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"Greenfurbishment" Sustainable Building Refurbishment at UOW











Ecologically Sustainable Development Design Standard



Environmental Management Plan

- Aspirational Targets.
- 5% reduction per year on energy and water consumption.
- Energy and Water Savings Action Plans.



Council KPI's

- Energy Consumption 0.59 GJ/m².
- Water Consumption 8.5kL/EFTSL.



Wollongong Campus Energy Consumption KPI (GJ/Sq.m.)



Wollongong Campus Potable Water Consumption (KL/EFTSL)



_ _ _ 2018 Target = 8.5 kL/EFTSL

UOW Sustainable Buildings Research Centre (SBRC)



Retrofitting for Resilient and Sustainable Buildings

\$25.1m Federal Government EIF grant\$1.2m NSW Government grant





Sustainable Buildings Research Centre

- Targeting:
 - 6 Star Green Star.
 - First Australian building to achieve Challenge certification.



- Net Zero Energy + Water Export.
- Green IT, low-e lighting, natural ventilation and advanced HVAC.
- Environmentally friendly materials.
- The building will be a demonstration and research testbed.





A Visionary Path to a Regenerative Future



INTERNATIONAL LIVING FUTURE INSTITUTE"

Summary Matrix

Imperative omitted from Typology Solutions beyond project footprint are permissible The 20 Imperatives of the Living Building Challenge: Follow down the column associated with each Typology to see which Imperatives apply.

	LIVING BUILDING CHALLENGE			
	BUILDINGS	RENOVATIONS	LANDSCAPE + INFRASTRUCTURE	
PLACE				01. LIMITS TO GROWTH
	SCALE JUMPING		SCALE JUMPING	02. URBAN AGRICULTURE
			SCALE JUMPING	03. HABITAT EXCHANGE
				04. HUMAN POWERED LIVING
WATER			SCALE JUMPING	05. NET POSITIVE WATER
ENERGY			SCALE JUMPING	06. NET POSITIVE ENERGY
HEALTH & HAPPINESS				07. CIVILIZED ENVIRONMENT
				08. HEALTHY INTERIOR ENVIRONMENT
				09. BIOPHILIC ENVIRONMENT
MATERIALS				10. RED LIST
			SCALE JUMPING	11. EMBODIED CARBON FOOTPRINT
				12. RESPONSIBLE INDUSTRY
				13. LIVING ECONOMY SOURCING
				14. NET POSITIVE WASTE
EQUITY				15. HUMAN SCALE + HUMANE PLACES
				16. UNIVERSAL ACCESS TO NATURE & PLACE
			SCALE JUMPING	17. EQUITABLE INVESTMENT
				18. JUST ORGANIZATIONS
BEAUTY				19. BEAUTY + SPIRIT
				20. INSPIRATION + EDUCATION



Research Activities

 BlueScope and Fraunhofer ISE - BIPVT Retrofit systems (\$0.47m grant).



- Low Income Energy Efficiency Program grant (\$2.3m) education and retrofitting.
- Steel Manufacturing Industrial Transformation Research Hub (development of steel products for resilient buildings).
- Sustainability, resilience and thermal comfort in aged-care facilities.
- Building Management System optimisation for complex buildings (collaborating with CSIRO).



Living Laboratory Program



Domestic Buildings

- Retrofitted with new and sustainable systems/products.
- Socio/psychological studies of occupant behaviour and use of technologies.





SOLAR DECATHLON CHINA 2013 - DATONG

The Solar Decathlon



Transforming our houses...



... into sustainable homes







Engineering Building Greenfurbishment



Client Objectives

ELEMENT	ITEM		
	Better circulation and way finding		
	Increased informal learning spaces		
optimisation	Maintenance of effective functional relationships (e.g. reception, staff - student, student central - student advisory, staff - labs)		
	Maintained office provision		
	Enhanced community culture (e.g. spaces to meet)		
Occupant health	High air, light, thermal, visual, and acoustic quality		
Occupant nearth	Improved personal mobility options (e.g. cyclist facilities, universal		
	ucccss)		
Public nercentions	A better 'building address' - celebrating the Engineering building		
	Improved visual aesthetic		
Pasaura concumption	Lower energy, water, and material consumption and costs		
Resource consumption	Greater building longevity		
	Addressing where possible BCA and Australian Standards (e.g. Access)		
Compliance	Addressing general safety (e.g. Fire Protection)		
	Improved access for maintenance (e.g. cherry picker)		
Maintenance	Addressing backlog maintenance (e.g. roof, slab deflection, hardware, drainage)		
	Simplification of ongoing maintenance (e.g. standardisation and consolidation for routine maintenance)		

Retrofit Opportunities

- Site Connections.
- Water Consumption.
- Electricity Consumption.
- Lighting.
- Thermal Comfort.
- Space Utilisation and Amenities.
- Maintenance.
- Occupant Engagement.



What was measured?

- Logged Distribution Board DB1A the first floor on the eastern side of building 4 as a representative board
- In the area shown This board supplies:
 - Lighting
 - Hot water
 - GPO outlets
 - Air conditioning





Power Distribution



When is the power being used?

40 Weekday Peaks 35 Power Consumption (kW) 30 25 20 15 10 5 0 Monday, 3 March 2014 Wednesday, 5 March 2014 Thursday, 6 March 2014 Saturday, 8 March 2014 Sunday, 9 March 2014 Monday, 10 March 2014 Tuesday, 4 March 2014 Friday, 7 March 2014

UoW Building 4 - DB1A Total Power Consumption

Constant Baseline

Air-Conditioning



Lighting



Electricity Consumption

During week 1 of session (3 – 9 March) 1,650 kWhr.
\$14,582 p.a.

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The Headlines

- Air-conditioning large consumer.
- Lighting and power usage in occupied relatively <u>low</u>.
- Lighting in common areas!
- Limited water-saving opportunity.



Refurbishment – ESD Opportunities



Lessons Learnt

- Green Star.
- LBC.
- Building fabric.
- Energy.



- Occupant behaviour/comfort.
- Regulatory compliance.



Greenfurbishment

- 1. Balance with strategic developments.
- 2. Environmental framework/targets.
- 3. LBC dictates social importance.
- 4. Building audits imperative.
- 5. Research linkages.
- 6. Showcasing environmental benefits is challenging.
- 7. Greenfurbishment is not easy.

