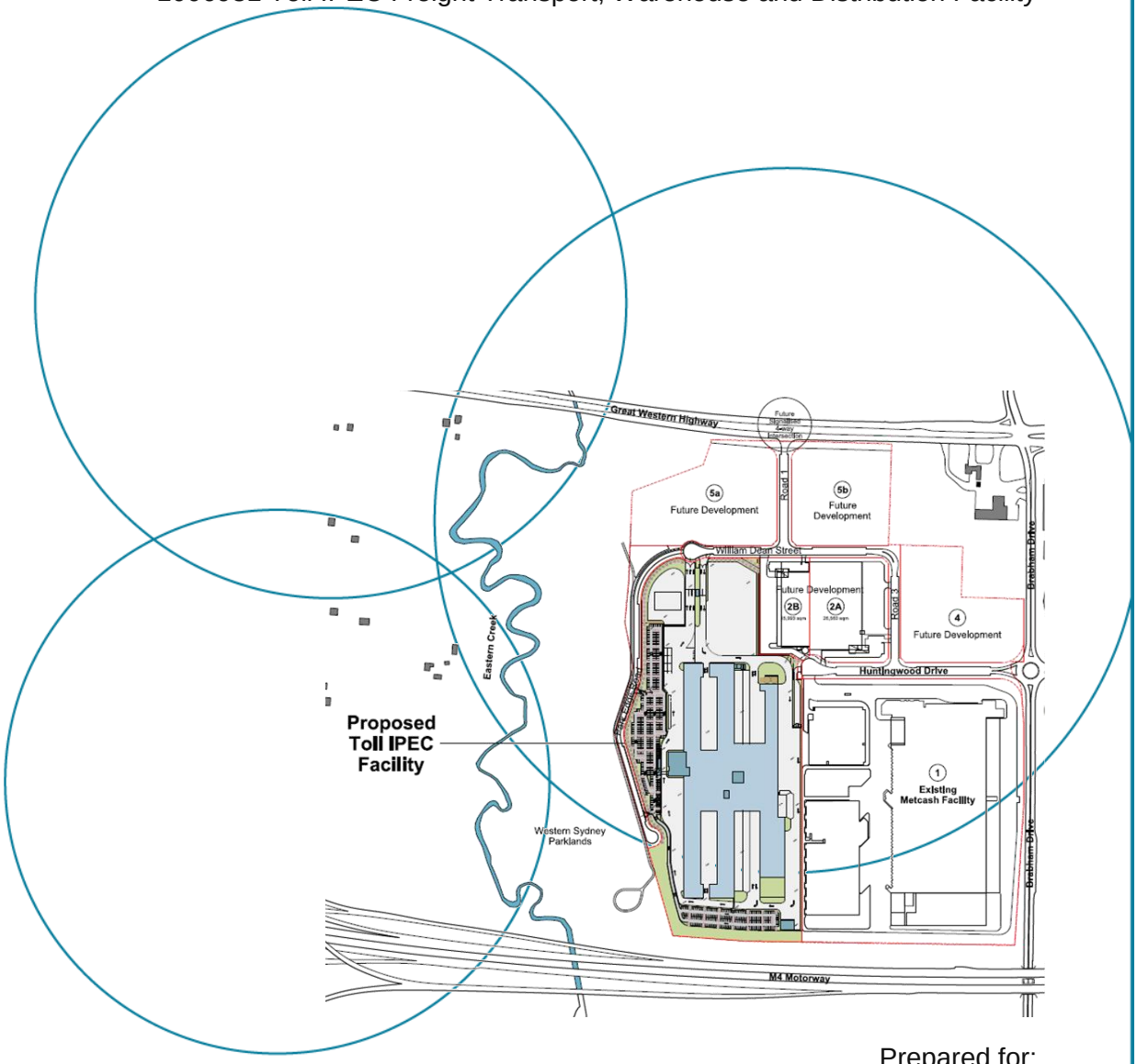
CUNDALL

26/11/2012

Sustainability and ESD Planning Submission Report

1006931 Toll IPEC Freight Transport, Warehouse and Distribution Facility



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The success and realisation of the proposed initiatives will be dependent upon the commitment of the design team, the development of the initiatives through the life of the design and also the implementation into the operation of the building. Without this undertaking the proposed targets may not be achieved.

Contents

Executive Summary

This report provides a summary of the Environmentally Sustainable Design (ESD) initiatives for the proposed Toll IPEC Freight Transport, Warehouse and Distribution Facility at Bungarribee Industrial Estate, Great Western Highway, Eastern Creek.

The building has a total building area of 61,460m², incorporating 47,000m² warehouse space, offices, and other facilities critical to Toll IPEC's operations.

Sustainability has been considered throughout the concept plan and major initiatives include:

- High efficiency lighting and HVAC
- High level of Indoor Environmental Quality with good access to daylight, fresh air and reduced emissions from installed finishes
- Rainwater harvesting for toilet flushing, irrigation and truck wash down
- Reduced concrete and steel through use of a jointless fibre reinforced slab and precast concrete panels in places
- Addressing minimum compliance in the form of BCA Section J

Sustainability initiatives have been taken into account to address both the Director General's Environmental Assessment Requirements and the requirements of the brief. This is demonstrated by tracking brief requirements with ESD targets and proposed initiatives. Certain interventions are embedded in the design, others are considered and still other 'stretch targets' require further investigation to determine the feasibility of implementing the strategy.

1 Project Background

The proposed Toll IPEC facility at Bungarribee Industrial Estate, Great Western Highway, Eastern Creek is a large industrial site providing storage and logistics for a range of delivery requirements.

The development includes a number of different functions as described below:

- Warehouse – 47,000m²
- Warehouse Mezzanine – 8,155m²
- Offices (2 levels) – 3,380m²
- Operations Offices (2 levels) – 840m²
- Fleet workshop – 1,200m²
- Truck wash – 225m²
- Drivers Rest Area – 400m²
- Gatehouse – 130m²
- Customer Pickup – 85m²
- Staff Visit Entry – 45m²

The facility has a total building area of 61,460m² on a total hardstand of 82,515m² with 18,640m² of light duty area.

The following parking provisions are provided in the design:

- Car parking – 700
- Trailer parking – 80
- PUD parking – 54
- Cab parking – 20

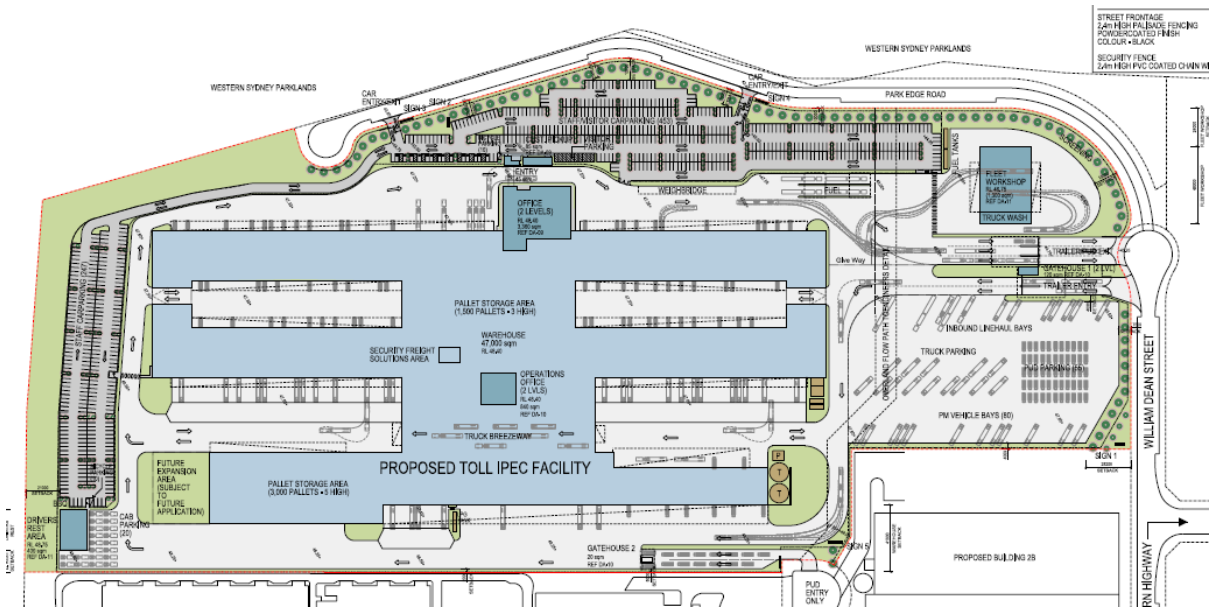

Figure 1: Site Plan

2 Environmentally Sustainable Design (ESD) at Toll

2.1 Global

Toll is an international company with a global corporate target of achieving a 20% reduction in greenhouse gas emissions by 2020. In order to achieve this goal, each facility is to be designed and operated as efficiently as possible and efficient logistics and management processes are will be implemented throughout the business.

2.2 Proposed Toll IPEC Facility

Sustainability has been considered throughout the briefing and concept design phase of the project and it is intended that the facility will be a leader in high performance, sustainable industrial facilities.

The Toll IPEC facility accounts for approximately 10-15% of total IPEC Australia carbon footprint so there is opportunity within this project to make measurable impact on targets.

The development is located adjacent to the Great Western Highway, M4 and M7 Motorways in western Sydney. This excellent access to major roadways reduces traffic congestion and associated excess pollution on local roads.

As well as energy and carbon emissions, the project brief identifies a number of ESD initiatives that are to be addressed in the project design. These include indoor environmental quality, materials, waste, water, transport and ecology, social sustainability and integrating ESD throughout the entire design process.

These initiatives allow the environmental impact of the development to be reduced, as well as ensuring occupant amenity reduced indirect impacts through materials extraction, manufacture and transport.

Through implementing the proposed ESD initiatives, the project meets the Director General's Environmental Assessment Requirements (DGRs) as well as the project sustainability objectives. The DGRs require that ESD principles be incorporated in the design, construction and ongoing operation phases of the development. Additionally, measures are to be implemented that reduce resource, energy and water consumption.

This report identifies ways in which the proposed Toll IPEC Freight Transport, Warehouse and Distribution Facility meets the DGR and project ESD objectives.

3 ESD Initiatives and Strategies

The following section identifies the ESD initiatives described in the project brief, proposed targets related to the objective and strategies that are considered or being implemented in order to meet these targets:

Objective based on project brief	Proposed Target	Proposed Compliance Strategy
Design: • Integrated design • Documentation of design intent and expected outcomes • Appropriate commissioning	• Consider a high level of commissioning and building tuning required by contractors and reviewed for 12 months after completion	• Investigate costs and viability of commissioning requirements and independent commissioning agent
Social sustainability: • Consider design with due regard to occupant satisfaction in accessibility, usability, Indoor quality and public space utility	• High level of occupant satisfaction	• High level of Indoor Environmental Quality (see following section) • Flexibility of space for potential future configurations • Consider occupant surveys to track user satisfaction • Provide external as well as internal thermal comfort for example in the covered walkway ensure that shading and air flow is sufficient • Consider occupant user control eg A/C systems, glare reducing strategies, lighting etc
Optimising Environment Quality • Optimise natural light to work environment • Optimise fresh air ventilation • Consider Thermal Comfort of occupants • Consideration of noise transference in space planning • Minimise use of materials that emit volatile organic compounds • Create a pleasant working environment	**Targets:** • Daylight: Daylight Factor (DF) of at least 2% at finished floor level under a uniform sky for at least 60% of the GLA. • Thermal comfort: 95% of office areas have PMV levels between -1 and +1 for 98% of the year; Warehouse spaces include passive thermal comfort strategies • Finishes: 95% of all paints, adhesives& sealants and all carpet and flooring to be low-VOC finishes; use low-formaldehyde wood products • Electric lighting levels: 95% of GLA has a lighting system that is flicker free and has a maintained illuminance of no more than 25% above those recommended in AS1680.2.4, 2.1 and 0.1 • Reduce visual glare	• Daylight: rationalised glazing and skylights; high performance glass • Thermal comfort: Office HVAC system designed to meet thermal comfort requirements; warehouse has whirly birds and big ass fans for comfort • Finishes: Specify and track correct finishes and wood products • Provide pleasant breakout spaces with sufficient daylight and plants • Lighting: Good light fixtures and well designed layout • Ventilation: Consider increased fan and duct sizing **Additionally:** • Install Eco-certified workstations • Investigate feasibility of low level common lighting with specific task lighting at work areas • Provide sufficient shading and rationalised glazing for visual and thermal comfort

Objective based on project brief	Proposed Target	Proposed Compliance Strategy
Minimising Energy Use • Consider passive design to minimise energy use such as orientation, ventilation, shading and floor plate design. • Appropriate sizing of plant and equipment in heating and cooling, lighting, control systems, • Building Management Systems and Renewable Energy sources	• Target at least a 20% reduction in Greenhouse gas emissions as per global corporate target • Energy sub-metering for all major uses greater than 100kVa; linked to monitoring system • Improved comfort in mezzanine through passive means • High efficiency warehouse lighting and controls • Reduce energy for water heating • Integrated building management • Consider onsite Co-gen • Consider Renewable energy generation for a portion of energy consumption and/or consider future-proofing the building for future installation • Reduce urban heat island effect and heat load through the roof by providing a highly reflective roof • Reduce office equipment load from 20W/m² to 15W/m² • Optimise insulation for energy and thermal comfort	• Efficient lighting, efficient HVAC; consider mixed-mode air conditioning to offices with operable windows • Sub-metering: install appropriate metering; develop metering and tracking strategy to allow for self-assessment, problem solving and ongoing improvements during operations • Investigate alternative passive exhaust for warehouse with a focus on improving thermal comfort for mezzanine • Consider LED lighting strategies and advanced controls • Solar water heating with gas boost • BMS linked to metering, operations and ongoing tracking • Investigate the viability (financial and environmental) of installing onsite co-generation. • Investigate feasibility of installing PV panels and/or requirements for future installation of PV system • Use roofing material such as Colourbond Surfmist Roofing that has a high SRI. • Work with office purchasing department to specify low-energy office and kitchen equipment eg High energy star ratings on all equipment • Investigate current insulation design and determine proposed options – current roof insulation of R1.65
Minimising Transport Impact • Consider location with links to public transport and employee services • Design considerations with regards to bicycle parking and amenities	• Reward drivers of fuel efficient cars by providing small spaces • Reduce reliance on personal cars by providing cyclist facilities • Provide alternatives to single-occupancy vehicles	• Natural gas refuelling station • Consider providing 10% of total parking spaces are for small cars and are situated near the building entrance • Provide cyclist facilities for 5% of office staff, 5 spaced for visitors plus a bike path to the facilities • Transport management plan based on staff surveys; implement car pooling, car-share etc

Objective based on project brief	Proposed Target	Proposed Compliance Strategy
Choosing Materials • With consideration to energy inputs in manufacture • Energy to Transport • Toxicity • Consequential impacts – rain forest timbers • Regional or local manufacturer employment support	• Reduce steel and cement in internal slab (10% reduction in embodied energy) • Reduce embodied energy in concrete and plasterboard elements • Consider 95% of timber to be AFS or FSC certified • Reduce emissions associated with insulation and refrigerant • Reduce environmental impact of materials for tiling, awning, cladding, roller shutters etc	• Jointless fibre reinforced slab • Use pre-cast concrete panels with recycled content • Use plasterboard with recycled content or Eco Certification • Joinery to be FSC certified timber • Use only insulations with zero ODP (Ozone Depleting Potential) associated with manufacture and composition; use only refrigerants with zero ODP • Use products with recycled content and/or Eco Certified (eg Almaxco, Wintec)
Minimising Waste • By clever design • Contracted to builder as a requirement on site • During the life of the building • And in dealing with building end of life options	• Reduce construction waste going to landfill by 90% • Reduce operational waste going to landfill • Consider a design that can be disassembled at the end of the building's life	• Contractor is to develop and implement a Waste Management Plan and track all waste going offsite to show that 90% of all construction waste is re-used or recycled • Waste storage and recycling facilities to be provided for different recycling streams such as paper, glass, plastics, metals, food waste etc. Consider operational waste plans and training for staff to provide incentive to reduce waste • Specify mechanical joining mechanisms and components that can be demounted; document procedure for dissassembly
Water Conservation • In monitoring of meters to track use • Timely maintenance of fixtures and fittings • Water sensitive landscape design • Source potable water alternatives such as rain water harvesting, grey and black water treatment.	• Reduce potable water in internal fixtures • Reduce potable water for irrigation • Water efficient operation of appliances	• Water fixtures of at least WELS 5 star • Water efficient landscape • Rainwater collection for toilets, irrigation and truck wash down • Water and energy efficient dishwasher
Land Use and Ecology Impact • Consider local biodiversity impacts of flora and fauna • Look to specialist advice on land impact in development.	• Increased biodiversity • Reduce light pollution from the site • Consider reducing impact of stormwater flows off the site into natural watercourses	• Install indigenous planting • Design external lighting not to emit light into the night sky or beyond the site boundary • Consider stormwater attenuation and treatment

4 BCA Section J Compliance

The development is required to comply with Section J (Energy Efficiency) of the BCA, 2012. Based on the DA Design, Section J Assessment has been carried out to determine the compliance of the design.

The building site is located in BCA Climate Zone 6.

Detailed strategies to comply with sections J1 and J2 are outlined in the following sections.

4.1 Part J1 – Building Fabric

In relation to part J1 Building Fabric, the Deemed-to-Satisfy (DTS) requirements specify minimum insulation levels required for all air-conditioned spaces. Conditioned spaces are to meet the insulation requirements outlined below. The figures quoted are for whole constructions.

Table 1: BCA DTS Building Fabric Insulation Requirements

Part	Minimum R-Value
Roof and Ceiling	R3.2
Ceilings	R1.6 for ceilings below plant rooms or other non-conditioned spaces
External Walls	R2.8
Internal Walls	R1.0 for internal walls forming the building envelope with a non-conditioned space on the other side. (providing the non-conditioned space is enclosed, with mechanical ventilation of not more than 1.5 air changes per hour of outside air. All other options require R1.8 on internal walls to conditioned spaces.
Floors	No additional insulation required for slab on ground R1.0 for a suspended floor above a mechanically ventilated (<1.5 ac/h) non-conditioned space R2.0 for all other floors
Roof lights	Roof lights must not have area greater than 5% of the area they serve, and have the following properties: U value of 3.4 W/m²K and SHGC of 0.34.

4.2 Section J2 – Glazing

BCA Glazing Assessment has been carried out for the conditioned spaces noted on the DA drawings for Toll IPEC Facility. At this stage the assessment has been carried out to determine the glazing performance required for the current design to meet the Deemed-to-Satisfy (DTS) requirements.

This report does not act as a specification for glazing to be used in the final design.

The properties quoted in this report are shown to demonstrate that the design is compliant with BCA Section J. During the detailed design phase of the project where specific glazing types are preferred, whole building modelling will be carried out in accordance with Section

J, Verification Method 3 (JV3). JV3 modelling involves comparing the annual energy consumption of the 'reference building' – i.e. the proposed building geometry with BCA Deemed-to-Satisfy (DTS) building fabric, glazing and services – to the proposed building, with the proposed fabric, glazing and services. The design is verified compliant if the annual energy consumption of the proposed building is lower than the annual energy consumption of the reference building. This exercise will be undertaken during detailed design to ensure the design is complaint with the specified glazing types. It is likely that JV3 modelling will be undertaken for the main office area.

The following pages present the DTS glazing properties required for each section of the buildings where conditioned spaces have been noted.

Glazing properties quoted are whole system values, inclusive of both frame and glazing.

Main Office, Internal Operations Office and Customer Pickup Centre

The modelling has been carried out based on the DA Design drawings and advice from SBA Architects that each glazing element on the main office and the internal operations office has a 900mm sill of insulated spandrel panel backed glass.

The entry stairwell to the main office has not been considered in the analysis as it has been advised that this space is not conditioned.

Table 2: BCA DTS Glazing Properties, Main Office

Facade	System U-value	Glazing SHGC	System U-value	Glazing SHGC
	Ground Floor		First Floor	
N	6.5	0.60	5.5	0.56
E	n/a	n/a	n/a	n/a
S	3.8	0.87	3.3	0.87
W	1.9	0.17	3.3	0.21
Internal Glazing to warehouse	3.8	0.87	3.3	0.87

Table 3: BCA DTS Glazing Properties, Internal Operations Office

Facade	System U-value	Glazing SHGC	System U-value	Glazing SHGC
	Ground Floor		First Floor	
Internal Glazing to warehouse	5.7	0.87	5.3	0.87

Table 4: BCA DTS Glazing Properties, Customer Pickup Centre

Facade	System U-value	Glazing SHGC
	Ground Floor	
N	6.5	0.70
E	6.5	0.87
S	6.5	0.87
W	6.5	0.87

Driver's rest building

The drivers rest building has been assessed based on discussions with SBA Architects and the proposed modifications to the western facade during detailed design. The design on the DA documentation does not achieve Section J DTS Compliance with realistic glazing performance and it is unlikely that JV3 modelling will be performed for this portion of the building.

The design shown in Figure 7 has been confirmed as complaint with Section J with the glazing properties outlined in Table 5. The assessment has been based upon this design which is to be implemented during detailed design. It is understood that double glazing will be required in these areas for the purposes of Section J as well as acoustic insulation considerations.

Table 5: BCA DTS Glazing Properties, Drivers Rest building

Facade	System U-value	Glazing SHGC
	Ground Floor	
N	6.5	0.70
E	4.4	0.87
S	n/a	n/a
W	2.5	0.36

Fleet Workshop building (conditioned spaces only)

Table 6: BCA DTS Glazing Properties, Fleet Workshop building (conditioned spaces only)

Facade	System U-value	Glazing SHGC
	Ground Floor	
N	n/a	n/a
E	n/a	n/a
S	5.1	0.87
W	3.5	0.40

5 Appendices

Appendix A : BCA Glazing Calculator Outputs

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010) HELP

Building name/description: Toll IPEC Eastern Creek, Main Office | Application: other | Climate zone: 6

Storey: G

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	73.71m²				159.8m²		115.8m²		
Option B									n/a
Glazing area (A)	26.5m²				81.5m²		74.3m²		

Number of rows preferred in table below: 8 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	North Glazing	N		1.80	14.70		6.5	0.60	2.500	2.300	1.09	0.50	0.47	0.41	26.46	100% of 64%
2	South Glazing	S		1.80	27.10		3.8	0.87				0.00	1.00	1.00	48.78	39% of 98%
3	Customer Service	W		1.80	26.00		1.9	0.17	0.900	2.300	0.39	0.50	0.91	0.85	46.80	61% of 100%
4	Employee Entry	W		1.80	8.30		1.9	0.17				0.00	1.00	1.00	14.94	21% of 100%
5	Risk Mgr Office Under Bı	W		1.80	3.50		1.9	0.17	12.000	2.300	5.22	0.50	0.21	0.36	6.30	9% of 100%
6	Risk/Risk Mgr Office	W		1.80	3.50		1.9	0.17				0.00	1.00	1.00	6.30	9% of 100%
7	INT.GLZ Operations/Tick	S		1.80	11.70		3.8	0.87	device		2.00	0.00	0.55	0.55	21.06	39% of 98%
8	INT GLZ Lunch Room	S		1.80	6.50		3.8	0.87	device		2.00	0.00	0.55	0.55	11.70	22% of 98%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters. While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

if inputs are valid

Figure 2: BCA Glazing Calculator - Main Office, Ground Floor

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010) HELP

Building name/description: Toll IPEC Eastern Creek, Office First Floor Including Bridge | Application: other | Climate zone: 6

Storey: 1

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	112.1m²				258.9m²		200.3m²		
Option B									n/a
Glazing area (A)	44.5m²				158m²		73.7m²		

Number of rows preferred in table below: 11 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	Lunch Room/Breakout	N		1.80	17.00		5.5	0.56	3.000	1.800	1.67	0.00	0.00	0.30	30.60	48% of 100%
2	State Sales	N		0.90	5.00		5.5	0.56	0.500	0.900	0.56	0.00	0.66	0.52	4.50	9% of 100%
3	Bridge Glazing	N		1.18		9.38	5.5	0.56				0.00	1.00	1.00	9.38	43% of 100%
4	Office/Reception	S		1.80	27.40		3.3	0.87				0.00	1.00	1.00	49.32	11% of 100%
5	Bridge Glazing	S		1.18		9.38	3.3	0.87				0.00	1.00	1.00	9.38	2% of 100%
6	Reception	W		1.80	6.25		3.3	0.21				0.00	1.00	1.00	11.25	15% of 100%
7	Reception/Stairs	W		1.80	7.70		3.3	0.21	3.000	1.800	1.67	0.00	0.14	0.33	13.86	19% of 100%
8	Office/Lunch Room	W		1.80	27.00		3.3	0.21	3.000	1.800	1.67	0.00	0.14	0.33	48.60	66% of 100%
9	INT GLZ. Office/Exec Lou	S		1.80	17.40		3.3	0.87	device		2.00	0.00	0.55	0.55	31.32	27% of 100%
10	INT GLZ. Exec Lounge/Bı	S		1.80	25.50		3.3	0.87	device		2.00	0.00	0.55	0.55	45.90	40% of 100%
11	INT GLZ. Brdrm/State Mg	S		1.80	12.20		3.3	0.87	device		2.00	0.00	0.55	0.55	21.96	19% of 100%

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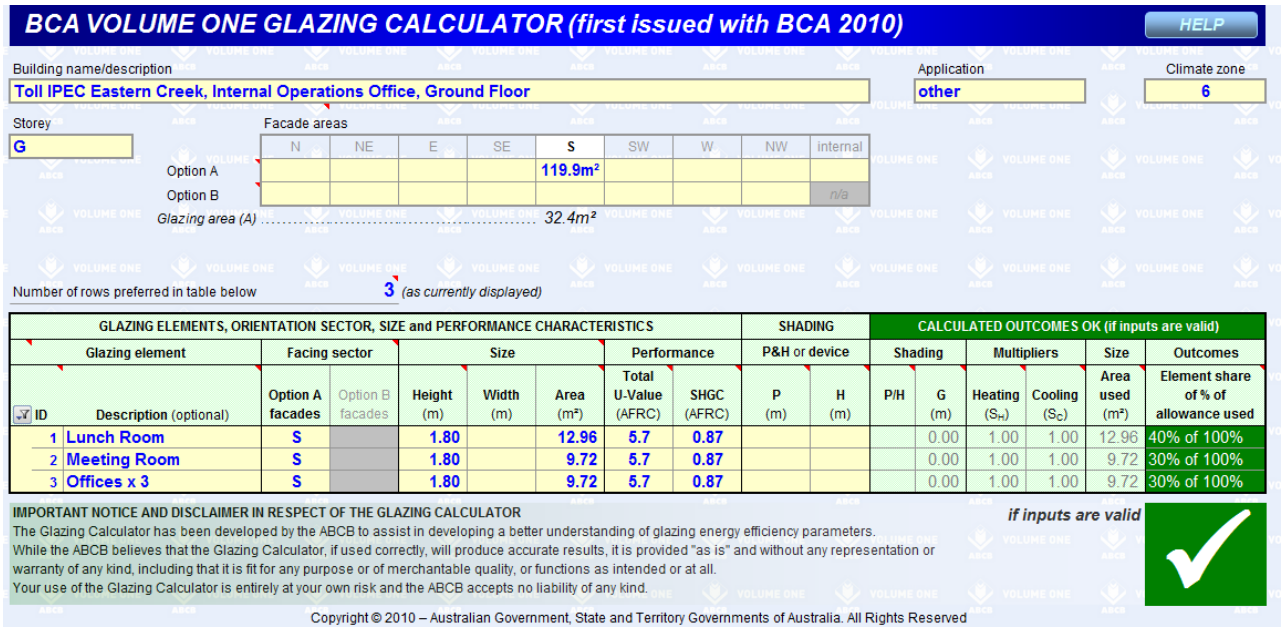
if inputs are valid

Figure 3: BCA Glazing Calculator - Main Office, First Floor



BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010) — HELP

Building name/description: Toll IPEC Eastern Creek, Internal Operations Office, Ground Floor | Application: other | Climate zone: 6

Storey: G

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A					119.9m²				
Option B									n/a

Glazing area (A) 32.4m²

Number of rows preferred in table below: 3 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance			Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	Lunch Room	S		1.80		12.96	5.7	0.87				0.00	1.00	1.00	12.96	40% of 100%
2	Meeting Room	S		1.80		9.72	5.7	0.87				0.00	1.00	1.00	9.72	30% of 100%
3	Offices x 3	S		1.80		9.72	5.7	0.87				0.00	1.00	1.00	9.72	30% of 100%

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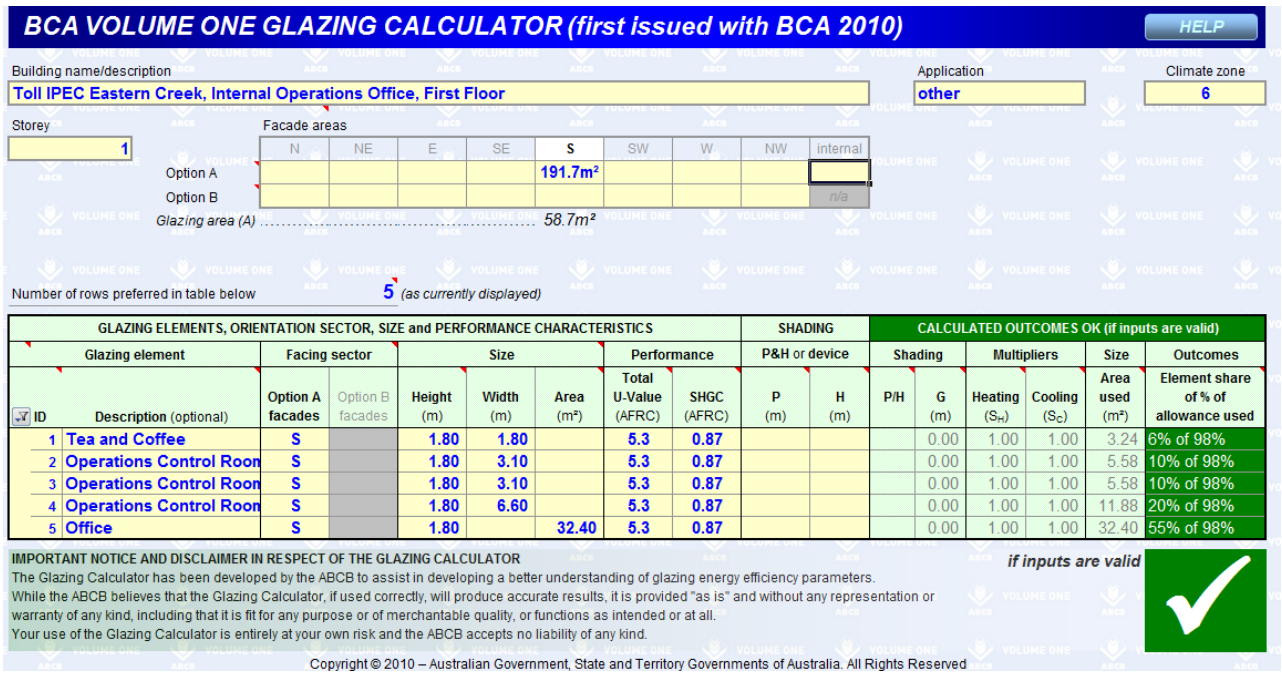
if inputs are valid

Figure 4: BCA Glazing Calculator - Operations Office (Internal), Ground Floor



BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010) — HELP

Building name/description: Toll IPEC Eastern Creek, Internal Operations Office, First Floor | Application: other | Climate zone: 6

Storey: 1

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A					191.7m²				
Option B									n/a

Glazing area (A) 58.7m²

Number of rows preferred in table below: 5 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance			Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	Tea and Coffee	S		1.80	1.80		5.3	0.87				0.00	1.00	1.00	3.24	6% of 98%
2	Operations Control Roon	S		1.80	3.10		5.3	0.87				0.00	1.00	1.00	5.58	10% of 98%
3	Operations Control Roon	S		1.80	3.10		5.3	0.87				0.00	1.00	1.00	5.58	10% of 98%
4	Operations Control Roon	S		1.80	6.60		5.3	0.87				0.00	1.00	1.00	11.88	20% of 98%
5	Office	S		1.80		32.40	5.3	0.87				0.00	1.00	1.00	32.40	55% of 98%

IMPORTANT NOTICE AND DISCLAIMER IN RESPECT OF THE GLAZING CALCULATOR

The Glazing Calculator has been developed by the ABCB to assist in developing a better understanding of glazing energy efficiency parameters. While the ABCB believes that the Glazing Calculator, if used correctly, will produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of the Glazing Calculator is entirely at your own risk and the ABCB accepts no liability of any kind.

if inputs are valid

Figure 5: BCA Glazing Calculator - Operations Office (Internal), First Floor

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010) HELP

Building name/description: Toll IPEC Eastern Creek, Customer Pickup | Application: other | Climate zone: 6

Storey: G

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A	12.83m²		48.6m²		12.83m²		48.6m²		
Option B									n/a
Glazing area (A)	*4.9m²*		*1.96m²*		*2.52m²*		*4.64m²*		

Number of rows preferred in table below: 5 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading		Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	N Glazing	N		1.40	3.50		6.5	0.70	1.000	1.400	0.71	0.00	0.44	0.44	4.90	100% of 96%
2	E glazing	E		1.40	1.40		6.5	0.87				0.00	1.00	1.00	1.96	100% of 31%
3	S glazing	S		1.40	1.80		5.5	0.87				0.00	1.00	1.00	2.52	100% of 68%
4	W glazing	W		1.40	1.40		6.5	0.87				0.00	1.00	1.00	1.96	42% of 59%
5	Glazed Door	W		2.50	1.07		6.5	0.87				0.00	1.00	1.00	2.68	58% of 59%

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if inputs are valid

Figure 6: BCA Glazing Calculator, Customer Pickup Building

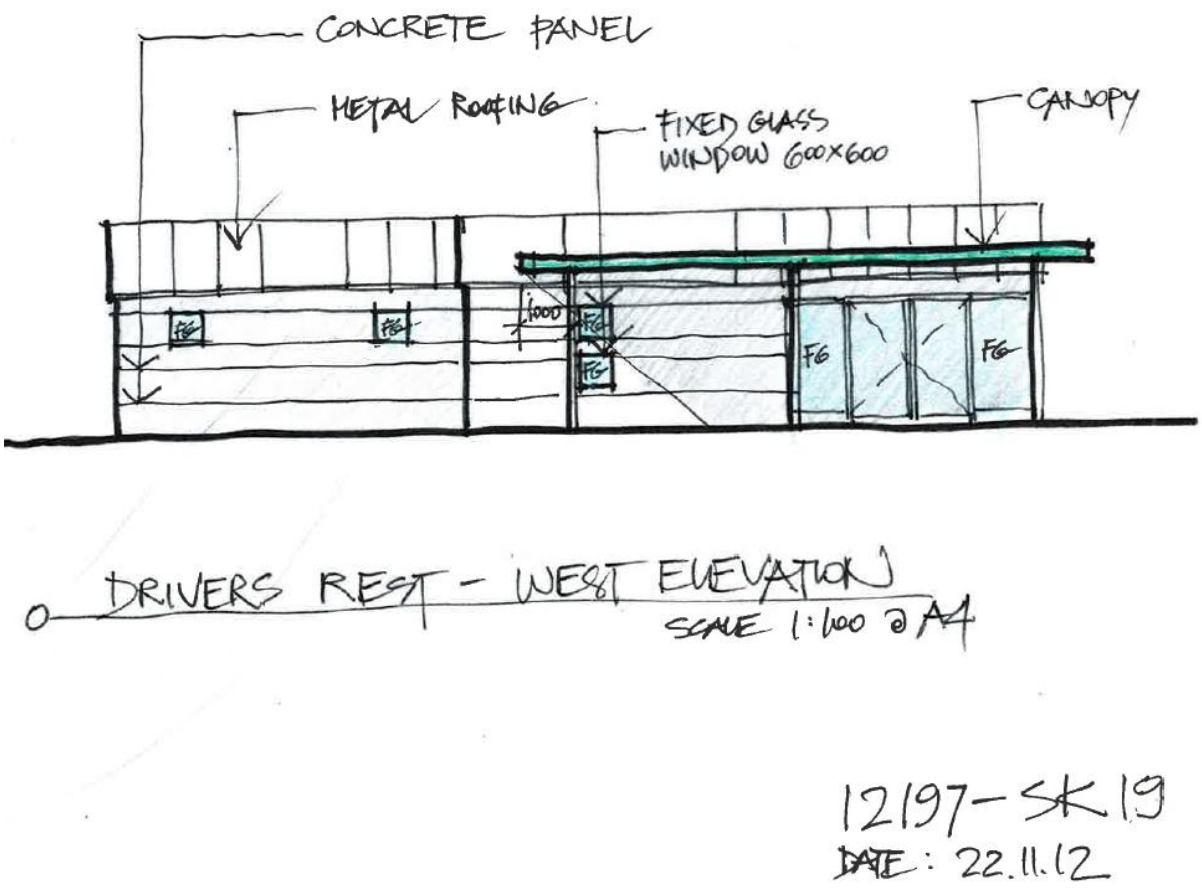

Figure 7: Revised Design, Western Facade, Drivers Rest Building

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010) HELP

Building name/description: Toll IPEC Eastern Creek, Drivers Rest | Application: Class 3 | Climate zone: 6

Storey: G

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A			43.2m²		67.5m²		27m²		
Option B									n/a
Glazing area (A)			*1.44m²*		*25.3m²*		*10.4m²*		

Number of rows preferred in table below: 5 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS								SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance			P&H or device		Shading	Multipliers		Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	E glazing corridors	E		0.60		1.44	6.5	0.87				0.00	1.00	1.00	1.44	100% of 33%
2	Kitchen/Dining/Lounge	S		2.20	11.50		4.4	0.87	0.850	2.800	0.30	0.60	0.98	0.96	25.30	100% of 99%
3	Dining nr Awning	W		2.20	4.40	9.68	2.5	0.36	5.500	2.800	1.96	0.60	0.49	0.48	9.68	93% of 100%
4	Dining small windows	W		0.60	0.60		2.5	0.36	5.500	1.200	4.58	0.60	0.48	0.47	0.36	3% of 100%
5	Dining small windows	W		0.60	0.60		2.5	0.36	5.500	2.200	2.50	1.60	0.64	0.57	0.36	3% of 100%

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if inputs are valid

Figure 8: BCA Glazing Calculator, Drivers Rest Building

BCA VOLUME ONE GLAZING CALCULATOR (first issued with BCA 2010) HELP

Building name/description: Toll IPEC Eastern Creek, Fleet Workshop (Conditioned Spaces being Offices x 3 and Lunch Room) | Application: other | Climate zone: 6

Storey: G

Facade areas

	N	NE	E	SE	S	SW	W	NW	internal
Option A					21.6m²		38.9m²		
Option B									n/a
Glazing area (A)					*7.2m²*		*12.2m²*		

Number of rows preferred in table below: 4 *(as currently displayed)*

GLAZING ELEMENTS, ORIENTATION SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES OK (if inputs are valid)					
Glazing element		Facing sector		Size			Performance		P&H or device		Shading	Multipliers			Size	Outcomes
ID	Description (optional)	Option A facades	Option B facades	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S_H)	Cooling (S_C)	Area used (m²)	Element share of % of allowance used
1	Main Office	S		1.80	1.50		5.1	0.87				0.00	1.00	1.00	2.70	38% of 98%
2	Office	S		1.80	2.50		5.1	0.87				0.00	1.00	1.00	4.50	63% of 98%
3	Main Office	W		1.80	4.80		3.5	0.40				0.00	1.00	1.00	8.64	71% of 100%
4	Lunch Room	W		1.80		3.60	3.5	0.40				0.00	1.00	1.00	3.60	29% of 100%

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if inputs are valid

Figure 9: BCA Glazing Calculator, Fleet Workshop Building (conditioned spaces only)

Appendix B : Draft Director Generals Requirements (DGRs)

The only requirements relevant to Cundall are the two noted in Figure 10. Compliance is shown throughout the document

8. Ecologically Sustainable Development (ESD) • Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 will be incorporated in the design, construction and ongoing operation phases of the development
• Include a description of the measures that would be implemented to minimise consumption of resources, water and energy, including an Integrated Water Management Plan which details any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design.

Figure 10: Extract from Draft DGRs relevant to Cundall

Appendix C : Draft Director Generals Requirements Compliance Table

Table 7: Draft DGRs Compliance Table

DGR	Section(s) describing compliance
Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 will be incorporated in the design, construction and ongoing operation phases of the development	Section 2.2 Section 3
Include a description of the measures that would be implemented to minimise consumption of resources, water and energy, including an Integrated Water Management Plan which details any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design.	Section 3: • Minimising Energy Use' • 'Minimising Transport Impact' • 'Choosing Materials' • 'Water Conservation'