

# CH<sub>2</sub> Setting a new world standard in green building design

## Design snap shot 04: Green Star Rating – Office Design v1

### Summary

#### Introduction

This fact sheet briefly describes the reasons a Green Star rating of CH2 was commissioned, the costs and benefits and the final outcome.

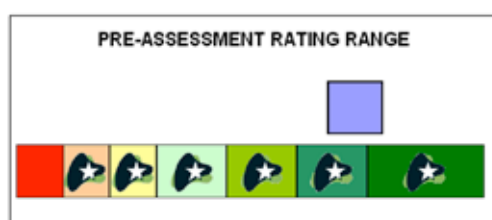


Figure 1. Preliminary Green Star – Design (v1) rating for CH2 as indicated by the blue square.

Green Star rates the environmental performance of a building based, in this case, on its design. It is administered by the Green Building Council of Australia (GBCA). Under Green Star – Office Design v1 methodology, the CH2 design was awarded the highest rating possible – 6 Stars.

The Green Star rating system looks at the following aspects of the building and process:

- Building input
- Management
- Indoor Environment Quality (IEQ)
- Energy
- Transport
- Water
- Materials
- Land Use & Ecology
- Emissions
- Innovation

#### Drivers and objectives

Having a building design rated by Green Star highlights the areas of the design that could be strengthened environmentally. It also provides a common language for the design team to use when discussing initiatives, and provides a comparative evaluation for the outside world.

#### Costs and benefits

##### Costs:

An accredited professional to rate the design and be a part of the design process costs between \$20-70,000. As this was a demonstration project, there was a lot of in-kind and additional work done.

##### Benefits:

Green Star is a public method of demonstrating commitment to environmentally responsible building. It provides a standard language to discuss sustainability for buildings.

#### Outcomes

The CH2 building design was awarded the rating of 6 Star under Green Star – Office Design v1, on 22 March 2005.

Category	Points Available	Points Awarded
Management	12	10
Indoor Environment Quality	26	20
Energy	24	16
Transport	11	9
Water	12	12
Materials	14	9
Land Use & Ecology	8	2
Emissions	13	9
Innovation (not included in total)	(5)	(5)
<b>TOTAL POINTS</b>	<b>120</b>	<b>87</b>

The minimum weighted score for the 6 Star rating is 75 (Green Star – Office Design v1). The maximum possible score is 100, with an additional 5 available for innovation.

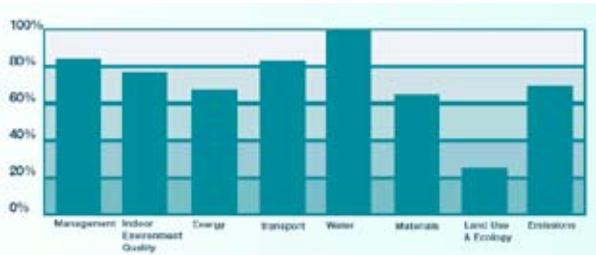


Figure 2. Green Star – Office Design (v1)

### Lessons

The Green Star rating tool was not available at the beginning of the design process, it was first applied in pilot phase during design development. Early initiatives were therefore based on the assessment and knowledge of the participants in the design process.

Environmental aims have played an important role in the CH2 project from the beginning, and many innovative design decisions were locked in before the GreenStar rating tool was even applied. However Green Star provides a solid framework for project teams to address environmental issues during design development, and establishes the building's green credibility and recognition in the marketplace.

### More detail

#### Green star rating

The Green Building Council of Australia (GBCA) has developed a national environmental rating tool for buildings, called Green Star. The tool's comprehensive evaluation process rates the building on the management of the design, construction and commissioning process, the health and wellbeing of its occupants, accessibility to public transport, water use, energy consumption, the embodied energy and environmental impact of its materials, land use and pollution.

CH2 will for many years be a showcase for how environmental and social innovation can be realised in the built environment. Maria Atkinson, Executive Director of the Green Building Council of Australia

The City of Melbourne worked closely with the Green Building Council of Australia to test the pilot version of the Green Star – Office Design tool, which came available during the design development stage of the project. This allowed certain elements of the tool to be fine tuned, before released in the marketplace as Green Star – Office Design v1.

Several issues need to be noted:

- 1 The current rating for CH2 is a design rating obtained under Green Star – Office Design v1
- 2 A second rating will be sought under Green Star – Office As Built v2 at the building's handover.
- 3 A third rating will be sought under Green Star – Office Interiors v1 for the fitout

A Green Star Accredited Professional was employed early on as an integral member of the design team. This professional was responsible for managing and evaluating the environmental outcomes for the project and also the Green Star process, including the initial rating of the building.

The scheme has categories for various areas of the building and its development. These are listed below and expanded on over the remainder of the case study.

- 1 Building input
- 2 Management
- 3 Indoor Environment Quality
- 4 Energy
- 5 Transport
- 6 Water
- 7 Materials
- 8 Land Use & Ecology
- 9 Emissions
- 10 Innovation

Documentation to validate every point claimed under the rating scheme was verified by third-party Certified Assessors. Responsibility for the provision of documentation was clearly passed on to the consultants working on the project from the beginning. As in all aspects of the project, everyone was well informed and encouraged to provide as much input as possible to make this a leading edge project.

The following sets out the categories and subcategories of the rating and how the CH2 design performs against them.

## Management Section

This section is focused on making sure the systems are in place to give the building the maximum chance of performing as designed, and continuing to perform at that level or better. For this reason there is an emphasis on commissioning and management systems. This highlights the importance of using this as a pre-design as well as a post-occupancy assessment and verification tool.

### Green Star accredited professional

Points available: 2

Points awarded: 2

The first mechanism Green Star uses for optimising the chance of success of the building is giving points for the employment of an accredited Green Star professional throughout the project.

Mark Cummins from Advanced Environmental Concepts (AEC) had been working with the design team since the initial workshops and will maintain an involvement through construction and into post-occupation. Mark's role has been to manage and co-ordinate the environmental agenda on the project and to ensure that the most appropriate environmental outcome is achieved. Mark is an accredited Green Star professional and has also been responsible for managing the Green Star process and the co-ordination of inputs from the Client and design team.

### Commissioning clauses

Points available: 2

Points awarded: 0

This explored the amount of planning for commissioning which is vital, as good commissioning ensures that the building is fine tuned for the first period of operation. City of Melbourne has not only included commissioning clauses as part of the relevant contracts but it is employing a separate firm to audit the commissioning process to ensure that all the requirements are met.

The importance of adequate commissioning has been recognised by the client and design team. This has been reflected by including relevant commissioning clauses in the tender documents and appropriate specifications. Project programmes issued with the tender documents have allowed for a sufficient time period prior to practical completion for a dedicated commissioning and building tuning phase.

### Commissioning – Building Tuning

Points available: 1

Points awarded: 1

MCC have committed to a twelve month building tuning period during which all building services and passive systems are monitored and fine tuned. The tender documents have ensured that the contractor is also involved in this process (this is separate to the auditing function described above).

### Commissioning – Commissioning Agent

Points available: 1

Points awarded: 1

City of Melbourne have committed to employ an independent commissioning agent to manage the commissioning process and to ensure that the building and its services are commissioned to the Client's satisfaction. A brief has been produced by AEC to detail the role of the commissioning agent and tenders were sought for suitably qualified and experienced agents.

### Building User's Guide

Points available: 1

Points awarded: 1

A building user's guide will include relevant information for the building users, occupants and tenants. As required by Green Star the guide will address the following aspects:

- Energy and environmental strategy
- Monitoring and targeting
- Building services overview
- Transport facilities
- Materials and waste policy
- Expansion, tenancy and refurbishment requirements

Melbourne City Council will be produced whilst the building is in construction.

### Environmental management

Points available: 3

Points awarded: 3

The tender documents ensured that the contractor provided and implemented a comprehensive Environmental Management Plan (EMP) in accordance with section 4 of the NSW Environmental Management System Guidelines (1998)<sup>1</sup>. As part of each contractor's tender return they were also required to submit a draft of their EMP.

<sup>1</sup> This was the standard used in the Green Star requirements.

Further, the tender documents required the contractor to have ISO14001 accreditation. In order to comply with this requirement, the Contractor obtained certification prior to commencing the project.

## Waste management

Points available: 2

Points awarded: 2

The contract documents require the contractor to re-use or recycle 80% of construction waste during the construction process and to record and demonstrate that this is achieved on a quarterly basis. During the tender period each contractor was to confirm that this requirement was to be achieved.

## Indoor Environment Quality

Questions on Indoor Environment Quality are aimed at ensuring that the building's users and those constructing it receive a minimal impact from materials and all the advantages of sensitive design.

## Ventilation Rates

Points available: 3

Points awarded: 3

Up to 3 points are awarded for providing outside air rates greater than the minimum requirements required by the Australian Standard AS1668.2-2002. For an office building this is 7.5 litres/second/ person. Due to the multitude of research relating to improvements in health and productivity by increasing outside air rates in the workplace, the need to increase outside air provision has always been a high priority for CH2. However, it is important that any increase in the outside air rate is balanced against any increase in energy consumption associated with the heating and cooling of this air.

The final design of the air-conditioning and ventilation system for CH2 ensures that 22.5 litres/second/person is delivered to the building occupants. This level of outside air provides the benefits associated with an increased outside air provision without too great an increase in the building's energy consumption.

## Air Change effectiveness

Points available: 2

Points awarded: 2

CH2 has a displacement ventilation system which delivers air into the office space via a raised floor void and evenly spaced floor grilles. Estimated air change effectiveness (ACE) is approximately 1.2 when measured in accordance with ASHRAE F25-1997. Green Star v1 awarded 2 credits where the ACE is greater than 0.95.

## Carbon dioxide monitoring and management

Points available: 1

Points awarded: 1

The ventilation systems designed for CH2 deliver outside air into the space without mixing or re-circulating air back at the central air handling plant. In addition, carbon monoxide (CO) monitoring and control is provided to each of the office spaces. CO sensors monitor the level of CO within each of the occupied zones and adjust the amount of air entering the space accordingly.

## Daylighting

Points available: 3

Points awarded: 0

Due to the constrained nature of the site and the commercial requirement for a deep plan office space, the provision of adequate daylighting has always been a challenge for CH2. However, daylight design and analysis has driven much of the decision making from day one with regards to building form and façade systems. During the initial two week workshop process daylight modelling using radiance software was conducted to assess the most appropriate form of the building.

As the design developed, further analysis was undertaken to look at the design of the façade and technologies to enhance the provision of daylighting into the building. This modelling influenced the design of the façade in providing larger windows at the lower levels and smaller windows at the upper levels and the provision of light shelves on the northern façade. However, due to the physical constraints of the building no more than 25% of the building floor area has a daylight factor greater than 2% as measured at the working plane under a standard overcast design sky.

Lower floors generally receive less daylight than upper floors so windows on the north and south facades will be larger on the lower floors than the upper ones. This allows the total amount of glass to be minimised, thus reducing energy loss, while maintaining desirable natural light levels. Sensors will monitor the amount of daylight coming in and adjust the artificial light required accordingly.

Light shelves on the north façade will reflect sunlight onto ceilings and produce a soft indirect light, reducing artificial lighting requirements. The light shelves are internal and external and made of perforated steel. Sensors will increase and decrease the artificial lighting according to the amount of sunlight being reflected into the building; thus a balance of natural and artificial light will be achieved.

## Daylight Glare Control

Points available: 1

Points awarded: 0

Although external shading is provided to the north and west façades and internal adjustable glare screens are provided to all façades no credits are available under the Green Star scheme as Green Star specifically requires the glare control devices to be external only.

Shading to control sun and glare will be used on the north, east and west facades. The north facade uses vertical gardens for shading, the east uses perforated metal and the west uses recycled timber louvres that move with the sun.

The north-facing facade will comprise steel trellises and balconies supporting a series of vertical gardens nine storeys high. The foliage will help protect the building from the sun and filter sunlight to reduce glare indoors. The entire west facade of CH2 is protected by a system of timber louvres that pivot with the sun to be fully open in the morning and closed for the full sun in the afternoon. The louvres will be made from recycled timber and will be controlled by a hydraulic system that moves the panels through a six-hour open and close cycle.

## High Frequency Ballasts

Points available: 1

Points awarded: 1

T5 lighting incorporating high frequency ballasts will be provided to all office areas. The T5 fittings are linked to sensors that will reduce the light when sufficient daylight is available. Lighting is supplemented with individually controlled lamps at workstations to give occupants more control over their environment. Thus the level of lighting on a floor or in an area will reflect the level of activity.

## Electric Lighting levels

Points available: 1

Points awarded: 1

Artificial lighting systems are designed as a two component lighting system with a background lighting system provided as part of the base building design and a separate task lighting component provided as part of the fit-out works. The background lighting component provides an average of 150lux to the office space and the task lighting component provides 320lux on each desk. Luminance no greater than 400 lux will be provided anywhere on the office floor.

## External views

Points available: 2

Points awarded: 1

Due to the constraints of the site and the commercial constraint to build a deep plan office space, approximately 75% of the office floor plate will be less than 8m from a façade to have access to external views. This will achieve 1 credit out of 2 available under the Green Star scheme.

## Individual thermal control

Points available: 2

Points awarded: 2

Each of the floor grilles can be relocated on the raised floor to be adjacent to each desk and each of the occupants. In addition, each floor grille is specified so that it can be adjusted by the occupants. This initiative achieves the credit available under the Green Star scheme. Although not recognised by Green Star a further initiative provided is to allow each user to control their lighting environment through the provision of task lighting at each desk.

## Asbestos

Points available: 0

Points awarded: 0

This credit is not applicable as it is only required for refurbished buildings or those with an existing building component of more than 25%.

## Thermal Modelling

Points available: 2

Points awarded: 2

Thermal modelling using TAS software has been used extensively throughout the design of CH2 to influence decision making with regards to those aspects which affect thermal comfort. In addition, computational fluid dynamic modelling (CFD), using Phoenics software, was utilised to discrete elements to quantify and optimise their performance.

Through the use of TAS and the international thermal comfort standard ISO7730, all building and services elements that affect thermal comfort have been designed to achieve a predicted mean vote (PMV) level between -0.5 and 0.5. This has been achieved by addressing all of the factors that affect thermal comfort such as radiation, convection and conduction. This has been further validated by detailed calculation.

**Internal noise levels**

Points available: 2

Points awarded: 2

Acoustic consultants were employed to ensure that the internal noise levels are within suitable limits for an office space. This has been achieved through the installation of acoustic insulation above the perforated chilled ceiling panel. In addition, the acoustic consultants have ensured that the noise generated from the building services systems are within suitable limits. These limits have been validated through detailed calculations.

**Indoor air pollutants**

Points available: 6

Points awarded: 5

The detailed selection and specification of internal materials and finishes has ensured that indoor air pollutants are kept to minimum. In addition, to prevent mould growth, the ventilation and air conditioning systems ensure that relative humidity is no more than 60% in the office space and no more than 80% within the ductwork and distribution system.

The materials credits claimed are as follows:

- Low VOC paints
- Low VOC carpets
- Low VOC adhesives and sealants
- All composite wood product is low emission formaldehyde

**Energy**

Many of the design elements described above aim to reduce energy consumption and go towards a broader aim of zero greenhouse gas emissions from energy use.

**Energy**

Points available: Conditional

Points awarded: Yes

It is a conditional requirement of Green Star that the building achieves 4 stars under the ABGR greenhouse gas rating scheme. This has been demonstrated through the use of detailed energy modelling conducted in accordance with the ABGR (Australian Building Greenhouse Rating scheme) validation protocol.

**Energy Improvement**

Points available: 15

Points awarded: 9

Further credits are available for improvements to a 5 star ABGR greenhouse gas rating. It has been predicted that the building will achieve a 5 star rating plus a 40% reduction in CO<sub>2</sub> emissions directly associated with energy use. This low level of greenhouse gas emissions has been achieved by a combination of the following elements:

- Selection of low energy plant and equipment
- Selection of efficient lighting
- Effective shading and façade systems
- Natural night purge ventilation and exposed thermal mass
- Free cooling via phase change material thermal storage
- Co-generation via gas micro-turbines and absorption chillers

**Electrical Sub-metering**

Points available: 1

Points awarded: 1

Sub-metering has been provided for all substantive energy uses greater than 100kVA and the computer rooms. All metering is logged and recorded by the Building Automation System (BAS).

**Tenancy Sub-metering**

Points available: 1

Points awarded: 1

Sub-metering is provided to the lighting and power for each floor. This is logged and recorded by the BAS.

**Office Lighting Power Density**

Points available: 4

Points awarded: 2

The lighting design utilises low energy T5 luminaires which achieve a lighting power density of less than 2.5 Watts/m<sup>2</sup> per 100lux.

**Office Lighting Zoning**

Points available: 1

Points awarded: 1

The lighting system has been designed to provide a number of separately switched zones per office floor. The design of the lighting system is fully addressable which means that each luminaire can be separately programmed to adjust zoning requirements to suit the future fit-out requirements. The office floor is zoned so that each lighting zone is no greater than 100m<sup>2</sup>.

**Peak Energy Demand Reduction**

Points available: 2

Points awarded: 2

Peak energy demand reduction has been achieved by the micro-turbine co-generation system and the use of phase change material thermal storage.

**Transport**

Transport credit points are earned if the building facilitates the use of public transport and the reduction of use and dependence on cars.

**Provision car parking spaces**

Points available: 2

Points awarded: 0

22 car parking spaces have been provided to the basement car park area. This is more than 50% less than the local planning allowances. This is hoped to increase public transport use. Version 2 of the Green Star Design tool allows this credit to be 'not applicable' if parking is not permitted in the local planning scheme.

**Small car spaces**

Points available: 1

Points awarded: 1

One point can be awarded for the provision of 25% or more of the car parks to small cars only. This encourages the use of smaller, more efficient cars over larger cars.

**Cycling facilities**

Points available: 3

Points awarded: 3

Sufficient secure bicycle spaces, lockers, showers and changing facilities have been provided for 10% of building staff.

**Commuting Public transport**

Points available: 5

Points awarded: 5

There are numerous tram and train services within the vicinity of the building. Maximum credits are achieved using the Green Star transport calculator.

**Water**

Water demand is half that of an equivalent standard building. Blackwater and greywater are treated on site via a Multi-Water Treatment Plant (providing 72 per cent of non-potable water). The building also collects rainwater, reuses water from the sprinkler system (providing 22 per cent of potable water) and uses AAAA-rated water saving fittings.

**Occupant amenity and potable water efficiency**

Points available: 5

Points awarded: 5

The Green Star system requires information be entered into a potable water calculator. This determines which toilets will be used for water purposes – i.e. how many times the waterless urinal will be used or the half flush (3l) or full flush (6l) on the toilets, the showers, taps, etc. The results estimated 8 litres used per person per day.

The calculator then requests information on any rainwater collection and waste treatment on site, and to which level this water is treated. The two systems are described in the fact sheet 'Water Initiatives'. The first collects potable water which is usually wasted in Australia when fire system testing is done, for an average 10 storey office building this is 10,000 litres per week. This water will not be treated and will be used in conjunction with mains water for potable, drinkable use.

The second system involves sewer mining of a neighbouring pipeline. This water will be filtered and treated to class A standard, not recommended for drinking. This water will be reinvigorated with the addition of rainwater collected from the roof of the building.

**Water Meter**

Points available: 2

Points awarded: 2

Linked to the building management system, water meters will be installed on all major water uses in the building including the cooling systems, hot water systems, irrigation and other services.

**Landscape irrigation water efficiency**

Points available: 1

Points awarded: 1

All the water required to maintain the plants on the façade and the roof garden will be sourced from the sewer mined water enriched with the rainwater. One of the innovative concepts which CH2 represents is the provision of the same number of leaves on the building as would have been present on the site in its natural state. This is depicted in the iconic image of the building shown at the beginning of this case study. The roof garden together with the planter boxes on the northern façade meet this aim and provide a lovely micro climate for various building spaces.

The northern green façade is made up of planter boxes situated to the east and west of each northern balcony. The interesting challenge for these planter boxes was how to get water to the plants. Innovative solutions were developed by the landscape architect involved in the project in collaboration with the architects, hydraulic and structural engineers.

**Cooling towers**

Points available: 4

Points awarded: 4

Water from the sewer mining plant has been approved for use by the cooling towers. As such, 4 points are available under Green Star for the use of non-potable water by the cooling towers.

**Materials**

An environmentally preferable material is a commercially available product that has a relatively low environmental impact throughout its life cycle. The CSIRO, with the cooperation of DesignInc, the architects for CH2, has conducted a comprehensive audit of all materials to be used in the construction and operation of the building. The audit covers all aspects of the manufacture and transportation of materials in relation to their effect on the environment and the occupants of the building.

**Recycling Waste Storage**

Points available: 2

Points awarded: 2

Recycling facilities have been provided on each floor and within the basement. Each storage area has been sized to accommodate the storage of paper, glass, plastics, metals and organic waste.

**Reuse of Façade**

Points available: 0

Points awarded: 0

Not applicable as there is no building to be demolished on the site.

**Reuse of Structure**

Points available: 0

Points awarded: 0

Not applicable as there is no building to be demolished on the site.

**Shell and Core or Integrated Fit-out**

Points available: 3

Points awarded: 3

An integrated fit-out ensures that maximum points are achieved for this credit.

**Recycled content of structural concrete**

Points available: 3

Points awarded: 0

No points were claimed although all efforts have been made to maximise the use of recycled content in the structural concrete. Being mainly pre-cast, suppliers are closely involved in achieving aim of 30% recycled concrete aggregate and 30% replacement of cement with industrial waste such as fly ash and slag. Concurrently, other requirements such as appearance, strength, etc. were met. Some elements therefore can have more recycled content, while others have less, depending on their need to be functional requirements.

**Recycled content of structural steel**

Points available: 2

Points awarded: 0

This credit could not be claimed, as documentation was insufficient.



**PVC minimisation**

Points available: 2

Points awarded: 2

All effort has been made to minimise PVC. This has been achieved for all hydraulics and electrical components. The latter currently attracts a cost premium because of the volume required as it is not yet a mainstream product in Australia.

**Sustainable timber selection**

Points available: 2

Points awarded: 2

Over 90% of the timber used on the project will be from recycled or certified sources. The main issue with achieving this score was the transparency and validity of certification processes. Some certification schemes are not as well received or supported by stakeholders as others.

**Land Use & Ecology**

Impacts on ecology through land use include the issues of what the site was used for previously and whether improvements and regeneration are planned for in the development.

**Ecological/Social Value of the Site**

Points available: Conditional

Points awarded: Yes

It is a conditional requirement that the site is not on land of high ecological/social value.

**Re-use of land**

Points available: 1

Points awarded: 1

The building is being built on an existing car park.

**Reclaimed contaminated land**

Points available: 2

Points awarded: 0

The land is not contaminated. Therefore, the two credits available for cleaning up the land could not be awarded.

**Change of ecological value**

Points available: 4

Points awarded: 1

The change of use from an impermeable concreted surface to a building incorporating both horizontal and vertical gardens, allows points to be awarded for the garden areas.

**Topsoil & Fill Removal from the Site**

Points available: 1

Points awarded: 0

Due to the constrained nature of the site this credit cannot be achieved.

**Emissions**

There are nine emissions subcategories with a total of 13 credits.

**Refrigerant Ozone Depletion Potential**

Points available: 2

Points awarded: 2

All refrigerants have been selected with an ozone depletion potential of zero.

**Refrigerant Global Warming Potential**

Points available: 1

Points awarded: 0

Due to the lack of products available which can utilise refrigerants with a GWP below 10 this credit cannot be achieved.

**Refrigerant leak detection**

Points available: 1

Points awarded: 1

A leak detection system was specified for the chiller plant room. If a sensor detects refrigerant concentration in excess of a set amount, an alarm is raised in the chiller plant room, in the Engineer's office and in the Building Management System.

**Refrigerant recovery**

Points available: 1

Points awarded: 0

This has not been specified.

**Watercourse pollution**

Points available: 1

Points awarded: 1

All rain and storm water falling on the site is collected and re-used for non-potable water purposes.

**Reduced flow to sewer**

Points available: 4

Points awarded: 4

Using the calculator, maximum points are achieved for this credit due to the use of efficient fittings and the black water treatment plant.

**Light pollution**

Points available: 1

Points awarded: 1

All lighting has been designed so that no beam of light is directed beyond the site boundaries or upwards without falling directly on the surface which it is illuminating.

**Cooling towers**

Points available: 1

Points awarded: 0

Cooling towers are important in the building services systems achieving such a low energy consumption. As such, no credits are available for this credit.

**Insulant Ozone Depleting Potential**

Points available: 1

Points awarded: 0

All thermal insulants specified avoid the use of ozone depleting substances in their manufacture or composition.

**Innovation**

Points available: 5

Points awarded: 5

Due to the innovative nature of the building and its services maximum credits are claimed under this category. Some innovative aspects are as follows:

- The first application of chilled ceiling technology in Australia
- The first application of chilled surface technology in Victoria
- The first use of sewer mining technology and multi water re-use technology in an Australian building
- The first use of free cooling via phase change storage batteries in the world.
- Shower tower technology for cooling of air and water

**Outcomes**

CH2 received the highest award possible, a design-stage rating of 6 Stars. A building with a 6 Star rating is said to be an international leader.

The results of CH2's rating are as follows:

Category	Points Available	Points Awarded
Management	12	10
Indoor Environment Quality	26	20
Energy	24	16
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<b>TOTAL POINTS</b>	<b>120</b>	<b>87</b>

By using the tool in it's pilot phase, the City of Melbourne and it's consultants involved in the CH2 project were able to feed back to the Green Building Council of Australia their experiences. This helped refine the tool before version 1 was publicly released for use in the marketplace.

Using the tool also established the City of Melbourne as a leader on green building issues, forging new ground that others could follow into the future. Since CH2 achieved a 6 Star rating, the City of Melbourne has established the tool as a common framework for all new commercial office buildings in the municipality. This has been achieved through the Ecological Sustainable Buildings Policy, which forms part of the Melbourne Planning Scheme. It requires all new (or change of use) commercial office buildings:

- over 2,500m<sup>2</sup> to achieve a minimum of 4.5 Stars under the ABGR scheme.
- For those over 5,000 m<sup>2</sup> they also require a 4 Star Green Star rating, and a maximum of 30 litres/day/person water consumption.

### Lessons

Overall, the experience of observing the implementation of the CH2 design highlights how useful the Green Star tool is. Specific targets allow the management of the project in parallel with costs. People understood the role certain decisions had for the environmental credentials of the project, within the use of Green Star parameters.

'well this will give us an extra point, and at this stage of the process we should have some extra points up our sleeve in case anything falls off'

'we are aiming to get the 20% recycled content in the concrete; some elements because of their properties cannot have 20% but others can have more so we should just aim to get an across the board 20%'

'we need the lighting to achieve x w/m<sup>2</sup> to get our star rating'

It is important for consultants to have an understanding of how their area of expertise fits into the Green Star rating from the very beginning of their involvement. This makes it easier to gather documentation for the rating process.

However the tool has many potential benefits for those in building projects, beyond communicating environmental credentials. The tool, if introduced early in the design process reinforces the integration of green practices, establishing a common language and framework for discussion amongst the design team and consultants.