement. Possible credits 15, credits achieved 11. ENE-5, Office Lighting Power Density. Possible credits 4, credits achieved 4. EMI-7, Light Pollution. Possible credits 1, credits achieved 1.
Cost to Implement	The lighting was part of the package with the controls at a total cost of \$120k.
Savings	The lighting design and installation is world's best practice, scoring the maximum points available in the Green Star tool.  The power consumption of the lighting system is integral to the NABERS Energy rating, and the subsequent performance of the Szencorp Building, as the lighting represents the single biggest base load on the electrical supply.
Simple Payback	20 years

### Lighting Controls Interface to Security

Scope of Works	The lighting control sensors serve a third purpose. They are also grouped into zones for intruder detection. Should two zones be activated concurrently the security panel will go into alarm, back to base.
NABERS Energy Impact	Refer to Lighting controls initiative
Green Star	Refer to Lighting controls initiative
Cost to Implement	Marginal savings due the size of the building and the number of zones.
Savings	Capital cost savings by not having separate detectors for the security system. Aesthetic benefit and less cluttering of ceilings/ walls.
Simple Payback	N/A

### Lighting Controls and Integrated Lighting, HVAC and Security Occupancy Controls

Scope of Works	<p>Lighting and controls design by Energy Conservation Systems. Designed to AS 1680.1, AS 1680.2.1, AS 1680.2.2, Amendment no.1 dated 21 December 1992 and Amendment no.1 dated 14 June 1993.</p> <p>For the Green Star – Office Design tool only rudimentary zoning was required, and therefore for compliance simple zones were documented for the base building floor plates, where each lighting control zone was to not exceed 100 square metres. Nominally there were 4 zones per floor.</p> <p>In real life, when integrating the fit out with the base building, ECS chose to install the ECS proprietary Managed Lighting System (MLS) occupancy control throughout the building. This is a fully automated lighting control system, where each and every detector is linked by a communications bus. It incorporates motion detectors and photoelectric light sensors to turn lights on and off based on occupancy, and dim to any pre-determined level.</p> <p>Whilst the lighting is not to exceed 400 lux uncontrolled through out the building, the MLS will actually maintain 320 lux at the working plane, therefore automatic control will take into account daylight where available, and also the lamp performance over time. The system is manually calibrated during the commissioning stage to the desired level.</p> <p>Each MLS2000 unit consists of a passive infrared motion detector for occupancy</p>
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	<p>control and a regulating (or passive) photocell for lumen control. Each unit will communicate with every other unit through the central bus connection, allowing programming of zones for controlling grouped areas. The MLS system is installed using a mix of detectors:</p> <ul style="list-style-type: none"> <li>• Integral, mounted in the luminaire.</li> <li>• Adjacent to the luminaire where the fitting is unable to take an integrated detector.</li> <li>• One detector controlling up to four fittings (offices, board rooms).</li> </ul> <p>The car park lighting is controlled by ultrasonic detectors for long range detection. In addition the lighting controls are also utilised for the HVAC, see Initiative - BMS occupancy control/ car park ventilation. Each of the HVAC zones utilises the lighting control occupancy sensors for control of the HVAC zones, by grouping the required sensors together, the communications bus is utilised to drive the HVAC plant in each zone. There is only one manual light switch in the building.</p>
NABERS Energy Impact	<p>This system is integral to achieving the NABERS ENERGY targets as per the design, and calculations.</p> <p>Occupancy control of lighting, HVAC, dimming of lighting, access control of floors and central plant, occupancy control of lighting and HVAC, and daylight linking for perimeter lighting levels have not been factored into NABERS Energy or Green Star. All NABERS Energy calculations are based on fixed levels of occupancy, and fixed hours of operation.</p> <p>The design team and the management of 40 Albert Road conservatively estimate the overall energy consumption and CO<sub>2</sub> emissions for the whole building will create a further reduction of 20-25% on the NABERS Energy calculations, contained within the NABERS Energy report.</p>
Green Star	<p>ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11. ENE-6, Office Lighting Zoning. Possible credits 1, credits achieved 1. EMI-7, Light Pollution. Possible credits 1, credits achieved 1.</p>
Other Considerations	N/A
Cost to Implement	To budget, \$80k included in lighting works package. (\$50k for controls, \$30K install)
Savings	<p>The lighting design and installation is world's best practice, scoring the maximum points available in the Green Star tool.</p> <p>The power consumption of the lighting system is key to the NABERS Energy rating, and the subsequent performance of the Szencorp Building, as the lighting represents the single biggest base load on the electrical supply.</p> <ul style="list-style-type: none"> <li>• Cost savings from removing the need for conventional light switches. Only one conventional wall light switch (in a stair well) is used in the building.</li> <li>• Low churn rate costs due to changing tenant floor layouts.</li> <li>• Savings are estimated at \$15k per annum based on lights and fan coil units being switched off or dimmed due to motion sensors.</li> </ul>
Simple Payback	5 years

## Materials and Indoor Environment Quality

Scope of Works	<ul style="list-style-type: none"> <li>• Asbestos survey – the specification called for a full asbestos survey to be carried out by the Contractor; and any asbestos found to be appropriately removed and disposed of.</li> <li>• WMP – The Contractor was required to provide and implement a comprehensive waste management plan (WMP) and recycle and/or reuse 80% of waste by weight during construction.</li> <li>• EMP – The Contractor was required to provide and implement a comprehensive environmental management plan (EMP) for the site, in accordance with Section 4 of the NSW Environmental Management System guidelines (1998) or equivalent.</li> <li>• Reuse of existing façades and structure – The project extensively re-used the existing building façades and structure, including the reuse of up to 88% of the existing façades and 86% of the existing roof.</li> <li>• Reuse of existing land – The project reused existing developed land and hence did not require the destruction or clearing of undeveloped land.</li> <li>• Use of low VOC materials – The design calls for the use of non ozone-depleting and low-VOC (volatile organic compound) insulation for both thermal insulation and acoustic insulation.</li> <li>• All sealants and paints are low-VOC.</li> <li>• Double glazing – All external glass used on the project is specified as high performance reflective ‘Low-E’ double-glazing for improved thermal performance and increased internal light levels.</li> <li>• FSC Timber – Forest Stewardship Council certified (Greenheart) timber is specified for internal and external flooring, as well as for deck areas and wall-cladding.</li> <li>• Plantation timber framing – All timber wall, roof and ceiling framing used on the project is specified as being suitable plantation timbers.</li> <li>• Recycled content concrete – New structural concrete works on the project, where an existing staircase was removed from the building, required that the concrete include a percentage of recycled content.</li> <li>• Integrated Fit-Out – The fit-out for the project was integrated, thereby minimising re-work by the Contractor and reducing material wastage.</li> <li>• Recyclable Carpet – The specified carpet is a recyclable nylon carpet with extremely low VOC emissions.</li> <li>• Synthetic rubber – Synthetic rubber flooring is specified to the kitchenette areas.</li> <li>• Stone tiling – Natural stone tiling was used in public areas.</li> <li>• Reconstituted veneers – Reconstituted timber veneers were specified as finishes for all doors and cupboards forming entries to the service and amenities cores of each office level and in the reception.</li> <li>• Wood pulp panels – Pressed wood pulp panels have been utilised as feature walling in the office and reception areas.</li> </ul> <p><b>Materials and Indoor Air Quality</b></p> <ul style="list-style-type: none"> <li>• Polyester film – Polyester (not vinyl) privacy and graphics film was used to provide a degree of screening on glass panels in areas of the fit-out.</li> <li>• Recycled aluminium ceiling tiles – The office areas are fitted out with 90% (min) post-industrial recycled aluminium ceiling tiles.</li> <li>• E-zero carcass construction – The carcasses of all the joinery utilise E-zero (low emission) particle-board.</li> <li>• E-zero wall-panelling and joinery – All face joinery and wall-panelling utilise E-zero (low emission) MDF (medium density fiber-board).</li> <li>• Phenolic resin desk-tops – All desktops are specified as phenolic resin - no VOC impact and is very durable (long life cycle).</li> <li>• Minimised pull hardware – Where joinery requires handle pulls, the use of specific hardware has been minimised by designing the pull handle into the joinery unit.</li> <li>• Friendly leather – Where leather upholstery is used the leather is specified as non-chromium treated.</li> <li>• Recycled timber – Meeting room tables in the offices utilise recycled stringy-bark timber.</li> <li>• Rubber flooring in kitchen areas has negligible VOCs, no PVC content and is very durable. It has none of the compounds variously found in the many vinyls available on the market</li> </ul>
NABERS Energy	

Impact	The impact is only due to the double glazed windows, which reduce heating and cooling requirements, and reduce lighting consumption through dimming as the glass has been designed to capture the maximum amount of light
Green Star	MAN-6, Environmental Management. 3 credits available, 3 credits achieved. MAN-7, Waste Management. 2 credits available, 2 credits achieved. IEQ-4, Daylighting. 3 credits available, 1 credit achieved. IEQ-5, Daylight Glare Control. 1 credit available, 0 credits achieved. IEQ-13, Indoor Air Pollutants. 6 credits available, 5 credits achieved. MAT-2, Reuse of Façade. 2 credits available, 2 credits achieved. MAT-3, Reuse of Structure. 4 credits available, 4 credits achieved. MAT-5, Recycled Content of Structural Concrete. 3 credits available, 0 credits achieved. Deemed N/A by the GBCA technical committee even though all concrete used in construction was deemed to be structural (new stairwell, deletion of existing stairwell, in fills required), all concrete used in construction was fully compliant with the MAT-5 criteria. MAT-6, Recycled Content of Structural Steel. 2 credits available, 0 credits achieved. A concerted effort to obtain structural steel compliant with the credit criteria for MAT-6 was made by the design team, and the builder. This is not currently achievable in construction in Australia. In the words of the GBCA, an 'aspirational' credit, intended to create a market force for steel manufacturers to offer compliant product. MAT-7, PVC Minimisation. 2 credits available, 0 credits achieved. MAT-8, Sustainable Timber. 2 credits available, 2 credits achieved. ECO-1, Ecological/ Social Value of the Site. Conditional requirement. Achieved. ECO-2, Reuse of Land. 1 credit available, 1 credit achieved. ECO-4, Change of Ecological Value. 4 credits available, 1 credit achieved. ECO-5, Topsoil & Fill Removal from Site. 1 credit available, 1 credit achieved.
Cost to Implement	>\$500K, This is based on estimate costs for each of the above elements.
Savings	N/A
Simple Payback	N/A

## Mixed Mode and Operable Windows

Scope of Works	The weather station working in unison with the Building Management System (BMS) controls the natural ventilation in the mixed mode cycle. Windows at both ends of the building are automatically opened and closed under certain conditions to provide both night purging and natural ventilation. Air flows through the office spaces and up through the central atrium.
NABERS ENERGY Impact	Reduced energy use from air-conditioning, however there is some Additional Energy use from the central vacuum cleaning system
Green Star	ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11.
Other Considerations	A major feature of 40 Albert Rd is the mixed mode air-conditioning that features operable windows for natural ventilation. Operable windows have raised a number of issues including: <ul style="list-style-type: none"> <li>• Increased ingress of dust, flies, etc. This leads to the requirement for the installation of a central vacuum cleaning system.</li> <li>• Indoor air quality at the Szencorp Building is extremely good due to the close attention to materials and the pre-conditioning of air. However due to the inner city location of Albert Rd, outside air introduced into the building during natural ventilation cycles reduces overall indoor air quality and has a negative impact on overall Indoor Environment Quality (IEQ)</li> <li>• Safety and OH&amp;S issues (ensuring fingers are not able to be caught during the automatic closing of the windows, etc.)</li> </ul>

	<ul style="list-style-type: none"> <li>Acoustics vs airflow – sealing offices for privacy acoustic reasons restricts natural airflows. While this was reviewed during the design phase no satisfactory alternative to naturally venting offices through open doors or vents was found. This experience at the Szencorp Building however, leads to the recommendation for the development of ceiling-based acoustic solutions that would allow for both office and open plan privacy requirements while still providing natural ventilation.</li> <li>The acoustic issue detailed above then impacted on floor layouts in terms restricting zones where sealed offices could be located.</li> </ul>
Cost to Implement	Included in the BMS package.
Savings	The primary function of the weather station is to ensure mixed mode operation is activated when the weather permits and that enthalpy control enables precise control.
Simple Payback	Not Available

## Monitoring and Verification

Scope of Works	<p>To monitor the various systems/ products within 40 Albert, complete verification of the various strategies deployed, allow continuous improvement, and facilitate rapid and effective response to any performance issues, an extensive monitoring and verification (M&amp;V) system has been installed and commissioned by ECS.</p> <p>The are over 59 independent meters monitoring:</p> <ul style="list-style-type: none"> <li>All electrical circuits on level 4. Both tenant and landlord.</li> <li>All major electrical Energy uses on Ground, L1-3. Both tenant and landlord.</li> <li>Incoming gas consumption, individual gas consumption of the VRV system, solar gas-boosted domestic hot water.</li> <li>Incoming mains, kVA, kVA<sub>r</sub>, current.</li> <li>Mechanical services board.</li> <li>Incoming water consumption.</li> <li>Grey water, rainwater consumption.</li> <li>Energy generation, both PV arrays and the ceramic fuel cell.</li> <li>IT/ telephone services.</li> <li>Landlord billing of tenants</li> <li>Utility bill verification</li> <li>Demand Management</li> </ul> <p>All data collected is routed via a data concentrator to a website where tailor-made reports are generated and available via a user-friendly web portal, where ECS are able to view energy/water/gas usage data in tabular and graphical formats over any selectable time period.</p> <p>The hierarchical filtering enables ECS to easily search for energy loads, and any other connected data, and to create custom filters to aggregate energy usage and to create benchmarks. Alerts can also be provided which enable ECS to receive alerts/alarms in the event of a threshold condition being exceeded, i.e. excess water consumption, inordinate Energy use out of hours. These alerts can be sent via email, SMS, facsimile or AVR.</p>
NABERS Energy Impact	This system is integral to achieving the NABERS Energy targets as per the design, and calculations.
Green Star	<p>MAN-3, Building Commissioning. Possible credits 1, credits achieved 1.</p> <p>MAN-4, Commissioning Agent. Possible credits 1, credits achieved 1.</p> <p>ENE-1, Energy. Green Star conditional compliance.</p> <p>ENE-2, Energy Improvement. Possible credits 15, credits achieved 11.</p> <p>ENE-3, Electrical Sub-metering. Possible credits 1, credits achieved 1.</p> <p>ENE-4, Tenancy Sub-metering. Possible credits 1, credits achieved 1.</p> <p>WAT-2, Water Meter. Possible credits 2, credits achieved 2.</p>

	EMI-3, Refrigerant Leak Detection. Possible credits 1, credits achieved 1.
Other Considerations	It is important that there be integration to the BMS, primarily in the areas of exception reporting, fault monitoring and specific usage pattern, i.e. demand control.
Cost to Implement	The M&V system cost \$45k
Savings	<p>The savings for the M&amp;V at this point are relatively intangible as it is a primarily a management tool, enabling the management to respond quickly and succinctly to any performance issues within the building, driving continuous improvement from the building systems over a prolonged time.</p> <p>With M&amp;V coupled to a fully integrated BMS, and an Energy Performance Contract, long term sustainable results are very achievable with the availability of robust reporting, coupled to long term management strategies and guaranteed results.</p> <p>It is often touted that any saving gained now, without adequate and focused management and reporting mechanisms will erode over time, with all the savings being eroded in the five year time span, back to zero.</p>
Simple Payback	N/A. The monitoring and verification initiative is a long term management commitment that improves the efficiency of running the building. It is difficult to calculate the dollar payback, but the benefits of being able to identify and resolve issues fast is invaluable.

## Natural Ventilation and Night Purging

Scope of Works	<p>The building is mixed mode, thus there is a requirement to introduce outside air into the building when weather permits. CFD modeling was utilised during the design phase which led to the formation of a natural chimney by utilising the central stair well atrium.</p> <p>Weather station data is used to determine when the outside air (OA) is suitable for use, either the west or east face louvers open to allow OA ingress. These louvers are automated and controlled by the BMS. This in turn allows the heating/ cooling to be reduced at the fan coils in the affected zone/ floor.</p> <p>There is an exhaust louver on each floor which remains fully open during normal operation. The louver doubles as a fire damper for each floor, it is fully automated and under the control of the BMS. The automation of this louver saves in maintenance costs, as the monthly fire tests are automated, saving the costs to manually reset each damper upon the completion of testing.</p> <p>At the top of the atrium stairwell (chimney) there is an exhaust damper to atmosphere. This is also fully automated and under the control of the BMS. The window, floor exhausts, and atrium exhaust are all integrated by the BMS. The following functions are enabled by this integration:</p> <ul style="list-style-type: none"> <li>• Natural ventilation.</li> <li>• Enthalpy control – Optimum stop/ start for the HVAC systems.</li> <li>• Cooling/ heating retention after hours. All louvers closed.</li> <li>• Fire/ smoke control.</li> </ul>
NABERS Energy Impact	Minor reduction in Energy consumption, and CO2 emissions.
Green Star	ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11.
Other Considerations	Sourcing the appropriate actuators for the louvers proved both difficult and time consuming especially where there are aesthetic implications at the windows. Also, due consideration was given to whether the tenants could take manual control of the

	<p>louvers as required. This was discounted due to the inordinate cost of automation required to monitor the position of the louvers, the individual controls required, and safety precautions required.</p> <p>The west louvers are at a height where human intervention (fingers) is possible, therefore clear instructions are to be issued to all tenants via company induction courses and the Building Users Guide, instructing all tenants on the operations of the louvers. Also security meshes are to be installed to prevent accidental 'intervention'. The east louvers are above 1.9 metres, and have insect screens installed. This process introduces dust and decreases indoor air quality.</p>
Cost to Implement	<\$120k. Louvers cost \$28.5k and the BMS system required to manage the opening and closing of the Windows for night purge cost \$90k.
Savings	<p>Energy – minor savings</p> <p>Productivity – greater tenant comfort and control and decreased 'sick building syndrome'</p> <p>Churn – industry estimates are that under floor services result in approximately 20% saving in churn costs. This is not a major factor at the Szencorp Building due to the stability of the tenants in occupation and the configuration of the floor plates, however this would be a major factor where the floor plate is larger, and where the tenant is likely to experience higher rates of churn i.e. call centres.</p>
Simple Payback	It is difficult to calculate the payback for the automated window/ louvers separately. The payback should be considered as part of the BMS package which has a simple payback of 5.26 years.

## Solar Arrays

Scope of Works	<p>The Szencorp Building has three PV (Photovoltaic) arrays with a total of 7.55kW.</p> <ul style="list-style-type: none"> <li>The first array is the largest, occupying 45 square metres with a total output of 5.9 MWh per annum and was designed, supplied, installed and commissioned by BP Solar. It is located on the western third of the roof at 40 Albert Road. Total cost including design integration and access/ safety considerations, \$90k.</li> <li>The second array is an amorphous array designed, supplied, installed and commissioned by Going Solar. This array doubles as weather protection for the roof deck, and is installed covering the pergola. Total area 18.9 square metres. Total output per annum is 1.262 MWh and the total cost was \$23k.</li> <li>A third 1.65kW array has been installed over Level 4's west-facing windows as a solar shade, which generates electricity whilst reducing heat load on the building.</li> </ul>
NABERS Energy Impact	Combined saving per annum 5.08 MWh. Estimated CO <sub>2</sub> saving per annum, 6.24 tonnes per annum.
Green Star	ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11
Other Considerations	The electrical output of both arrays is to be monitored and verified by the Szencorp Building's monitoring and verification (M&V) system.
Cost to Implement	\$113k.
Savings	Electrical Energy and CO <sub>2</sub> emissions. Structural savings for the pergola roof and the fuel cell roof.

Simple Payback	This initiative helps in reducing the greenhouse gases to the atmosphere. There is no monetary commercial payback for this initiative
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## Solar Hot Water

Scope of Works	A high efficiency solar hot water system is installed on the roof plant platform, utilising high efficiency parabolic reflectors.  The system has in line instantaneous gas boosting, should the solar radiation be unavailable or inadequate for the load.
NABERS Energy Impact	Reduced Energy consumption, and CO <sub>2</sub> emissions.
Green Star	ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11.
Cost to Implement	\$27k.
Savings	\$439 per annum
Simple Payback	This initiative was undertaken to reduce greenhouse gas emissions.

## Waste Management

Scope of Works	<p>During the detailed operational study WASTECH Engineering was commissioned to assess the various solid waste streams to be generated by the Szencorp Building. The assessment, based upon known occupancy levels, calculated that the Szencorp Building would generate 0.38 cubic metres per day, or 1.9 cubic metres per working week. This required a total of 8, 240 litre bins per week for storage and collection.</p> <p><b>Type of Waste and number of bins:</b></p> <p>General Waste: 4 bins Paper/ Cardboard: 1 bin Secure Paper: 1 bin Co-mingle (glass, PET, cans): 2 bins</p> <p><b>Optional</b></p> <ul style="list-style-type: none"> <li>- A spare Secure Paper bin (need for this to be assessed upon operational review).</li> <li>- A Toner Cartridge bin – dependant on printing requirements, and contract arrangements.</li> </ul> <p>The waste area is a section of the basement car park, with area surrounded by a wall and secured for tenant/ contractor use only. There is also a deodoriser installed to minimise odours. There was also consideration given to:</p> <ul style="list-style-type: none"> <li>• Waste compactor – but given the space constraints and high capital costs this was discounted.</li> <li>• Compost bin – this was discounted due to special ventilation requirements.</li> </ul> <p>The tenancy fit outs will have colour coded bins disbursed, these are based on the colour coded bins located in the basement:</p> <p>Green – General waste. Blue – Paper/ cardboard. Lockable for secure waste. Red – Co-mingled. Yellow – For printer cartridges, dependent on printing contract arrangements.</p> <p>The Building Users Guide will contain comprehensive instructions on the building waste management regime, with the cleaning / waste management contractor to carry out</p>
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	the waste management as per the provided waste plan.
NABERS Energy Impact	N/A
Green Star	MAT-1, Recycling Waste Storage. 2 Credits available. 2 credits achieved.
Cost to Implement	\$20k
Savings	N/A
Simple Payback	N/A

## Waterless Urinals

Scope of Works	Selection and sourcing of the most environmentally friendly urinal. Uridan waterless urinals selected utilising blocking fluid (instead of a cartridge trap).
NABERS Energy	Nil. NABERS Energy does not measure water initiatives.
Green Star	WAT-1, Occupant Potable Water Efficiency. Possible credits 5, credits achieved 5. EMI-6 Reduced Flow To Sewer. Possible credits 4, credits achieved 2.
Other Considerations	There are a number of waterless urinals available on the market in Australia. The selection was made on the reference sites available for the Uridan range. Also to reduce maintenance costs the biodegradable oil trap was chosen over the cartridge option.  Not requiring water for urinal flushing significantly reduces the sources were treated grey water can be supplied to.
Cost to Implement	Total cost \$4,108.
Savings	155 kL/year (\$289 per annum). Cost savings include not having to provide water supply.
Simple Payback	14 years. Generally this is between 6-10 years depending on the building's occupancy. Due to 40A being currently under occupied, the payback is longer.

## Weather Station

Scope of Works	The weather station works in unison with the Building Management System (BMS) to: <ol style="list-style-type: none"> <li>Control the natural ventilation in the mixed mode cycle</li> <li>Provide the data for the enthalpy control by the BMS, including optimum start/ stop of all HVAC plant.</li> <li>Provide data to the DryKor dehumidification air pre-treatment system.</li> </ol> <p>There is a high level interface between the Vaisala WTX510 integrated weather station and the Alerton BMS.</p> <p>The weather station monitors:</p> <ul style="list-style-type: none"> <li>• Wind speed</li> <li>• Wind direction</li> <li>• Rainfall</li> <li>• Barometric pressure</li> <li>• Air temperature</li> <li>• Relative humidity</li> </ul>
NABERS Energy Impact	Mixed mode strategies are not separately factored in NABERS ENERGY calculations as the natural ventilation is introduced in tandem to the widening of dead bands for the HVAC control strategies. The dead band ranges have been reviewed during commission

	to take account of occupants requirements
Green Star	ENE-1, Energy. Green Star conditional compliance. ENE-2, Energy Improvement. Possible credits 15, credits achieved 11.
Other Considerations	<p>A major feature of the Szencorp Building is the mixed-mode air-conditioning that features openable windows for natural ventilation. A major concern with this system at the Szencorp Building's location is the swirling nature of the winds in the precinct. Should the wind pass across front and/ or the rear of the building at a moderate velocity when the building is in mixed mode there could be a venturi effect, where the conditioned air is siphoned from the building resulting in a quick and uncomfortable decline in comfort conditions for the tenants.</p> <p>The BMS and weather station track and predict wind direction, wind speed and floor temperatures to ensure that this does not occur. If required the automated louvers are closed to counter this siphoning of the conditioned air.</p> <p>Also refer to Mixed Mode and Openable Windows review.</p>
Cost to Implement	Included in the BMS package.
Savings	The primary function of the weather station is to ensure mixed mode operation is activated when the weather permits and that enthalpy control enables precise control.
Simple Payback	N/A. The weather station is part of the BMS package, hence there is no identifiable simple payback for it independent of the BMS.