

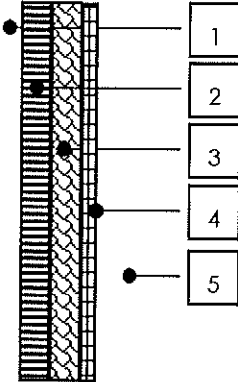
Ceiling /Floor

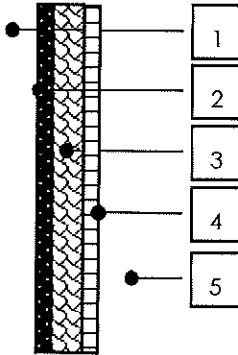
CF-01: Typical ceiling/Floor separating conditioned and unconditioned space	Item	Description	R-value Unventilated	
			Up	Down
	1.	Indoor air film (still air)	0.11	0.16
	2.	Dense concrete (250mm)	0.174	0.174
	3.	Insulation (density 30kg/m ² 65mm thick or similar)	1.50	1.50
	4.	Air cavity (100mm to 300mm, non-ventilated)	0.15	0.22
	5.	Plasterboard (10 mm)	0.06	0.06
	6.	Indoor air film (still air)	0.11	0.16
Total R-value			2.16	2.27

External Wall

EW-01a: External Wall section A, B, C, D, E Typical (FT8, FT10, FT12, FT13, FT21)	Item	Description	R-value
	1.	Outdoor air film (7m/s)	0.04
	2.	Pre-cast spandrel Panel (150mm)	0.188
	3.	Air cavity	0.17
	4.	Insulation (density 30kg/m ² 95mm thick or similar)	2.50
	5.	Prefinished Aluminium panels (10mm)	0.00
	6.	Indoor air film (still air)	0.12
Total R-value			3.02

EW-01b: External Wall section to Slab Typical	Item	Description	R-value
	1.	Outdoor air film (7m/s)	0.04
	2.	Pre-cast spandrel Panel (150mm)	0.188
	3.	Insulation (density 30kg/m ² 95mm thick or similar)	2.50
	4.	Dense concrete	0.173
Total R-value			2.90

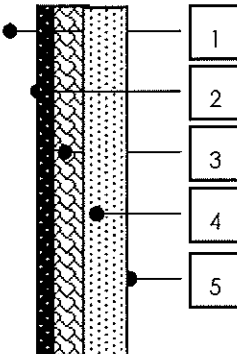
IW-03: Internal wall Concrete + 13mm Plasterboard		Item	Description	R-value
	1.	Indoor air film (still air)	0.12	
	2.	Solid Concrete (200mm)	0.139	
	3.	Insulation (low density 30kg/m² 40mm thick or similar)	0.70	
	4.	Plasterboard (13mm)	0.076	
	5.	Indoor air film (still air)	0.12	
	Total R-value			1.16

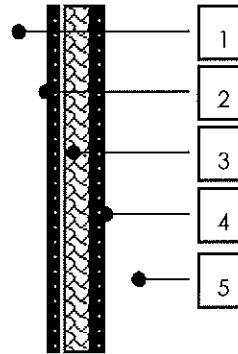
IW-04: Internal wall 9FC + 76 Stud + 13mm Plasterboard		Item	Description	R-value
	1.	Indoor air film (still air)	0.12	
	2.	Fibre Cement (9mm)	0.036	
	3.	Insulation (low density 30kg/m² 65mm thick or similar)	1.60	
	4.	Plasterboard (13mm)	0.076	
	5.	Indoor air film (still air)	0.12	
	Total R-value			1.95

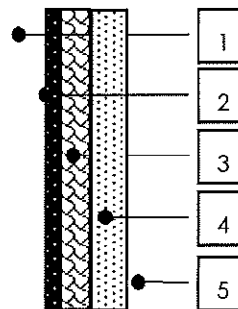
IW-05: Internal wall 9FC + 40 furring + Concrete

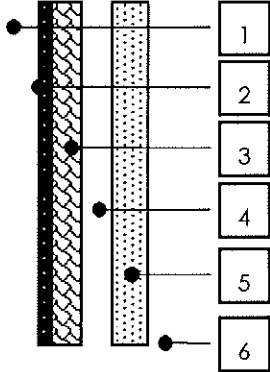
The diagram illustrates the cross-section of wall IW-05. It consists of five distinct layers, numbered 1 through 5 from left to right. Layer 1 is the indoor air film (still air). Layer 2 is a 9mm thick Fibre Cement board. Layer 3 is the insulation, specified as low density 30kg/m² 65mm thick or similar. Layer 4 is a 200mm thick Solid Concrete block. Layer 5 is the indoor air film (still air) on the opposite side. The diagram uses different patterns and colors to represent each material: a dotted pattern for the air film, a cross-hatch pattern for the fibre cement, a wavy pattern for the insulation, and a solid grey pattern for the concrete.

Item	Description	R-value
1.	Indoor air film (still air)	0.12
2.	Fibre Cement (9mm)	0.036
3.	Insulation (low density 30kg/m ² 65mm thick or similar)	1.50
4.	Solid Concrete (200mm)	0.139
5.	Indoor air film (still air)	0.12
Total R-value		1.92

IW-06: Internal wall 9FC + 40 furring + 190 BLK		Item	Description	R-value
	1.	Indoor air film (still air)	0.12	
	2.	Fibre Cement (9mm)	0.036	
	3.	Insulation (low density 30kg/m ² 65mm thick or similar)	1.50	
	4.	Dense Concrete (190mm)	0.173	
	5.	Indoor air film (still air)	0.12	
	Total R-value			1.95

IW-07: Internal wall 9FC + 76 Stud + 9FC		Item	Description	R-value
	1.	Indoor air film (still air)	0.12	
	2.	Fibre Cement (9mm)	0.036	
	3.	Insulation (low density 30kg/m ² 65mm thick or similar)	1.60	
	4.	Fibre Cement (9mm)	0.036	
	5.	Indoor air film (still air)	0.12	
	Total R-value			1.91

IW-08: Internal wall 9FC + 28 furring + 190 BLK		Item	Description	R-value
	1.	Indoor air film (still air)	0.12	
	2.	Fibre Cement (9mm)	0.036	
	3.	Insulation (low density 30kg/m² 65mm thick or similar)	1.50	
	4.	Dense Concrete (190mm)	0.173	
	5.	Indoor air film (still air)	0.12	
	Total R-value			1.95

IW-09: Internal wall 9FC + 76 Stud w insulation + 10 mm air gap + 190 BLK		Item	Description	R-value
	1.	Indoor air film (still air)	0.12	
	2.	Fibre Cement (9mm)	0.036	
	3.	Insulation (low density 30kg/m ² 65mm thick or similar)	1.30	
	4.	Air cavity (10 mm)	0.17	
	5.	Dense Concrete (190mm)	0.173	
	6.	Indoor air film (still air)	0.12	
	Total R-value			1.92

Level 2 - 3

Report from Wallace Wurth L2 to L3.xlsx

printed 23/08/2011

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

Building name/description
Wallace Wurth 2010 DTS

Application
other

Climate zone
5

Storey
Level 2 - 3

Option A
Option B

Facade area	N	E	S	W	Internal
143m²	377m²	68m²			318m²
Glazing area (A)	25.3m²	78.6m²	14.4m²		93m²

Number of rows preferred in table below 6 (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 facade	Option B facade	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S _g)	Cooling (S _g)	Area used (m²)	Element share of % of allowance used		
1	North (East Wing) G2	N		2.60	10.10		6.2	0.78				0.00	1.00	1.00	25.25	100% of 100%		
2	South (East Wing) G2	S		2.40	6.00		6.2	0.60				0.00	1.00	1.00	14.40	100% of 45%		
3	East (East Wing) G2	E		2.60	27.60		6.2	0.74				0.00	1.00	1.00	69.00	89% of 95%		
4	East (West Wing) G2	E		2.40	4.00		6.2	0.74	0.600	2.400	0.21	0.00	0.51	0.66	9.60	11% of 95%		
5	East Internal	Internal		2.30	40.60		6.6	0.60				2.00	0.00	0.64	0.64	93.15	100% of 70%	

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If inputs are valid



Level 4-5

Report from Wallace Wurth L4 to L5.xlsx

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

Building name/description
Wallace Wurth 2010 DTS

Application
other

Climate zone
5

Storey
Level 4 - 5

Option A
Option B

Facade area	N	E	S	W	Internal
143m²	377m²	68m²			318m²
Glazing area (A)	25.3m²	78.6m²	14.4m²		93m²

Number of rows preferred in table below 6 (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 facade	Option B facade	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S _g)	Cooling (S _g)	Area used (m²)	Element share of % of allowance used			
1	North (East Wing) G2	N		2.60	10.10		6.2	0.78				0.00	1.00	1.00	25.25	100% of 100%			
2	South (East Wing) G2	S		2.40	6.00		6.2	0.60				0.00	1.00	1.00	14.40	100% of 45%			
3	East (East wing) G2	E		2.60	27.60		6.2	0.74				0.00	1.00	1.00	69.00	89% of 95%			
4	East (West wing) G2	E		2.40	4.00		6.2	0.74	0.600	2.400	0.21	0.00	0.51	0.66	9.60	11% of 95%			
5	East Internal	Internal		2.30	40.60		6.6	0.60				2.00	0.00	0.64	0.64	93.15	100% of 70%		

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Level 6

Report from Wallace Wurth L6.xlsx

printed 23/08/2011

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

Building name/description
Wallace Wurth 2010 DTS

Application
other

Climate zone
5

Storey
Level 6

Option A
Option B

Facade area	N	E	S	W	Internal
133m²	337m²	69.4m²	335m²		244m²
Glazing area (A)	30.3m²	219m²	23.7m²	81.4m²	95m²

Number of rows preferred in table below 6 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION, SECTOR, SIZE AND PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES (if inputs are valid)						
Glazing element		Facing sector		Size			Performance			P&H or device		Shading		Multipliers		Size	Outcomes	
ID	Description (optional)	Option A facade	Option B facade	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S _g)	Cooling (S _g)	Area used (m²)	Outcomes % of allowance used		
1	North (East Wing) G2	N		3.00	10.10		6.2	0.80	4.000	3.860	1.64	0.00	0.91	0.67	36.30	100% of 76%		
2	South (East Wing) G2	S		3.20	7.40		6.2	0.80	1.600	3.860	0.40	0.76	0.97	0.55	23.65	100% of 49.2%		
3	East (East Wing) G2	E		3.00	69.00		6.2	0.26	2.200	3.900	0.68	0.00	0.95	0.68	207.00	84% of 95%		
4	East (West Wing) G2	E		3.00	4.00		6.2	0.26				0.00	1.00	1.00	12.00	64% of 50%		
5	West (West Wing)	W		2.20	37.00		6.2	0.70				0.00	1.00	1.00	81.40	100% of 100%		
6	East Internal	Internal		2.45	40.50		6.5	0.50				2.00	0.00	0.64	0.64	99.25	100% of 57%	

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Proposed Glazing

Ground Level

Report from Wallace Wurth Ground prop.xlsx

printed 16/08/2011

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

Building name/description Wallace Wurth prop wo link										Application other		Climate zone 6	
Storey Ground													
Facade areas													
Option A		Option B		Option C		Option D		Option E		Option F		Option G	
135m²		318m²		107m²								Internal 279m²	
Glazing area (A)		14.4m²		117m²		6.96m²						60m²	

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	North (East Wing) G2	N		2.40	6.00	3.0	0.26					0.03	1.00	1.00	11.49	100% of 19%			
2	South (East Wing) G2	S		2.40	2.90	3.0	0.26					0.03	1.00	1.00	6.96	100% of 9%			
3	East (East wing) G2	E		2.40	44.40	3.0	0.26					0.03	1.00	1.00	106.56	86% of 65%			
4	East (West wing) G2	E		2.40	4.60	6.8	0.48		0.500	2.400	0.21	0.03	0.91	0.16	10.60	14% of 65%			
5	Internal	Internal		2.30	28.00	6.8	0.75					2.00	0.03	0.14	25.65	100% of 49%			

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Level 1

Report from Wallace Wurth L1 prop.xlsx

printed 16/08/2011

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

Building name/description Wallace Wurth 2010 prop										Application other		Climate zone 6	
Storey Level 1													
Facade areas													
Option A		Option B		Option C		Option D		Option E		Option F		Option G	
135m²		315m²		84m²								Internal 379m²	
Glazing area (A)		10.4m²		85.1m²		5.44m²						93m²	

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	North (East Wing) G2	N		1.70	6.10	3.0	0.26	8.000	1.700	4.71	0.03	0.03	0.19	10.37	100% of 1%				
2	South (East Wing) G2	S		1.70	3.20	3.0	0.26	6.500	1.700	3.82	0.03	0.64	0.54	5.44	100% of 6%				
3	East (East wing) G2	E		1.70	44.40	3.0	0.26	2.500	1.700	1.47	0.03	0.03	0.32	75.44	64% of 23%				
4	East (West wing) G2	E		2.40	4.00	6.8	0.48	0.500	2.400	0.21	0.03	0.91	0.68	9.60	36% of 23%				
5	Internal	Internal		2.30	40.60	6.5	0.75					2.00	0.03	0.14	51.15	100% of 76%			

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Level 2-3

Report from Wallace Wurth L2 to L3.xlsx

printed 16/09/2011

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

Building name/description
Wallace Wurth 2010 prop

Application
other

Climate zone
6

Storey
Level 2-3

Facade areas

	N	E	S	W	Internal
Option A	143m²	377m²	68m²		318m²
Option B					
Glazing area (A)	25.3m²	78.6m²	14.4m²		93m²

Number of rows preferred in table below 6 (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 (m ²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S)	Cooling (S)	Area used (m ²)	Element share of % of allowance used		
1	North (East Wing) G2	N		2.60	10.10		3.0	0.37					0.00	1.00	1.00	25.25	100%	OK of 47%
2	South (East Wing) G2	S		2.40	6.00		3.0	0.37					0.00	1.00	1.00	14.40	100%	OK of 23%
3	East (East wing) G2	E		2.60	27.60		3.0	0.37					0.00	1.00	1.00	69.60	87%	OK of 51%
4	East (West wing) G2	E		2.40	4.00		5.5	0.48	0.500	2.400	0.21	0.00	0.91	0.85	9.60	13%	OK of 51%	
5	East Internal	Internal		2.30	40.50		6.5	0.75				2.00	0.00	0.64	0.54	93.15	100%	OK of 67%

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Level 4-5

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

Building name/description
Wallace Wurth 2010 prop

Application
other

Climate zone
6

Storey
Level 4-5

Facade areas

	N	E	S	W	Internal
Option A	143m²	377m²	68m²		318m²
Option B					
Glazing area (A)	25.3m²	78.6m²	14.4m²		93m²

Number of rows preferred in table below 6 (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)	Cooling (S)	Area used (m²)	Element share of % of allowance used	
1	North (East Wing) G2	N		2.60	10.10		3.0	0.37					0.00	1.00	1.00	25.25	100% of 47%
2	South (East Wing) G2	S		2.40	6.00		3.0	0.37					0.00	1.00	1.00	14.40	100% of 23%
3	East (East wing) G2	E		2.60	27.60		3.0	0.37					0.00	1.00	1.00	69.60	87% of 51%
4	East (West wing) G2	E		2.40	4.00		5.5	0.48	0.500	2.400	0.21	0.00	0.91	0.85	9.60	13% of 51%	
5	East Internal	Internal		2.30	40.50		6.5	0.76				2.00	0.00	0.64	0.54	93.15	100% of 67%

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Level 6

Report from Wallace Wurth L6.xlsx

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

Building name/description
Wallace Wurth 2010 prop

Application
other

Climate zone
6

Storey
Level 6

Facade areas

	N	E	S	W	Internal
Option A	133m²	337m²	89.4m²	335m²	244m²
Option B					
Glazing area (A)	30.3m²	219m²	23.7m²	81.4m²	93m²

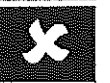
Number of rows preferred in table below 6 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION, SECTOR, SIZE and PERFORMANCE CHARACTERISTICS									SHADING		CALCULATED OUTCOMES FAILURES (highlighted below)						
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)	Cooling (S)	Area used (m²)	Element share of % of allowance used	
1	North (East Wing) G2	N		3.00	10.10		3.0	0.26	4.000	3.360	1.01	0.95	0.91	0.57	39.30	100% of 19%	
2	South (East Wing) G2	S		3.20	7.40		3.0	0.26	1.600	3.360	0.40	0.76	0.97	0.55	23.68	100% of 44%	
3	East (East wing) G2	E		3.00	69.00		3.0	0.26	2.200	3.900	0.50	0.99	0.95	0.69	207.00	69% of 103%	
4	East (West wing) G2	E		3.00	4.00		5.5	0.48				0.00	1.00	1.00	12.00	11% of 103%	
5	West (West Wing)	W		2.20	37.00		3.0	0.37				0.00	0.00	1.00	81.40	100% of 62%	
6	East Internal	Internal		2.45	40.50		6.5	0.76				2.00	0.00	0.64	0.54	93.23	100% of 92%

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.

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Appendix D

Lighting Fixture Count



Lighting Count - Wallace Worth

Lower Ground

Block Name	Tag Name	Value	Qty
EW-RSPK	RECESSED-PA-SPEAKER	SP	34
L-E2X28W	2X28W-EMERGENCY	WG	15
L-E2X28W	2X28W-EMERGENCY	WP	4
L-E3X28W-C25	3X28W-EMERGENCY	E/R	37
L-ESPF	EMERGENCY-SPITFIRE		14
L-ESPF	EMERGENCY-SPITFIRE	P	9
L-ESPF-S	SURFACE-MOUNTED-EMERGENCY		15
L-EX1S1D	EXIT-1SIDE-1DIRECTION		4
L-EX2S1D	EXIT-2SIDE-1DIRECTION		4
L-EXIT	EXIT-STANDARD		12
L-LIGHT	GENERAL-DOWNLIGHT	A2	12
L-LIGHT	GENERAL-DOWNLIGHT	B1	23
L-LIGHT	GENERAL-DOWNLIGHT	B2	7
L-LIGHT	GENERAL-DOWNLIGHT	F	24
L-PIR	MOTION-DETECTOR		14
L-R12X3	1200X300-RECESSED-FLUORESCENT	S1	25
L-R12X3	1200X300-RECESSED-FLUORESCENT	S2	35
L-R12X3	1200X300-RECESSED-FLUORESCENT	S3	14
L-R12X3	1200X300-RECESSED-FLUORESCENT	I1	76
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4A	8
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4B	8
L-S1X28W	SURFACE-1X28W		4
L-S2X28W	SURFACE-2X28W	L6/L7	82
L-S2X28W	SURFACE-2X28W	FR	4
L-S2X28W	SURFACE-2X28W	WG	51
L-S2X28W	SURFACE-2X28W	WP	12
L-switch-pb	LIGHT_SWITCH_PB		1
X-202925-GRID			1

Ground

Block Name	Tag Name	Value	Qty
L-E2X28W	2X28W-EMERGENCY	WG	1
L-E3X28W-C25	3X28W-EMERGENCY	E/R	16
L-ESPF	EMERGENCY-SPITFIRE		18
L-EX2S1D	EXIT-2SIDE-1DIRECTION		5
L-EXIT	EXIT-STANDARD		14
L-LIGHT	GENERAL-DOWNLIGHT	A1	42
L-LIGHT	GENERAL-DOWNLIGHT	A2	1
L-LIGHT	GENERAL-DOWNLIGHT	B2	1
L-LIGHT	GENERAL-DOWNLIGHT	CA2	7
L-LIGHT	GENERAL-DOWNLIGHT	CC	23
L-LIGHT	GENERAL-DOWNLIGHT	CC1	2
L-LIGHT	GENERAL-DOWNLIGHT	CG	16
L-LIGHT	GENERAL-DOWNLIGHT	F	32
L-LV12	LOW-VOLTAGE-TYPE12	WA	6
L-LV12	LOW-VOLTAGE-TYPE12	WB	15
L-LV2	LOW-VOLTAGE-TYPE2	CH	3
L-LVWW	LOW_VOLT_WASHER	CB1	7

L-PIR	MOTION-DETECTOR		12
L-R12X3	1200X300-RECESSED-FLUORESCENT	T2	104
L-S1X28W	SURFACE-1X28W		10
L-S1X28W	SURFACE-1X28W	CK1	5
L-S1X58W	SURFACE-1X58W	CK	11
L-S2X28W	SURFACE-2X28W	L1	120
L-S2X28W	SURFACE-2X28W	WG	1
X-202925-A00			1

Level 1

Block Name	Tag Name	Value	Qty
L-ESPF	EMERGENCY-SPITFIRE		7
L-ESPF	EMERGENCY-SPITFIRE	P	21
L-EX1S1D	EXIT-1SIDE-1DIRECTION		1
L-EX2S1D	EXIT-2SIDE-1DIRECTION		5
L-EXIT	EXIT-STANDARD		4
L-EXIT	EXIT-STANDARD	WP	8
L-LIGHT	GENERAL-DOWNLIGHT	A2	2
L-LIGHT	GENERAL-DOWNLIGHT	B1	16
L-LIGHT	GENERAL-DOWNLIGHT	B2	1
L-LIGHT	GENERAL-DOWNLIGHT	CA	4
L-LIGHT	GENERAL-DOWNLIGHT	CA1	3
L-LIGHT	GENERAL-DOWNLIGHT	CA4	2
L-LIGHT	GENERAL-DOWNLIGHT	CC	10
L-LIGHT	GENERAL-DOWNLIGHT	CC1	2
L-LIGHT	GENERAL-DOWNLIGHT	CG	17
L-LIGHT	GENERAL-DOWNLIGHT	F	24
L-LV12	LOW-VOLTAGE-TYPE12	WA	6
L-LV12	LOW-VOLTAGE-TYPE12	WB	1
L-LV2	LOW-VOLTAGE-TYPE2	CH	7
L-LVWW	LV_WALL_WASHER	CB2	7
L-R12X3	1200X300-RECESSED-FLUORESCENT	T1	9
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4A	168
L-S1X28W	SURFACE-1X28W		8

Level 2

Block Name	Tag Name	Value	Qty
L-E2X28W	2X28W-EMERGENCY	EB	1
L-ESPF	EMERGENCY-SPITFIRE		21
L-ESPF	EMERGENCY-SPITFIRE	P	5
L-EX1S1D	EXIT-1SIDE-1DIRECTION		2
L-EX2S1D	EXIT-2SIDE-1DIRECTION		11
L-EXIT	EXIT-STANDARD		11
L-LIGHT	GENERAL-DOWNLIGHT	A1	117
L-LIGHT	GENERAL-DOWNLIGHT	B1	45
L-LIGHT	GENERAL-DOWNLIGHT	B2	4
L-LIGHT	GENERAL-DOWNLIGHT	CA	4
L-LIGHT	GENERAL-DOWNLIGHT	CA1	3
L-LIGHT	GENERAL-DOWNLIGHT	CC	10
L-LIGHT	GENERAL-DOWNLIGHT	CC1	2
L-LIGHT	GENERAL-DOWNLIGHT	CG	22
L-LIGHT	GENERAL-DOWNLIGHT	F	14
L-LIGHT	GENERAL-DOWNLIGHT	PB	52
L-LV12	LOW-VOLTAGE-TYPE12	WA	6
L-LV2	LOW-VOLTAGE-TYPE2	CH	3
L-LVDLIT	LV_DOWNLIGHT	C	46

L-LVWW	LV_WALL_WASHER	CB2	3
L-R12X3	1200X300-RECESSED-FLUORESCENT	T1	120
L-R12X3	1200X300-RECESSED-FLUORESCENT	T2	153
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4A	15
L-S1X28W	SURFACE-1X28W		9
L-S2X28W	SURFACE-2X28W	EB	5
L-SP1200	28W-SPECIAL-FLUORESCENT	L3	42
L-SPOT	SPOT-LIGHT	CJ1	1
L-SPOT	SPOT-LIGHT	CJ2	1
L-SPOT	SPOT-LIGHT	CJ3	2

Level 3

Block Name	Tag Name	Value	Qty
L-ESPF	EMERGENCY-SPITFIRE		21
L-ESPF	EMERGENCY-SPITFIRE	P	6
L-EX1S1D	EXIT-1SIDE-1DIRECTION		3
L-EX2S1D	EXIT-2SIDE-1DIRECTION		7
L-EXIT	EXIT-STANDARD		9
L-LIGHT	GENERAL-DOWNLIGHT	A1	51
L-LIGHT	GENERAL-DOWNLIGHT	B1	59
L-LIGHT	GENERAL-DOWNLIGHT	B2	4
L-LIGHT	GENERAL-DOWNLIGHT	CA	4
L-LIGHT	GENERAL-DOWNLIGHT	CA1	3
L-LIGHT	GENERAL-DOWNLIGHT	CC	10
L-LIGHT	GENERAL-DOWNLIGHT	CC1	2
L-LIGHT	GENERAL-DOWNLIGHT	CG	22
L-LIGHT	GENERAL-DOWNLIGHT	F	14
L-LV12	LOW-VOLTAGE-TYPE12	WA	6
L-LV2	LOW-VOLTAGE-TYPE2	CH	3
L-LVDLIT	LV_DOWNLIGHT	C	6
L-LVWW	LV_WALL_WASHER	CB2	3
L-R12X3	1200X300-RECESSED-FLUORESCENT	T1	174
L-R12X3	1200X300-RECESSED-FLUORESCENT	T2	83
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4A	10
L-S1X28W	SURFACE-1X28W		9
L-SP1200	28W-SPECIAL-FLUORESCENT		6

Level 4

Block Name	Tag Name	Value	Qty
L-E2X28W	2X28W-EMERGENCY	EB	1
L-ESPF	EMERGENCY-SPITFIRE		21
L-ESPF	EMERGENCY-SPITFIRE	P	7
L-EX1S1D	EXIT-1SIDE-1DIRECTION		3
L-EX2S1D	EXIT-2SIDE-1DIRECTION		9
L-EXIT	EXIT-STANDARD		12
L-LIGHT	GENERAL-DOWNLIGHT	A1	79
L-LIGHT	GENERAL-DOWNLIGHT	B1	45
L-LIGHT	GENERAL-DOWNLIGHT	B2	4
L-LIGHT	GENERAL-DOWNLIGHT	CA	4
L-LIGHT	GENERAL-DOWNLIGHT	CA1	3
L-LIGHT	GENERAL-DOWNLIGHT	CC	10
L-LIGHT	GENERAL-DOWNLIGHT	CC1	2
L-LIGHT	GENERAL-DOWNLIGHT	CG	22
L-LIGHT	GENERAL-DOWNLIGHT	F	14
L-LV12	LOW-VOLTAGE-TYPE12	WA	6
L-LV2	LOW-VOLTAGE-TYPE2	CH	3

L-LVDLIT	LV_DOWNLIGHT	C	6
L-LVWW	LV_WALL_WASHER	CB2	3
L-R12X3	1200X300-RECESSED-FLUORESCENT	T1	243
L-R12X3	1200X300-RECESSED-FLUORESCENT	T2	102
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4A	10
L-S1X28W	SURFACE-1X28W		9
L-S2X28W	SURFACE-2X28W	EB	5
L-SP1200	28W-SPECIAL-FLUORESCENT		6
X-202925-A04			1
X-202925-GRID			1

Level 5

L-ESPF	EMERGENCY-SPITFIRE		22
L-ESPF	EMERGENCY-SPITFIRE	P	9
L-EX1S1D	EXIT-1SIDE-1DIRECTION		4
L-EX2S1D	EXIT-2SIDE-1DIRECTION		13
L-EXIT	EXIT-STANDARD		10
L-LIGHT	GENERAL-DOWNLIGHT	A1	79
L-LIGHT	GENERAL-DOWNLIGHT	B1	35
L-LIGHT	GENERAL-DOWNLIGHT	B2	4
L-LIGHT	GENERAL-DOWNLIGHT	CA	14
L-LIGHT	GENERAL-DOWNLIGHT	CC	15
L-LIGHT	GENERAL-DOWNLIGHT	F	14
L-LV12	LOW-VOLTAGE-TYPE 12	WA	6
L-LV2	LOW-VOLTAGE-TYPE 2	CH	3
L-LVDLIT	LV_DOWNLIGHT	C	12
L-R12X3	1200X300-RECESSED-FLUORESCENT	T1	100
L-R12X3	1200X300-RECESSED-FLUORESCENT	T2	205
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4A	4
L-R12X3	1200X300-RECESSED-FLUORESCENT	T4B	8
L-S1X28W	SURFACE-1X28W		10
L-SP1200	28W-SPECIAL-FLUORESCENT		12

Level 6

Block Name	Tag Name	Value	Qty
L-E2X28W	2X28W-EMERGENCY	EB	8
L-E3X28W-C25	3X28W-EMERGENCY	E/R	4
L-ESPF	EMERGENCY-SPITFIRE		25
L-EX2S1D	EXIT-2SIDE-1DIRECTION		2
L-EXIT	EXIT-STANDARD		6
L-LIGHT	GENERAL-DOWNLIGHT	A1	83
L-LIGHT	GENERAL-DOWNLIGHT	B2	7
L-LIGHT	GENERAL-DOWNLIGHT	CA	4
L-LIGHT	GENERAL-DOWNLIGHT	CA1	3
L-LIGHT	GENERAL-DOWNLIGHT	CA2	4
L-LIGHT	GENERAL-DOWNLIGHT	CA3	1
L-LIGHT	GENERAL-DOWNLIGHT	CC	8
L-LIGHT	GENERAL-DOWNLIGHT	CG	13
L-LIGHT	GENERAL-DOWNLIGHT	F	14
L-LIGHT	GENERAL-DOWNLIGHT	JC	3
L-LV12	LOW-VOLTAGE-TYPE 12	WA	6
L-LVDLIT	LV_DOWNLIGHT	C	31
L-PIR	MOTION-DETECTOR		4
L-R12X3	1200X300-RECESSED-FLUORESCENT	T2	205
L-S1X28W	SURFACE-1X28W		13
L-S2X28W	SURFACE-2X28W		24

Section J Verification Assessment Report

L-S2X28W	SURFACE-2X28W	EB	13
L-SP1200	28W-SPECIAL-FLUORESCENT	L3	30
L-TABLIT	TABLE_LIGHT	PA	5
L-WASHER	GENERAL_WALL_WASHER	CA3	2

Level 7

See Drawing

Appendix E

Mechanical Services Calculations

- o Process Cooler
- o DTS AHU/FCU
- o Ventilation Fan
- o Pumps Calculation

Table 27: Process cooler calculations

BCA 2011 Reference model Calculation	Values
Annual operating hours	8,736
Percentage operation %	70
Total Hours of operation in a year	6115
Evaporative cooled chiller EER	2.5
BCA energy consumption kW	7.2
Total BCA energy consumption kW	14.4
BCA energy consumption MWh	88

Propose Model Process cooler Energy Calculation	Values
Number of process cooler (1 Duty , 1 Standoff)	2
Proposed cooling capacity kW	18
Delta T	6
Chilled water flow l/s	0.7
Total proposed energy consumption (1 Off Unit) kW	15
Proposed energy consumption MWh	92

Table 28: Calculation for determining the DTS input parameters of AHU/FCU fan static pressure into simulation software

LOWER GROUND	Total cooling capacity (kW)	Total cooling sensible capacity (kW)	Total heating capacity (kW)	HW flow (l/s)	CW flow (l/s)	Supply air (l/s)	QA (l/s)	RA (l/s)	Approx Area (m2)	cooling/heat load per sqm	BCA Maximum Fan Power (W/m2)	BCA internal load Fan Power (W/m2)	BCA internal load exceeding 400W/m2 Fan Power (W/m2)	BCA calculated static Pressure for modeling (pa)	Efficiency	Input parameter static ES (pa)
AHU-LG-02	52.4	41.9	42.4	0.7	2.1	2065	2065	0	192	218.2	17.1	3283.2		1590		1192
AHU-LG-03A/B	90.1	75.2	75.6	1.2	3.6	3585	3585	0	357	210.6	17.1	6104.7		1703		1277
AHU-LG-04A/B	8.3	6.4	5.9	0.1	0.3	290	290	0	28	228.6	17.1	478.8		1651		1238
AHU-LG-05	38.1	31	29.5	0.5	1.5	1440	1440	0	152	203.9	17.1	2599.2		1805		1354
AHU-LG-06	160	98.6	78.2	1.2	6.4	3470	3470	0	314	314.0	23.6	7410.4		2136		1602
FCU-LG-01	14.4	13.9			0.6	1135	20	1115	27.5	505.5	0	0	973	857		643
FCU-LG-02	15.4	15			0.6	1207	20	1187	27.4	547.4	0	0	1050	870		652
FCU-LG-03	30	30			0.6	2300	1700	600	32.6	920.2	0	0	2100	913		685
FCU-LG-04	32.4	19.7	16		1.3	725	725	0	100	197.0	10.5	1050		1448		1086
FCU-LG-05	2.6	2.1	1		0.1	155	50	105	29	72.4	4.1	118.9	672	767		575
FCU-LG-06	9.9	9.6			0.4	770	20	750	12	800.0	0	0		873		655
CASS-LG-01	4.5	3.5			0.2	400		400	57	61.4	4.1	233.7		584		438
CASS-LG-02	4.5	3.5			0.2	400		400	57	61.4	4.1	233.7		584		438
PRECON-LG-01	1.65	1.53			6.6	7100	7100	0	1385.5	110.4	14.1	19535.55		2751		2064
GROUND																
AHU-G-01	81.9	51	42.7	0.7	3.3	2385	1995	390	272	187.5	10.5	2856		1197		898
AHU-G-02	39.3	25.1	15	0.2	1.6	1345	720	625	152	165.1	10.5	1596		1187		890
AHU-G-03	52.3	32.6	25.1	0.4	2.1	1935	1095	840	142	229.6	17.1	2428.2		1255		941
AHU-G-04	70.3	62.5	14.2	0.2	2.8	3650	456	3194	261	239.5	17.1	4463.1		1223		917
AHU-G-05	60.1	53.5	6.5	0.1	2.4	3210	275	2935	180	297.2	17.1	3078		959		719
FCU-G-01	16.6	10.1			0.7	530	325	205	50.1	201.6	17.1	856.71		1616		1212
FCU-G-02	15.5	9.9			0.6	490	330	160	50.1	197.6	10.5	526.05		1074		905
FCU-G-03	12.9	7.7			0.5	300	300	0	47	163.8	10.5	493.5		1645		1234
FCU-G-04	12.9	7.7			0.5	300	300	0	47	163.8	10.5	493.5		1645		1234
FCU-G-05	12	7.6			0.5	460	300	160	46	165.2	10.5	483		1050		788
FCU-G-06	11.7	7.4			0.5	460	300	160	49	151.0	10.5	514.5		1118		839
FCU-G-07	8.2	6.8			0.3	550	75	475	75	90.7	4.1	307.5		559		419
FCU-G-08	16.8	13.7			0.7	1060	140	920	46	297.8	17.1	786.6		742		557

Section J Verification Assessment Report

LOWER GROUND	Total cooling capacity (kW)	Total cooling Sensible capacity (kW)	Total heating capacity (kW)	HW flow (l/s)	CHW flow (l/s)	Supply air (l/s)	OA (l/s)	RA (l/s)	Approx Area (m2)	cooling/heat load per sqm	RCA Maximum Fan power (W/m2)	RCA internal load Fan Power (Watt)	RCA Internal load exceeding 400W/m2 Fan Power (Watt)	RCA calculated Static Pressure for modeling (pa)	Efficiency	Input parameters into IES (pa)
FCU-G-09	38	24.5			1.5	1325	730	595	143	171.3	10.5	1501.5		1133		850
FCU-G-10	18.3	14.5			0.7	1215	200	1015	127.3	113.9	7.3	929.29		765		574
FCU-G-11	5	4			0.2	420		420	9.5	421.1	0	0	280	667		500
FCU-G-12	10.8	10.4			0.4	845	60	785	184.6	56.3	4.1	756.86		896		672
FCU-G-13	5.8	4.4			0.2	410	210	200	22	200.0	10.5	231		563		423
FCU-G-14	18.1	17			0.7	1665	1665	0	120	141.7	7.3	876		526		395
FCU-G-15	10.2	7.7			0.4	660	400	260	46.4	165.9	4.1	190.24		288		216
FCU-G-16	39.3	27.1			1.6	1600	650	950	157	172.6	10.5	1648.5		1030		773
FCU-G-17	31.4	21			1.2	1365	640	725	153	137.3	7.3	1116.9		818		614

LEVEL 1

AHU-L1-01	46.2	31.2	17.6	0.3	1.8	1420	800	620	230	135.7	7.3	1679		1182		887
AHU-L1-02	56.6	38.1	17.7	0.3	2.3	1850	835	1015	311.5	122.3	7.3	2273.95		1229		922
AHU-L1-03	28.5	31.3	20.8	0.3	1.8	2010	800	1210	237	132.1	7.3	1730.1		861		646
AHU-L1-04	57.4	41.5	22.2	0.4	2.3	2425	845	1580	295	140.7	7.3	2153.5		888		666
AHU-L1-05	71.5	49.9	29.3	0.5	2.8	3005	1145	1860	300	166.3	10.5	3150		1048		786
AHU-PC3A/L	52	31.4	26.9	0.4	2	1400	1400	0	133	236.1	17.1	2274.3		1625		1218
FCU-L1-1	10	7.5			0.4	655	330	325	245	30.6	4.1	1004.5		1534		1150

LEVEL 2

AHU-L2-01	113	79.7	45.4	0.7	4.5	4595	2000	2595	675.5	118.0	10.4	7025.2		1529		1147
AHU-L2-02	63.1	50.3	21.3	0.3	2.5	3910	640	3270	453	111.0	7.3	3306.9		846		634
FCU-L2-01	11.4	9.7			0.5	1680	220	1460	250	38.8	4.1	1025		610		458
FCU-L2-02	7.3	6.2			0.3	1310	140	1170	108	57.4	4.1	442.8		338		254
FCU-L2-03	10.3	9.4			0.4	1045	110	935	91	103.3	7.3	664.3		636		477
FCU-L2-04	9.2	8.3			0.4	715	110	605	55	150.9	10.5	577.5		808		606
FCU-L2-05	15.4	14.1			0.6	1310	170	1140	118	119.5	7.3	861.4		658		493
FCU-L2-06	7.7	6.3			0.3	780	180	600	228	27.6	4.1	934.8		1198		899
FCU-L2-07	10	7.5			0.4	655	330	325	245	30.6	4.1	1004.5		1534		1150
FCU-L2-08	12	11			0.5	1000	50	950	27	407.4		0	770	770		578
FCU-L2-09	3.2	2.2			0.1	195	150	45	42	52.4	4.1	172.2		883		662
FCU-L2-10	3	2.3			0.1	195	150	45	41	56.1	4.1	168.1		862		647
FCU-L2-11	3	2.3			0.1	195	150	45	41	56.1	4.1	168.1		862		647
FCU-L2-12	3.6	2.5			0.1	220	150	70	43	58.1	4.1	176.3		801		601
FCU-L2-13	4.3	2.9			0.2	160	80	80	24	120.8	7.3	175.2		1095		821

Section J Verification Assessment Report

LOWER GROUND	Total cooling capacity (kW)	Total cooling sensible capacity (kW)	Total heating capacity (kW)	HW flow (l/s)	CHW flow (l/s)	Supply air (l/s)	OA (l/s)	RA (l/s)	Approx Area (m2)	Cooling/heat load per sqm	Maximum Fan power (W/m2)	RCA internal load Fan Power (Watt)	RCA internal load exceeding 400W/m2 Fan Power (Watt)	RCA calculated Static Pressure for modeling (pa)	Efficiency	Input power meter s into IES (pa)
CASS-2.1	15	14.6			0.6	1200	20	1180	28	521.4	0	0	1022	852		639

LEVEL 3

AHU-L3-01	110	65.6	59.3	0.9	4.4	2950	600	2350	365	179.7	10.5	3832.5		1299		974
AHU-L3-02	50.6	35.2	18.8	0.3	2	2015	900	1115	336.6	104.6	7.3	2457.18		1219		915
AHU-L3-03	64.5	51.6	21.5	0.3	2.6	5205	650	4555	453	113.9	7.3	3306.9		635		476
FCU-L3-01	23.5	23.5				2035	2035	0	176	133.5	7.3	1284.8		631		474
FCU-L3-02	22	22				1180	1180	0	136	161.8	10.5	1428		1210		908
FCU-L3-04	6.3	6.3				400	400	0	78	80.8	4.1	319.8		800		600
FCU-L3-06	4.26	3.79	2.4	0.1	0.2	336	60	276	57.4	66.0	4.1	235.34		700		525
FCU-L3-07	10.3	9.58	4.24	0.1	0.4	822	90	732	89.4	107.2	7.3	652.62		794		595
FCU-L3-08	20.7	19.3	7.16	0.1	0.8	1658	173	1485	222	86.9	4.1	910.2		549		412
FCU-L3-09	7.62	6.2	3.89	0.1	0.3	532	180	352	85	72.9	4.1	348.5		655		491
FCU-L3-10	13	9.85	10.6	0.2	0.5	845	500	345	245	40.2	4.1	1004.5		1189		892
FCU-L3-11	4.3	2.92	1.73	0.1	0.2	161	80	81	24	121.7	7.3	175.2		1088		816
CASS-3.1	15	14.6			0.6	1200	20	1180	25.6	570.3	0	0	1022	852		639
CASS-3.2	15	14			0.6	1200	20	1180	21.6	648.1	0	0	980	817		613

LEVEL 4

AHU-L4-01	83	64.9	25.7	0.4	3.3	4550	910	3640	674	96.3	6.4	4313.6		948		711
AHU-L4-02	63.6	50.6	20.8	0.3	2.5	3930	650	3280	453	111.7	7.3	3306.9		841		631
FCU-L4-01	8.64	8.13	2.26	0.1	0.3	697	63	634	112.5	72.3	4.1	461.25		662		496
FCU-L4-02	10.5	9.28	4.62	0.1	0.4	1056	154	902	161	57.6	4.1	660.1		625		469
FCU-L4-03	48.1	128.1	26.2	0.4	1.9	1350		1350	182	703.8	0	0	8967	6642		4982
FCU-L4-04	26.7	23.5	12.8	0.2	1.1	2016	502	1514	154	152.6	10.5	1617		802		602
FCU-L4-06	13.7	10	10.8	0.2	0.5	861	500	361	0	0.0	4.1	0		0		0
FCU-L4-07	12	12			0.5	1000	50	950	37	324.3	23.6	873.2		873		655
FCU-L4-08	6.45	5.78	2.02	0.1	0.3	702	91	611	112	51.6	4.1	489.2		654		491
FCU-L4-09	8.38	7.84	1.87	0.1	0.3	673	73	600	88.7	88.4	4.1	363.67		540		405
FCU-L4-10	4.3	2.92	1.73	0.1	0.2	161	80	81	24	121.7	7.3	175.2		1088		816
CASS-4.1	10	8.5			0.4	800	20	780	0	0.0	4.1	0		0		0
CASS-4.2	10	8.5			0.4	800	20	780	0	0.0	4.1	0		0		0
CASS-4.3	10	8.5			0.4	800	20	780	0	0.0	4.1	0		0		0
CASS-4.4	10	8.5			0.4	800	20	780	0	0.0	4.1	0		0		0
CASS-4.5	10	8.5			0.4	800	20	780	0	0.0	4.1	0		0		0

Section J Verification Assessment Report

LOWER GROUND	Total cooling capacity (kW)	Total sensible capacity (kW)	Total heating capacity (kW)	RW flow (l/s)	CW flow (l/s)	Supply air (l/s)	OA (l/s)	EA (l/s)	Approx Area (m2)	cooling/heating load per sqm	SCA Maximum Fan power (W/m2)	RCA internal load Fan Power (Watt)	RCA internal load exceeding 400W/m2 Fan Power (Watt)	RCA calculated static pressure for modeling (pa)	Efficiency	Input parameters into IES (pa)
CASS-4.6	10	8.5			0.4	800	20	780	0	0.0	4.1	0		0		0
CASS-4.8	10	8.5			0.4	800	20	780	28.7	296.2	17.1	490.77		613		460
CASS-4.9	15	14.6			0.6	1200	20	1180	24.3	600.8	0	0	1022	852		639

LEVEL 5

AHU-L5-01	64	46.4	22.5	0.4	2.5	4060	1000	3060	470	98.7	4.1	1927		475		356
AHU-L5-02	74.3	57.7	24.6	0.4	3	4420	820	3600	440	131.1	7.3	3212		727		545
FCU-L5-01	9.46	8.31	4.21	0.1	0.4	713	145	568	119	69.8	4.1	487.9		684		513
FCU-L5-02	6.25	5.37	2.83	0.1	0.2	461	113	348	77	69.7	4.1	315.7		685		514
FCU-L5-03	4.61	3.72	2.56	0.1	0.2	319	121	198	49	75.9	4.1	200.9		630		472
FCU-L5-04	5.2	4.39	2	0.1	0.2	363	110	253	87.4	50.2	4.1	358.34		987		740
FCU-L5-05	5.45	4.64	2.43	0.1	0.2	384	110	274	81	57.3	4.1	332.1		865		649
FCU-L5-06	16.9	15.3	7.2	0.1	0.7	1310	205	1105	158	96.8	4.1	647.8		495		371
FCU-L5-07	8.78	7.3	4.02	0.1	0.3	703	200	503	121.4	60.1	4.1	497.74		708		531
FCU-L5-08	16.6	11.7	13.6	0.2	0.7	1008	650	358	0	0.0	4.1	0		0		0
FCU-L5-09	7.41	6.38	2.94	0.1	0.3	766	140	626	115	55.5	4.1	471.5		616		462
FCU-L5-10	8.85	7.44	3.98	0.1	0.4	1489	190	1299	126	59.0	4.1	516.6		347		260
FCU-L5-11	3.93	2.55	1.74	0.1	0.2	129	80	49	24	106.3	7.3	175.2		1358		1019
CASS-5.1	15	14.6			0.6	1200	20	1180	42	347.6	23.6	991.2		826		620

LEVEL 6

AHU-L6-01	43.3	33.8	20.1	-	1.7	2365	480	1885	260	130.0	7.3	1898		803		602
AHU-L6-02	32.3	20.3	17.6	0.3	1.3	840	840	0	83	244.6	17.1	1419.3		1690		1267
AHU-L6-03	28.7	18.1	15.6	0.2	1.1	750	750	0	83	218.1	17.1	1419.3		1892		1419
AHU-L6-04	22.9	19.2	11.1	0.2	0.9	1850	185	1665	264	72.7	4.1	1082.4		585		439
FCU-L6-01	7.34	6.47	3.65	0.1	0.3	1123	110	1013	98	66.0	4.1	401.8		358		268
FCU-L6-02	7.85	6.91	3.65	0.1	0.3	593	120	473	98	70.5	4.1	401.8		678		508
FCU-L6-03	3.22	2.47	2.17	0.1	0.1	212	99	113	25	98.8	4.1	102.5		483		363
FCU-L6-04	3.03	2.94	1.15	0.1	0.1	281	10	271	54	54.4	4.1	221.4		788		591
FCU-L6-05	5.85	5.08	2.89	0.1	0.2	436	100	336	88	57.7	4.1	360.8		828		621
FCU-L6-06	6.93	5.94	2.92	0.1	0.3	509	120	389	82	72.4	4.1	336.2		661		495
FCU-L6-07	17.9	16.5	7.3	0.1	0.7	1416	190	1226	179	92.2	4.1	733.9		518		389
FCU-L6-08	10.2	9.05	4.28	0.1	0.4	844	160	684	152	59.5	4.1	623.2		738		554
FCU-L6-09	13.3	10.5	11.8	0.2	0.5	900	380	520	245	42.9	4.1	1004.5		1116		837
FCU-L6-10	12	12			0.5	100	50	50	99	121.2	7.3	722.7		7227		5420

Section J Verification Assessment Report

LOWER GROUND	Total cooling capacity (kW)	Total cooling sensible capacity (kW)	Total heating capacity (kW)	RW flow (l/s)	CHW flow (l/s)	Supply air (l/s)	OA (l/s)	RA (l/s)	Approx Area (m2)	cooling/heat load per sqm	BCA maximum fan power (W/m2)	BCA internal load fan power (Watt)	BCA internal load exceeding 400W/m2 Fan Power (Watt)	BCA calculated static pressure for modeling (pa)	Efficiency	Input parameters into IES (pa)
FCU-L6-11	8.75	7.56	3.73	0.1	0.3	689	160	529	113	66.9	4.1	463.3		672		504
FCU-L6-12	10.2	8.75	4.45	0.1	0.4	796	190	606	30	291.7	17.1	513		644		483
FCU-L6-13	12	8.78	6.12	0.1	0.5	574	160	414	45	195.1	10.5	472.5		823		617
FCU-L6-14	6.12	3.71	2.97	0.1	0.2	161	140	21	20	185.5	10.5	210		1304		978
FCU-L6-15	6.23	3.82	3.09	0.1	0.2	171	140	31	20	191.0	10.5	210		1228		921
FCU-L6-16	12	12	22	0.4	0.5	1000	50	950	20	600.0	0	0	840	840		630
PRECON-L7-01	81.9	42.2	59.9	1	3.3	3250	3250	0	0			0				
PRECON-L7-02	1.69	87.2	122.7	2	6.7	6745	6745	0	0			0				
total	3333.91	2610.47	1215.5	20.3	130.6	170417	70910	99507	17705.6	20949.6	918.5	149555.7	6			

Appendix A

Section JV3 Occupancy and Operation Profiles for

- o Class 5 - Office
- o Class 6 - Cafe
- o Class 8 - Laboratory
- o Class 9b - School

Table 24: Class 5 and 8 Occupancy and Operation profiles

Time Period (Local Standard Time)	Occupancy (Mon to Fri)	Artificial Lighting (Mon to Fri)	Appliances and Equipment (Mon to Fri)	Air- conditioning (Mon to Fri)
12:00am to 1:00am	0%	10%	10%	Off
1:00am to 2:00am	0%	10%	10%	Off
2:00am to 3:00am	0%	10%	10%	Off
3:00am to 4:00am	0%	10%	10%	Off
4:00am to 5:00am	0%	10%	10%	Off
5:00am to 6:00am	0%	10%	10%	Off
6:00am to 7:00am	0%	10%	10%	Off
7:00am to 8:00am	15%	40%	25%	On
8:00am to 9:00am	60%	80%	70%	On
9:00am to 10:00am	100%	100%	100%	On
10:00am to 11:00am	100%	100%	100%	On
11:00am to 12:00pm	100%	100%	100%	On
12:00pm to 1:00pm	100%	100%	100%	On
1:00pm to 2:00pm	100%	100%	100%	On
2:00pm to 3:00pm	100%	100%	100%	On
3:00pm to 4:00pm	100%	100%	100%	On
4:00pm to 5:00pm	100%	100%	100%	On
5:00pm to 6:00pm	50%	80%	60%	On
6:00pm to 7:00pm	15%	60%	25%	Off
7:00pm to 8:00pm	5%	40%	15%	Off
8:00pm to 9:00pm	5%	20%	15%	Off
9:00pm to 10:00pm	0%	10%	10%	Off
10:00pm to 11:00pm	0%	10%	10%	Off
11:00pm to 12:00am	0%	10%	10%	Off

Table 25: Class 6 Occupancy and Operation profiles

Time Period (Local Standard Time)	Occupancy (Mon to Sat)	Artificial lighting (Mon to Sat)	Appliances and Equipment (Mon to Sat)	Air- conditioning (Mon to Sat)
12:00am to 1:00am	0%	5%	15%	Off
1:00am to 2:00am	0%	5%	15%	Off
2:00am to 3:00am	0%	5%	15%	Off
3:00am to 4:00am	0%	5%	15%	Off
4:00am to 5:00am	0%	5%	15%	Off
5:00am to 6:00am	0%	5%	15%	Off
6:00am to 7:00am	5%	40%	40%	Off
7:00am to 8:00am	5%	40%	40%	On
8:00am to 9:00am	5%	60%	60%	On
9:00am to 10:00am	5%	60%	60%	On
10:00am to 11:00am	20%	90%	90%	On
11:00am to 12:00pm	50%	90%	90%	On
12:00pm to 1:00pm	80%	90%	90%	On
1:00pm to 2:00pm	70%	90%	90%	On
2:00pm to 3:00pm	40%	90%	90%	On
3:00pm to 4:00pm	20%	90%	90%	On
4:00pm to 5:00pm	25%	90%	90%	On
5:00pm to 6:00pm	50%	90%	90%	On
6:00pm to 7:00pm	80%	90%	90%	On
7:00pm to 8:00pm	80%	90%	90%	On
8:00pm to 9:00pm	80%	90%	90%	On
9:00pm to 10:00pm	50%	90%	90%	On
10:00pm to 11:00pm	35%	50%	50%	On
11:00pm to 12:00am	20%	30%	30%	On

Figure 7: Lower Ground Floor Architectural Floor Plan

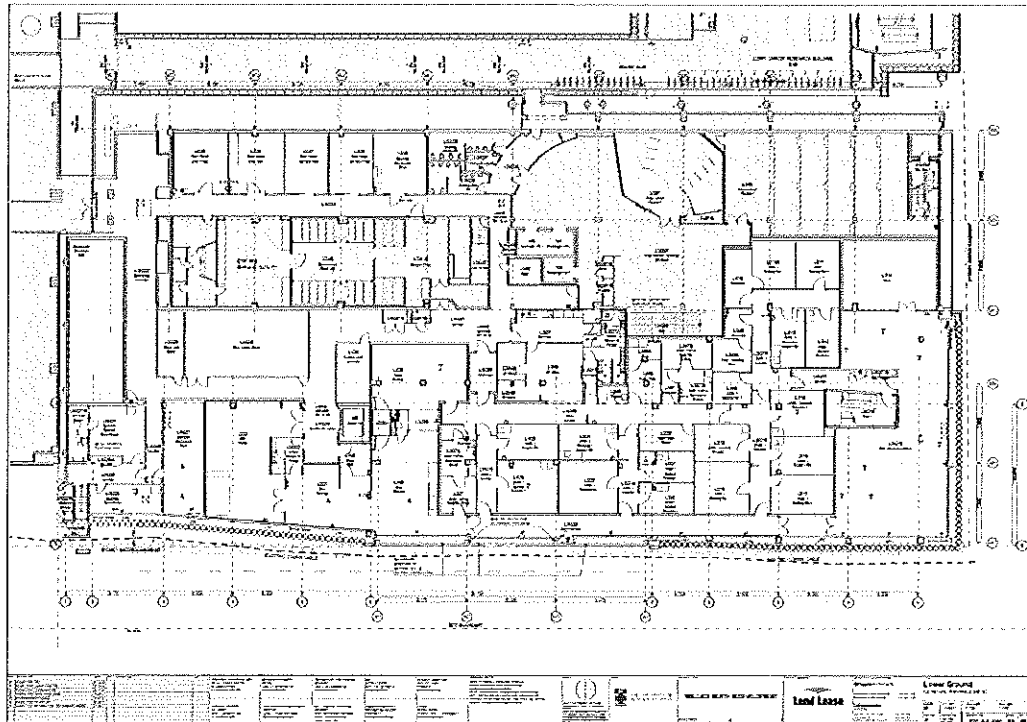


Figure 8: Ground Floor Architectural Floor Plan

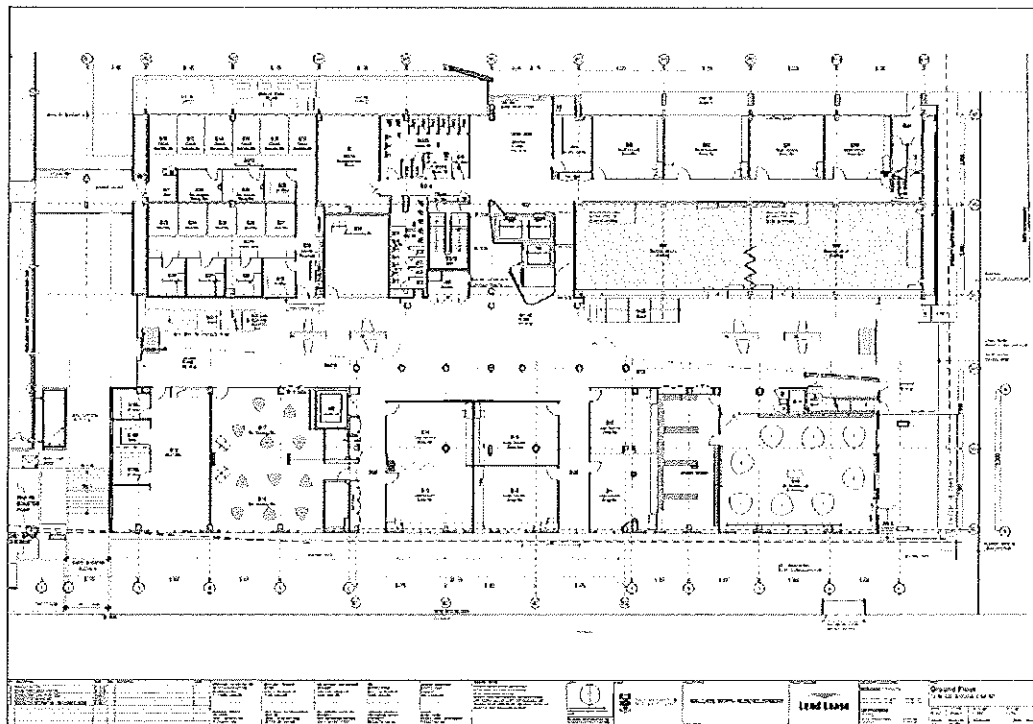


Figure 9: Level 1 Architectural Floor Plan

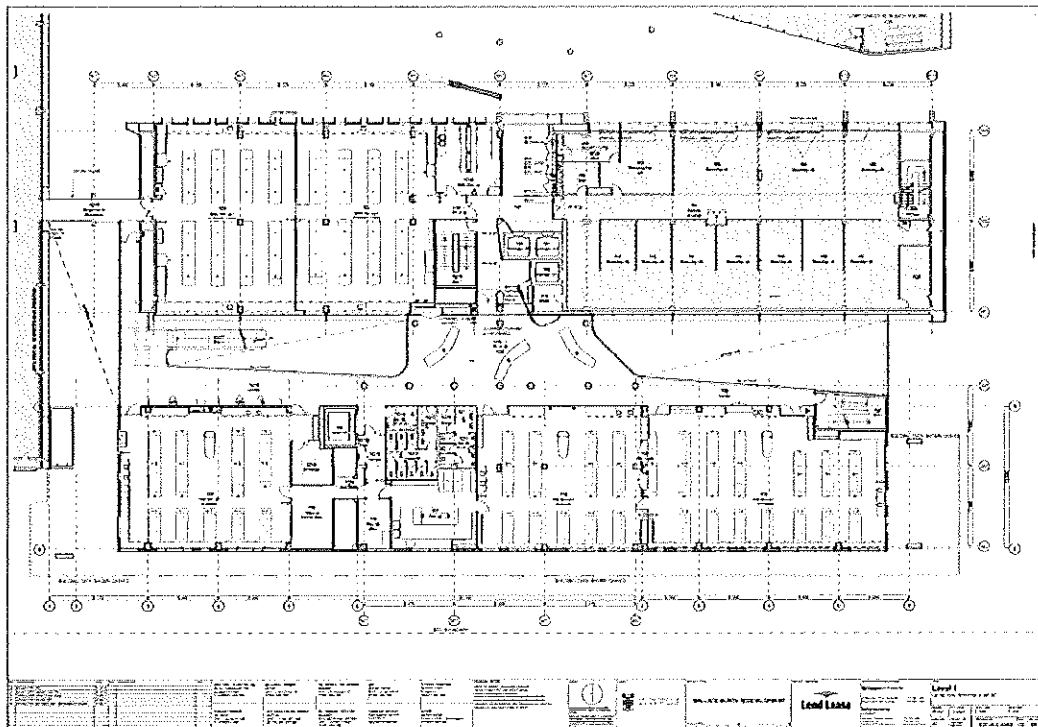


Figure 10: Level 2 Architectural Floor Plan

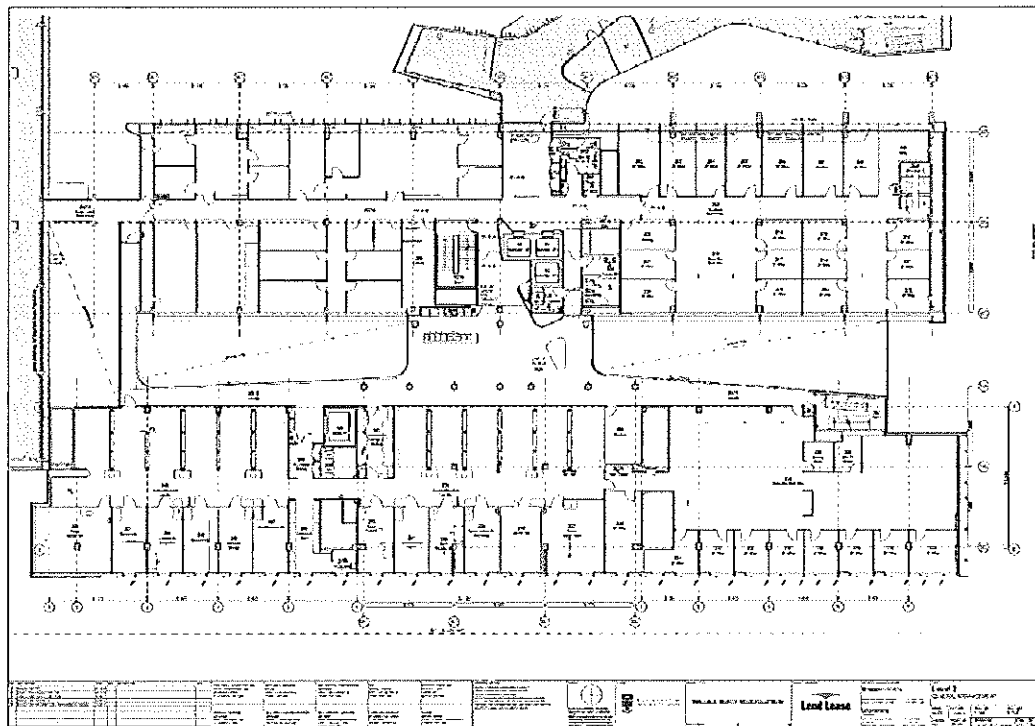


Figure 11: Level 3 Architectural Floor Plan

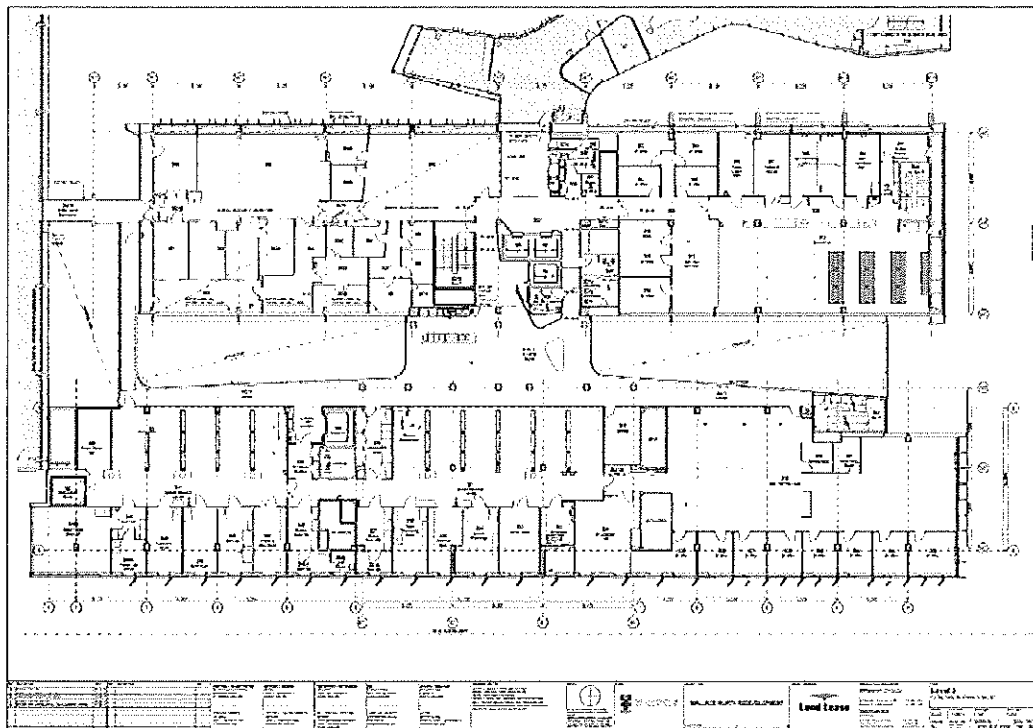


Figure 12: Level 4 Architectural Floor Plan

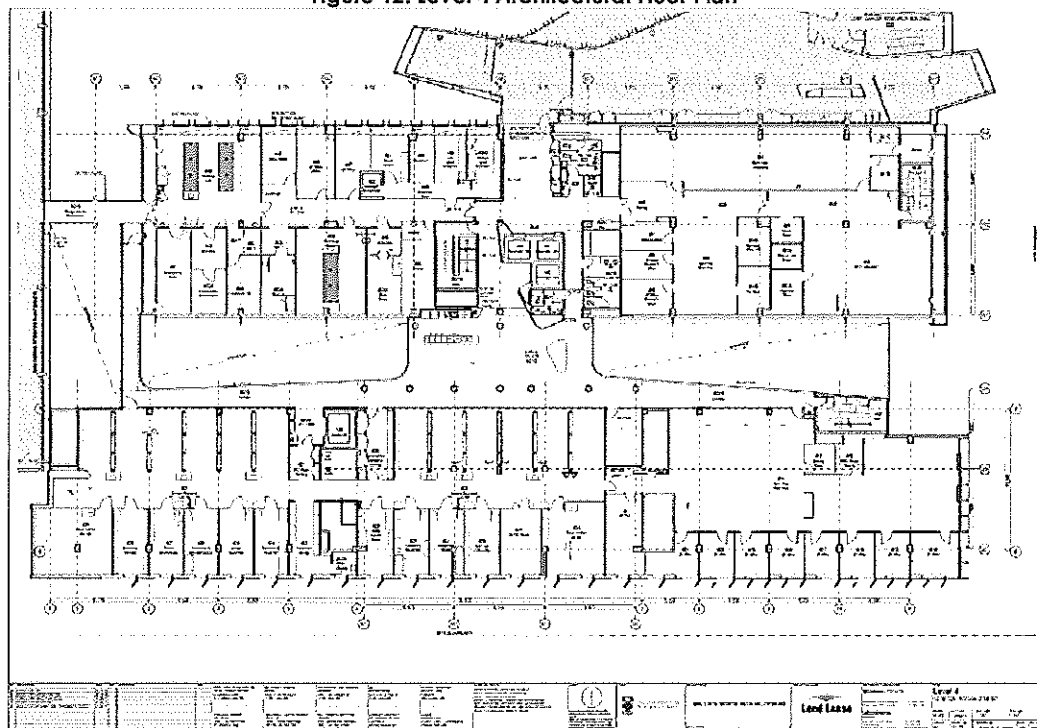


Figure 13: Level 5 Architectural Floor Plan

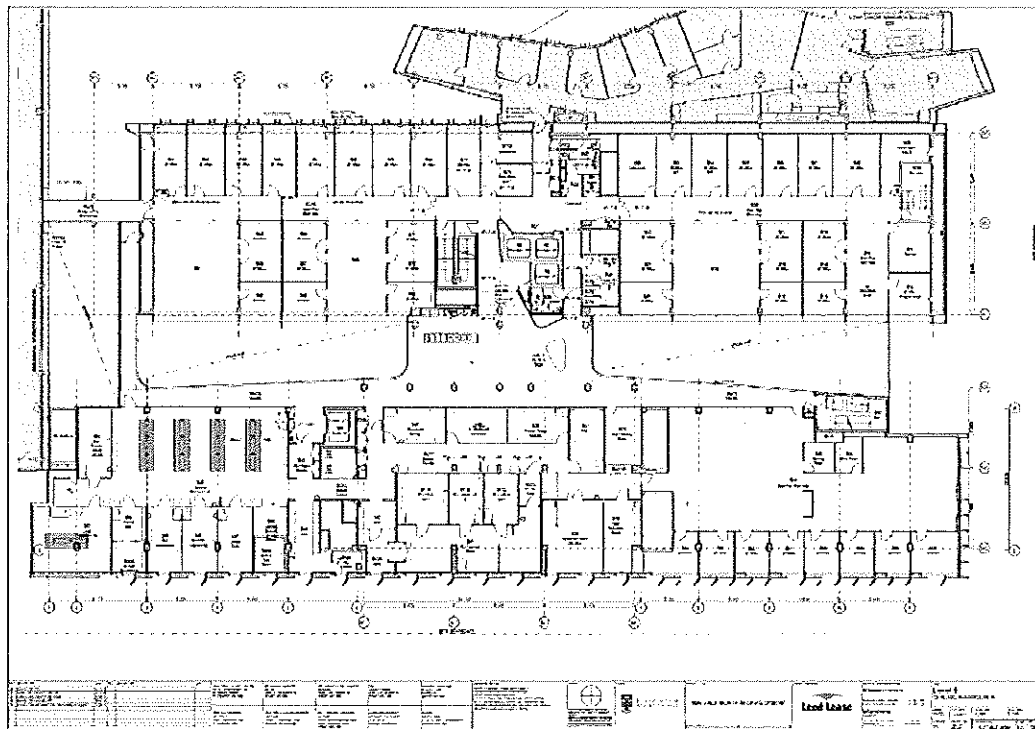


Figure 14: Level 6 Architectural Floor Plan

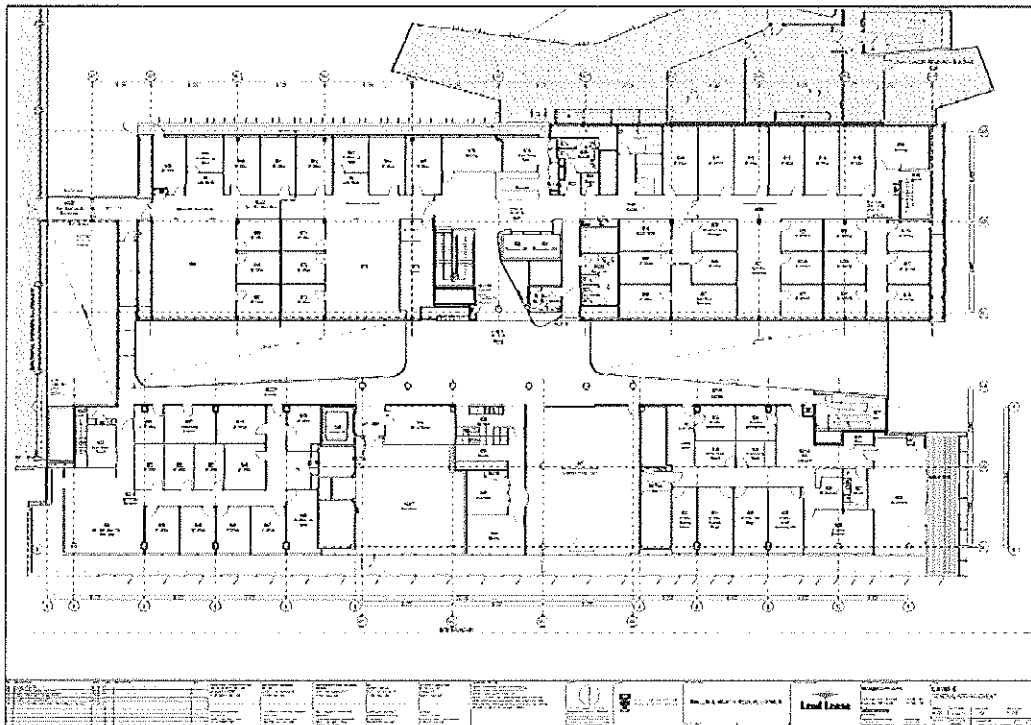


Figure 15: Level 7 Architectural Floor Plan

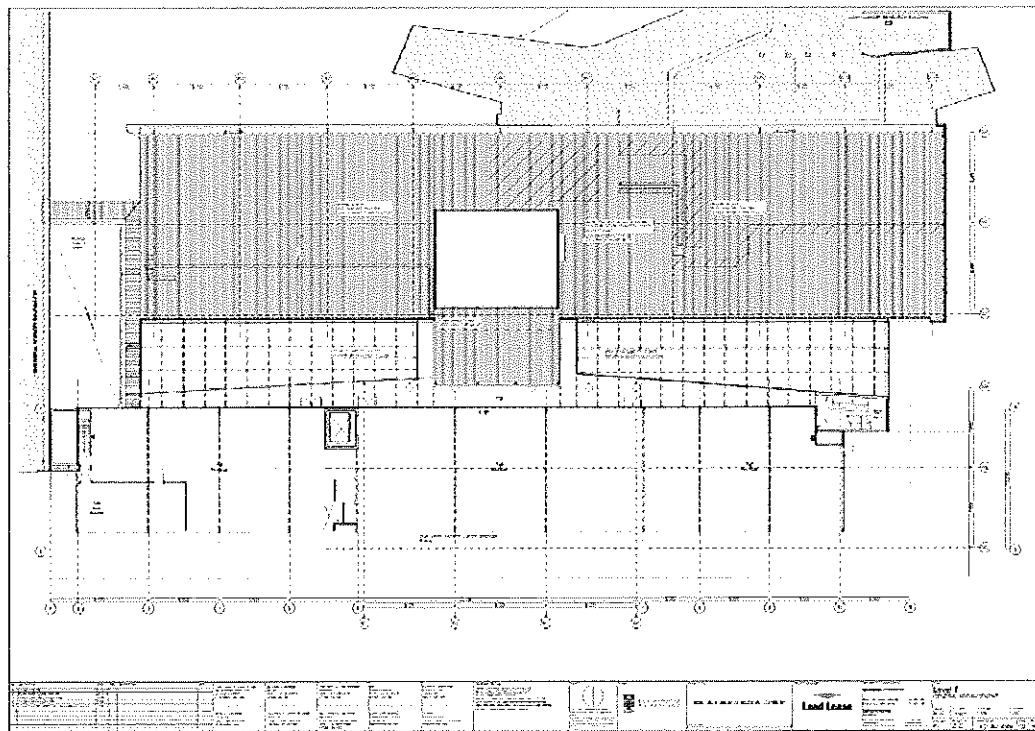
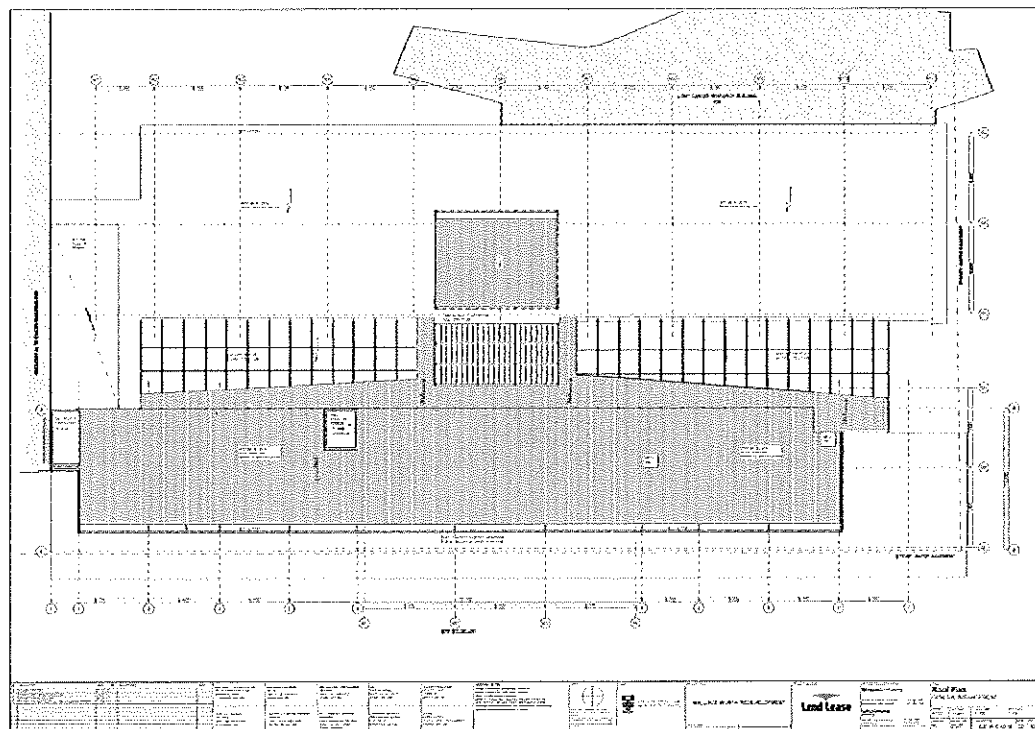


Figure 16: Roof Level Architectural plan



Appendix C

Glazing Specification Evaluation

'Deemed to Satisfy' Glazing Assessment

Ground Floor

Report from Wallace Wurth Ground DTS.xlsx

Printed 23/08/2011

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

Building name/description

Wallace Wurth DTS wo link

Application

Other

Climate zone

5

Storey

Ground

Facade areas

Option A

135m²

135m²

107m²

60m²

279m²

Option B

14.4m²

117m²

6.96m²

60m²

Number of rows preferred in table below

5 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION, SECTOR, SIZE and PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES ON (if inputs are valid)						
Glazing element		Facing sector		Size			Performance			P&H or device		Shading		Multipliers		Size		Outcomes
ID	Description (optional)	Option A facade	Option B facade	Height (m)	Width (m)	Area (m²)	Total U-Value (AFRC)	SHGC (AFRC)	P (m)	H (m)	P/H	G (m)	Heating (S _a)	Cooling (S _a)	Area used (m²)	Element share of % of allowance used	Outcomes	
1	North (East Wing) G2	N		2.40	6.00	6.2	0.90					0.00	1.00	1.00	14.40	100% of 70%		
2	South (East Wing) G2	S		2.40	2.90	6.2	0.60					0.00	1.00	1.00	6.96	100% of 15%		
3	East (East wing) G2	E		2.40	44.40	6.2	0.42					0.00	1.00	1.00	105.96	92% of 100%		
4	East (West wing) G2	E		2.40	4.60	6.2	0.42		0.500	2.400	0.21	0.00	0.91	0.66	10.60	8% of 100%		
5	Internal	Internal		2.30	26.60	6.6	0.50					2.00	0.00	0.64	0.54	59.16	100% of 51%	

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



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Level 1

Report from Wallace Wurth L1 DTS.xlsx

Printed 23/08/2011

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

Building name/description

Wallace Wurth 2010 DTS

Application

Other

Climate zone

5

Storey

Level 1

Facade areas

Option A

135m²

135m²

84m²

279m²

Option B

10.4m²

85.1m²

5.44m²

93m²

Number of rows preferred in table below

5 (as currently displayed)

GLAZING ELEMENTS, ORIENTATION, SECTOR, SIZE and PERFORMANCE CHARACTERISTICS										SHADING		CALCULATED OUTCOMES ON (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 _a)	Cooling (S _a)	Area used (m²)	Element share of % of allowance used	Outcomes	
1	North (East Wing) G2	N		1.70	6.10	6.2	0.90		8.000	1.700	4.71	0.00	0.00	0.19	10.37	100% of 6%		
2	South (East Wing) G2	S		1.70	3.20	6.2	0.60		6.500	1.700	3.82	0.00	0.64	0.54	5.44	100% of 15%		
3	East (East wing) G2	E		1.70	44.40	6.2	0.80		2.600	1.700	1.47	0.00	0.03	0.32	75.48	77% of 67%		
4	East (West wing) G2	E		2.40	4.60	6.2	0.90		0.600	2.400	0.21	0.00	0.91	0.66	8.60	23% of 67%		
5	Internal	Internal		2.30	40.60	6.5	0.50					2.00	0.00	0.64	0.54	53.15	100% of 50%	

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.

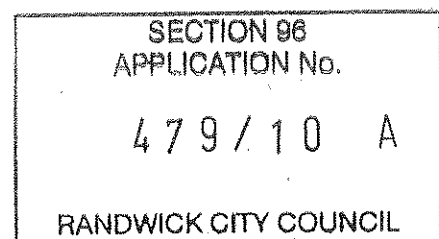
if inputs are valid



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Appendix D

Correspondence from Lend Lease to Randwick City Council regarding trees



Randwick City Council

09 SEP 2011

Records Received

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Trials	No feedback (%)	Feedback (%)
1	75	85
2	72	88
3	70	90
4	68	92
5	65	94
6	63	95
7	62	95
8	61	95
9	60	95
10	60	95

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RE: UNSW Wallace Wurth Redevelopment - Tree Removal Changes

David Meredith [David.Meredith@randwick.nsw.gov.au]

Sent: Wednesday, 20 July 2011 4:56 PM**To:** Meyer, Ron

Ron,

I refer to our site meeting of 16 June 2011, regarding the amendments being proposed to the Wallace Wurth development (MP 09_0075), and have reviewed the following information that was submitted with your e-mail of 29 June 2011:

- Covering letter by Ron Meyer of Lend Lease, dated 29 June 2011;
- Arboriculture Assessment - Proposed Tree Changes, by the Ents Tree Consultancy dated 16 June 2011;
- Existing Tree Plan by Spackman Mossop Michaels, dwg no C27-J-C-0304, revision F, dated .27.06.11.

Whilst no objections are raised to the changes being sought, relating to the retention and removal of certain trees, as well as slight changes to the approved landscaping scheme, in order to ensure that correct and accurate information is provided to you, I consulted our Executive Planner who performed Council's original assessment of the proposal last year.

I have now been instructed that regardless of any advice being provided by Council, the process for the UNSW in gaining formal approval for these changes will need to be through the Department of Planning, in the first instance, as they are the consent authority, whereby Council would then be asked for input.

Lastly, should any of the street trees along the Botany Street frontage need to be removed for hoardings, construction access or similar, Council would not object; however, we will require that removal and replacement costs be borne wholly by the UNSW.

Regards,

David Meredith | Development Assessments | Randwick City Council
Landscape Development Officer | Administration Centre, 30 Frances Street, Randwick NSW 2031
T 02 9399 0613 | F 02 9399 0799 | W www.randwick.nsw.gov.au



From: Meyer, Ron [mailto:Ron.Meyer@lendlease.com]
Sent: Monday, 4 July 2011 10:08 AM
To: David Meredith
Cc: Geoffrey Leeson
Subject: RE: UNSW Wallace Wurth Redevelopment - Tree Removal Changes

David,

Thank you for keeping me in the loop.

Please advise if you need anything further.

Regards

Ron

Ron Meyer | Senior Project Manager, NSW | Project Management & Construction | Lend Lease
T 61 2 9277 2069 | F 61 2 9383 8139 | M 0413 018 799
30 The Bond, 30 Hickson Rd, Millers Point NSW Australia 2000

ron.meyer@lendlease.com.au | www.lendlease.com

From: David Meredith [mailto:David.Meredith@randwick.nsw.gov.au]
Sent: Monday, 4 July 2011 9:48 AM
To: Meyer, Ron
Subject: RE: UNSW Wallace Wurth Redevelopment - Tree Removal Changes

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Client	UNSW c/o Lend Lease
Location	Wallace Wurth Building Upgrade UNSW.
Document Type	Arboriculture Assessment - Proposed Tree Changes
Date/Time	16 th June 2011

THE ENTS TREE CONSULTANCY

Client	UNSW c/o Lend Lease
Location	Wallace Wurth Building Upgrade UNSW.
Document Type	Arboriculture Assessment – Proposed Tree Changes
Date/Time	16 th June 2011

1. Contents

	Page
2. Introduction	3
3. Methodology	3
4. Discussion	4
5. Recommendations	5
Appendices	
1. S.U.L.E Rating Schedule	6
2. Assessment of Trees	7
3. Tree Images	8
4. Site Plan	14
5. References	16
6. Glossary of Terms	17
7. Curriculum Vitae	18
	19

2 Introduction

2.1 On the 15th June 2011 Ron Meyer representing Lend Lease contacted The Ents Tree Consultancy in regards to obtaining an updated tree report for the trees located on the proposed Wallace Wurth Development site at the UNSW Kensington Campus. This report has been requested by Randwick City Council to address the changes to the landscape plan which was approved by the Department of Planning under Major Projects Part 3A Project Approval on 27th November 2010 (Application No. MP 09_0075). As Randwick City Council was the delegated assessor for the project, the proposed changes are considered minor and are therefore referred back to the Council for assessment. Minor alterations to the landscape plan are proposed to be implemented after consideration of information provided by the Royal Botanic Gardens that tree 11 is a rare tree that should be retained and that some trees have shown some decline over the last year. Consultation with the client about the number and position of trees to be inspected in relation to the works occurred prior to a survey being completed.

2.2 The site inspection of the nominated trees occurred on the 16th June 2011, only the trees impacted upon by the proposed changes will be discussed in this report. The client was present for the site inspection and issued a verbal brief providing background information in regards to the trees on the site. The client also issued a site plan showing the position of the trees on the site and another plan showing the extent of the works. On the 22nd June 2011, a representative of Lend Lease issued an amended drawing based which shows some minor alterations to the approved landscape plan.

2.3 The purpose of this report is to assess the proposed changes to the landscape works as well as the health and suitability of the trees nominated at the time of the inspection. Tree Protection Guidelines will be discussed for all trees nominated to be retained. The information in this report will be based on the information presented by the client at the time of the inspection as well as the site inspection. The Australian Standard AS4970 Protection of Trees on development sites will be used as a guide to managing the site.

2.4 To achieve the objectives of the report, the trees will be assessed noting the species, size, general condition with any defects discussed. The trees characteristics and eventual size will be taken into consideration as will the trees position in relation to structures and hard scapes. Recommendations will be outlined in section 5 of the report. A detailed list of the trees surveyed will be provided in Appendix 2 of the report and a numerical system will be used to identify them for this report and future reference on this job site. A site plan will show the trees and their allocated numbers in Appendix 4.

3 Methodology

3.1 The trees were assessed using the standard Visual Tree Assessment technique (VTA). The trees were assessed from the ground for the purpose of this report. VTA is an internationally recognised practice in the visual assessment of trees as formulated by Mattheck & Breloer (1994).

3.2 A Lufkin 6.5m diameter tape was used to obtain the Diameter at breast height (DBH) as recommended at 1.3 metres unless otherwise stated due to variations in the trees form.

3.3 The height of the trees was estimated and the spread of the trees canopy was paced out.

3.4 A Canon 350D Digital camera with a 20-40mm lens was used to take all photographs in this report. No image modification has been used in any of the images.

3.5 The SULE rating system has been used as a guide to assist in determining the Safe Useful Life Expectancy of the tree surveyed. Refer to Appendix 1.

4 Discussion

4.1 The trees nominated to be inspected are located on the proposed Wallace Wurth Redevelopment site at the UNSW Kensington Campus. Some of the trees are significant in the immediate landscape and some are likely to be considered important in the local areas landscape in terms of amenity and function. The current redesign of the landscape to the East and North of the site is occurring due to advice from the Royal Botanic Gardens Sydney that tree 11 is a rare species and should be retained. The changed landscape plan also considers other trees (no# 2) which are declining due to an ongoing pest problem and the councils suggestions in relation to retaining tree 4.

4.2 The trees on site are located in an exposed position with some protection from surrounding structures and topography. The soil on site is sandy and it has been disturbed previously. The majority of the trees nominated to be retained on this site are located in garden beds that separate the UNSW campus from either High or Botany Street. Most of the construction works are limited to the within existing building footprints, with the exception of the eastern facade which is cantilevered over the existing building footprint and extends towards Botany Street. .

4.3 Based on the information provided by the client, the existing buildings are to be renovated and the new sections of the building added. The existing landscape plan is being altered slightly with trees 4, 7 & 11 to be retained and trees 1, 2 and 3 to be removed. Two trees on the council footpath area are also planned to be removed to provide access to the site.

4.4 The changes to trees due to the new landscape plan will be discussed below, other trees not discussed have no changes occurring. The trees nominated to be retained on site will have little or no disturbance due to the proposed works. To review the requirements of the trees to be retained and the trees to be removed they will be discussed in groups below. It is envisaged that all of the trees proposed to be retained can be kept in good condition for the duration of the works using the Australian Standard AS4970 2009 Protection of trees on development sites. Additional instructions will be discussed below as required.

4.5 New Trees to be Removed.

4.5.1 The trees that are proposed to be removed are close to the boundary and cannot be retained due to the impacts anticipated by the construction works. These impacts may cause the trees to decline or may impact too heavily on the trees crown or root structure. Due to the size and position of the proposed works and structures the best long term management plan for these trees close to the works is to remove and replace them in a new landscape plan.

4.5.2 The trees nominated for removal are Trees 1, 2 & 3. Two semi mature brush boxes on the council footpath area will also require removal. It is anticipated that these trees can be removed and replaced with semi mature specimens at the completion of the works.

4.6 New Trees to be Retained.

4.6.1 High Street West Tree 4 is proposed to be retained. requires an 8.4m tree protection zone (TPZ) and a 3.5m Structural Root Zone, (SRZ). Disturbance of the TPZ is permitted up to 20%. Disturbance of the SRZ will not be permitted. The trees crown may need minor pruning to the south for building clearance or piling rig operations. The information provided by Bovis Lend Lease indicated that the disturbance will be less than 10%. Minor crown lifting may also be required for pedestrian access.

4.6.2 Botany Street Trees 7 & 11 are proposed to be retained. It is anticipated that these trees will have little disturbance to their root zones, these trees may have up to 15% of their root zones disturbed. The trees will require pruning for crown clearance to the West. The pruning will account for approximately 20% of the trees crowns and will be mostly secondary branches. No pruning for scaffolding is permitted on any tree. Pruning is for building clearance only or if the tree cannot be worked around when the piling rig is operating.

4.6.3 Tree protection fencing will need to be installed around each tree to be retained in accordance with the Australian Standard AS 4970, prior to works commencing. A sufficient irrigation supply to the trees and adequate mulch is to be maintained for the duration of the works. It is anticipated that these trees can be kept in good condition for the duration of the works using the Australian Standard AS4970 2009 Protection of trees on development sites.

5 Recommendations

5.1 After reviewing the minor changes to the landscape plan and the information provided by the client it is my recommendation the proposed plan for the Wallace Wurth Redevelopment at the UNSW Kensington Campus is allowed to proceed with the following actions carried out.

5.2 It is recommended that trees 1, 2 & 3 are removed due to their position in relation to the works. Two semi mature brush boxes as marked on the plan are also removed due to access. The trees removed can be replaced within the new landscape plan.

5.3 It is recommended that trees 4, tree 7 and tree 11 are retained in good condition for the duration of the works using the Australian Standard AS4970 2009 Protection of trees on development sites. Tree protection fencing must be installed in accordance with the Australian Standard AS4970 prior to works commencing and mulch/ irrigation supply must be maintained for the duration of the works.

5.4 Tree pruning for building clearance is to be completed by a qualified arborist in accordance with the Australian Standard AS4373. Pruning works is not permitted for scaffolding and will be considered for piling rig operations as a last resort if necessary.

5.5 Regular site inspections by a level 5 Arborist should be completed to ensure the appropriate tree protection measures and recognised horticultural practices are being utilised to keep these trees in good condition for the duration of the works.

Note: All tree works are to be conducted by suitably qualified persons and should comply with the Australian standard for the pruning of Amenity trees AS4373.

Please do not hesitate to call 0422 265 128 if you have any questions regarding the contents of this report.

Regards

Hayden Coulter
Diploma in Arboriculture
Advanced Certificate in Urban Horticulture

The Ents Tree Consultancy. ABN: 95 598 933136 theents@bigpond.net.au



Disclaimer

All trees have been assessed based on the information and facts of the site and as presented by the client or relevant parties at the time of inspection. No responsibility can be taken for incorrect or misleading information provided by the client or other parties.

The nominated tree/s are assessed for biological requirements and hazard potential with reasonable care. The trees are assessed from the ground and by visual means only unless otherwise stated. All tree protection and tree preservation measures are designed to minimise the damage to the tree/s or to reduce the hazard potential of the tree/s. Trees are inherently dangerous, therefore will always have a hazard potential.

Trees fail in ways that are not predictable or fully understood. There is no guarantee expressed or implied that failure or deficiencies may not arise of the subject trees in the future. No responsibility is accepted for damage to property or injury/death caused by the nominated tree/s.

Appendix 1

S.U.L.E Categories (After Barrell) 1996 Updated 01/04/01.

1. **Long S.U.L.E-** the tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance:
 - a. Structurally sound trees located in positions that can accommodate future growth.
 - b. Trees, which could be made suitable for long term retention by remedial care.
 - c. Trees of special significance which would warrant extraordinary efforts to secure their long term retention.
2. **Medium S.U.L.E-** the tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance:
 - a. Trees, which may only live from 15-40 years.
 - b. Trees that may live for more than 40 years but may be removed for safety or nuisance reasons.
 - c. Trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new plantings.
 - d. Trees which could be made suitable for retention in the medium term with remedial care.
3. **Short S.U.L.E-** trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable degree of risk, assuming reasonable maintenance:
 - a. Trees which may only live from 5 to 15 years.
 - b. Trees that may live for more than 15 years but may be removed for safety or nuisance reasons.
 - c. Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new plantings.
 - d. Trees which require substantial remediation and are only suitable for retention in the short term.
4. **Removal-** Tree which should be removed within the next 5 years.
 - a. Dead, dying suppressed or declining trees
 - b. Dangerous trees through instability or recent loss of adjacent trees.
 - c. Dangerous trees because of structural defects including cavities, decay included bark, wounds or poor form.
 - d. Damaged trees that are clearly not safe to retain.
 - e. Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new plantings.
 - f. Trees which are damaging or may cause damage to existing structures within the next 5 years.
 - g. Trees that will become dangerous after the removal of other trees for the reasons given in (A) to (F).
 - h. Trees in categories (A) to (G) that have a high wild life habitat value and with appropriate treatment could be retained subject to regular review.
5. **Small, young or regularly pruned-** Trees that can be reliably moved or replaced.
 - a. Small trees less than 5m in height.
 - b. Young trees less than 15 years old but over 5m in height.
 - c. Formal hedges and trees intended for regular pruning to artificially control growth.

Appendix 2 Assessment of Trees affected by Proposed Landscape Amendments

Tree No	Species	Height (m)	Trunk Diameter (DBH*)	Canopy Spread (m)	Estimated Age Class	TPZ **	SULE ***	Observations and comments
1	<i>Agonis flexuosa</i>	7	.59	8	Mature	7m SRZ 3.2	Medium	This semi mature tree is located close to the existing building, has average health and average form for the species. The tree has no significant defects evident.
2	<i>Eucalyptus scoparia</i>	18	.90	10	Mature	10m SRZ 4.5m	Medium	This mature tree is located close to the existing building, has average health and average form for the species. The tree has strong reaction wood and a lean to light but no significant defects evident.
3	<i>Agonis flexuosa</i>	8	.71	9	Mature	8.4m SRZ 3.5	Medium	This semi mature tree is located close to the existing building, has average health and average form for the species. The tree has no significant defects evident.
4	<i>Podocarpus falcatus</i>	14	.70	12	Mature	8.4m SRZ 3.5	Medium	This mature tree is located near an existing building, has average health and average form for the species. The tree has no significant defects evident.
7	<i>Calodendron capense</i>	13	.55	12	Mature	6.5m SRZ 3.25m	Medium	This semi mature tree is located near an existing building, has average health and average form for the species. The tree has no significant defects evident.
11	<i>Calodendron capense</i>	12	.39	8	Mature	4.5m SRZ 2.5m	Medium	This semi mature tree is located near an existing building, has average health and average form for the species. The tree has no significant defects evident.

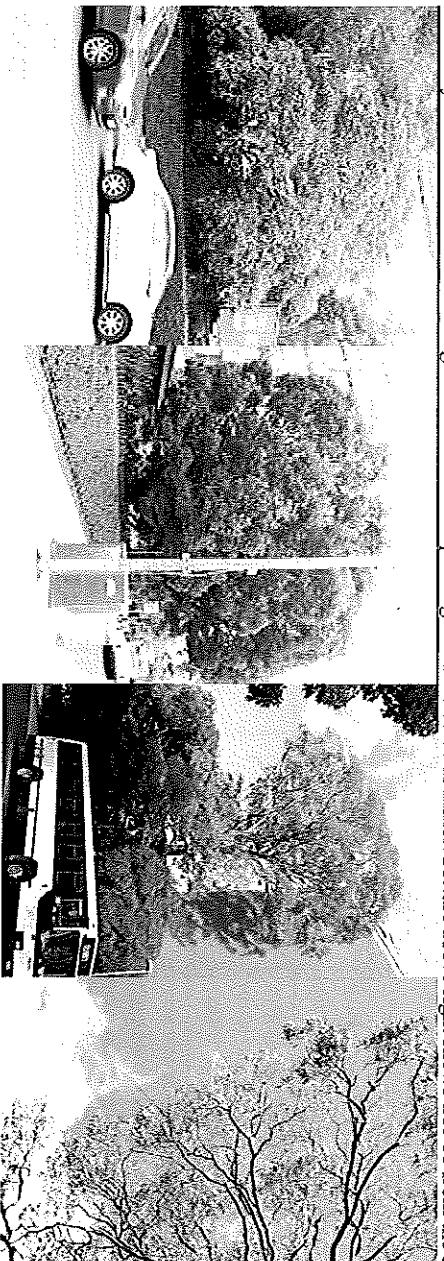
Explanatory Notes for Table

- *Dbh = Diameter of trunk at breast height.
- **TPZ refers to the Tree Protection Zones as recommended by The Ents Tree Consultancy and are to be used in conjunction with the Tree Protection Guidelines in Appendices 3. TPZ based on 10x the trees Dbh for retention of biological function, 5x Dbh for critical root zone and tree stability.
- ***SULE Explanation can be found in Appendix 2.

Appendix 3 Tree Images

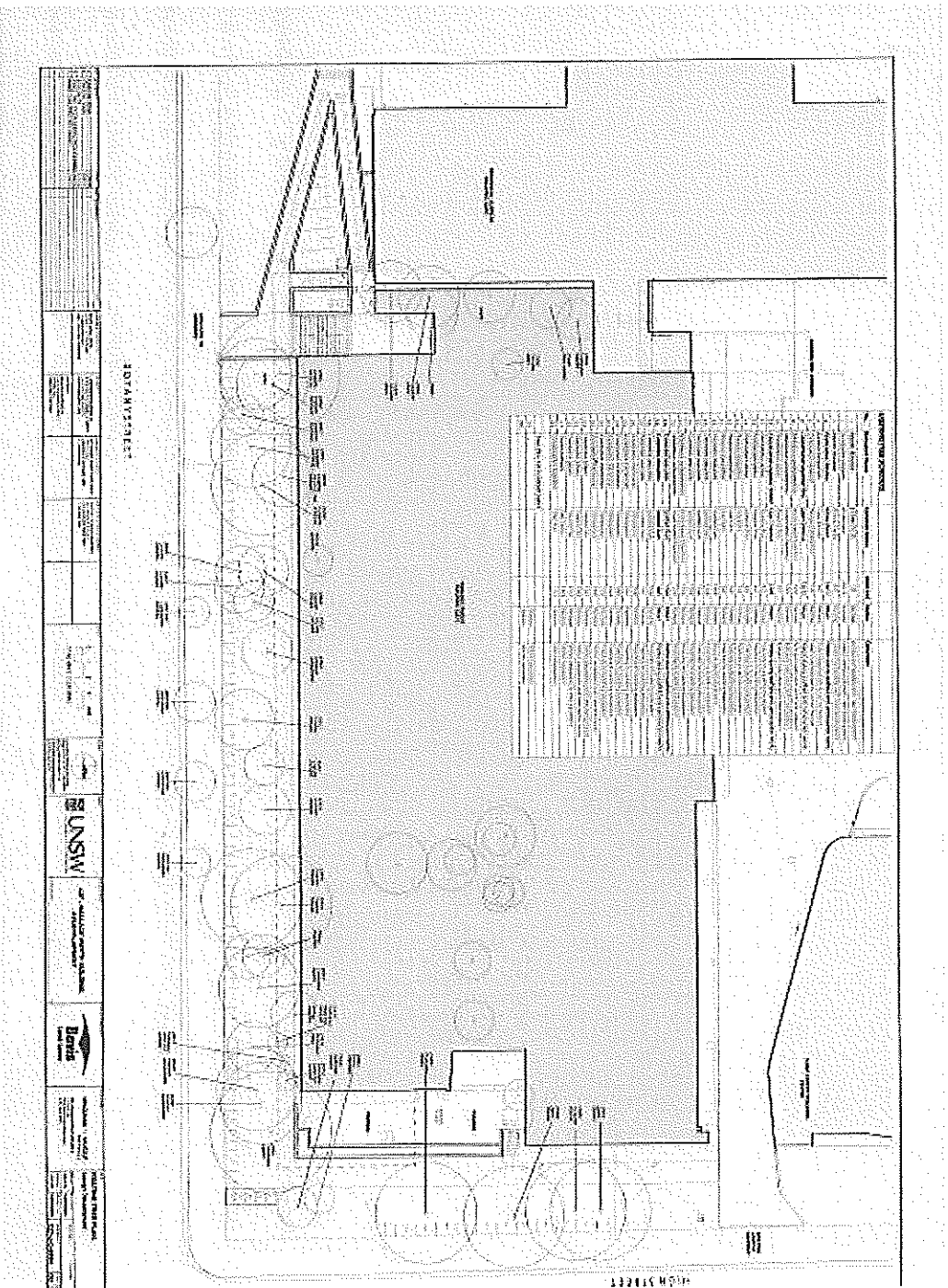


Picture above left shows tree 4 and the approximate line required for building clearance, not an issue. Picture above centre left show tree 7 which will require pruning of up to 20% of mostly secondary branches. Picture above right centre shows the pruning line for tree 11 as minor. Picture above right shows tree 11 from the street.



Picture above left shows tree 7. Picture above left centre shows tree 4. Above right shows tree 2 and its sparse crown that is discoloured by *Thaumaschiorid* infection.

Appendix 4, Site Plan



Appendix 5

References

- Harris, R. W; Clark, J.R; & Matheny, N.P (2004). *Arboriculture: Integrated Management of Landscape Trees, Shrubs & Vines* 4th Edition, Prentice Hall, New Jersey
- Shigo, A.L. (1986). *A New Tree Biology*. Shigo & Trees, Associates, Durham, New Hampshire
- Hadlington, P. & Johnston, J. (1988). *Australian Trees: Their Care & Repair*. University of NSW Press, Kensington
- Lonsdale, D. (1999). *Principles of Tree Hazard Assessment & Management*. Forestry Commission, The Stationery Office, London
- Mattheck, C. & Breloer, H. (1994). *The Body Language of Trees*. Research for Amenity Trees No.4. The Stationery Office, London

Appendix 6 Glossary Of Terms

Abiotic	Nonliving
Anthraxnose	a fungal disease causing dead areas on the leaves, buds, stems.
Arboriculture	The science and art of caring for trees, shrubs and other woody plants in landscape settings.
Barrier Zone	Protective boundary formed in new wood in response to wounding or other injury.
Biotic	Alive, pertaining to living organisms.
Branch attachment	The structural union of a lateral branch.
Callus	Undifferentiated tissue produced in response to wounding.
Canker	A dead spot or necrotic lesion that is caused by a bark inhabiting organism/pathogen.
Cavity	an open wound characterized by the presence of decay resulting in a hollow.
Collar	the ring of tissue that surrounds the lateral branch at its point of attachment.
Compartmentalization	A physiological process that creates the chemical and physical boundaries that act to limit the spread of disease and decay organisms.
Compression wood	A type of reaction wood that forms on the underside of branches which tends to maintain a branch angle of growth.
Crown	The above ground parts of the tree, including the trunk.
DBH	The diameter of a trees trunk measured at 1.4m.
Decay	Process of degradation of woody tissues by fungi and bacteria through the decomposition of cellulose and lignin.
Decline	Progressive decrease in health of organs or the entire plant usually caused by a series of interacting factors.
Drip line	The width of the crown, as measured by the lateral extent of the foliage.
Epicormic shoot	a shoot that arises from latent or adventitious buds that occur on stems, branches or the bases of trees.
Included bark	Pattern of development at branch junctions where bark is turned inward, rather than pushed out; contrast with the branch bark ridge.
Mortality Spiral	The sequence of events describing a change in the trees health from vigorous to declining to death.
Photosynthesis	The transformation in the presence of chlorophyll and light, of carbon dioxide from (the air) and water (primarily from soil) into a simple carbohydrate and oxygen.
Pruning	systematic removal of branches of a plant usually a woody perennial.
Reaction wood	Specialized secondary xylem that develops in response to a lean or similar mechanical stress to restore the stem to vertical.
Taper	The change in diameter over the length of trunks and branches. Important to mechanical support.
Tension wood	A type of reaction wood that trees form on the upper side of branches and stems and roots.
VTA	Visual Tree Assessment is a method of evaluating structural defects and stability in trees.
Wound	Any injury that induces a compartmentalization response.

Appendix 7 Curriculum Vitae

Education and Qualifications

- 2005 Diploma of Arboriculture (AQF Cert 5), Ryde TAFE. Distinction.
- 2000 Tree Climbing Course (AQF Cert 2), Ryde TAFE.
- 1999 Advanced Certificate in Urban Horticulture, (AQF Cert 4), Ryde TAFE. Distinction.
- 1995 Greenkeepers Trade Certificate (AQF 3) Ryde TAFE. Credit.
- 1991 Higher School Certificate.

Conference Attendance/presentation of Scientific Papers

- Barrell Tree Care Workshop- Trees on Construction Sites (Brisbane 2005)
- Tree Logic seminar- Urban Tree Risk Management (Sydney 2005)
- Tree Pathology and Wood Decay Seminar (Sydney 2004)
- Excelsior Training Claus Mattheck (Sydney 2001)
- Managing Mature Trees NAAA(Sydney 2000), Presented a Paper "Habitat Value of Mature Trees"

Industry Experience

- 2004 to Date, Sole Trader The Ents Tree Consultancy. Writing of tree reports for development applications, master plans, hazard evaluations, tree management plans and expert witness reports. Hazard assessments, tree surveys and consultations.
- 2003 to 2008, Arborist University of New South Wales. Survey all trees on site, developed a Tree Management Database. Minimise hazard potential of all trees on site through evaluation and works. Generate and prioritise works and tree assessment based areas usage, tree conditions and staff required. Development of UNSW Tree Protection Guidelines for master planning works. Acting Supervisor December 2006 to May 2007.
- 2003 Tree management Officer Randwick Council. Liaise with public to explain and enforce the councils Tree Preservation order. Management of internal staff and contractors. Project management and co ordination of street tree planting and maintenance.
- 1999 to 2003 Animal Food Production Manager and Arborist. Management of Koala food Plantation, Management of animal food supply registry for herbivores/omnivores. Coordination of staff contractors and volunteers. Maintain and manage tree management database, complete tree works within zoo grounds and at zoo owned plantations. Acting supervisor 6 month period 2002 for grounds dept and asset management trade team.
- 1998 to 1999 Sole Trader Techniques Lawn & Garden Consultancy. Lawn, garden and Tree care. Garden design and maintenance. Tree works and tree removal. Installation of irrigation equipment.
- 1997 to 1998 Greenkeeper / Horticulturist Muirfield Golf Course. General grounds duties, machinery maintenance, horticultural works, tree works
- 1992 to 1997 Greenkeeper / Horticulturist Ashlar Golf Course. General grounds duties, machinery maintenance, horticultural works, tree works