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Green Buildings

Collaboration, Integration & Common Sense

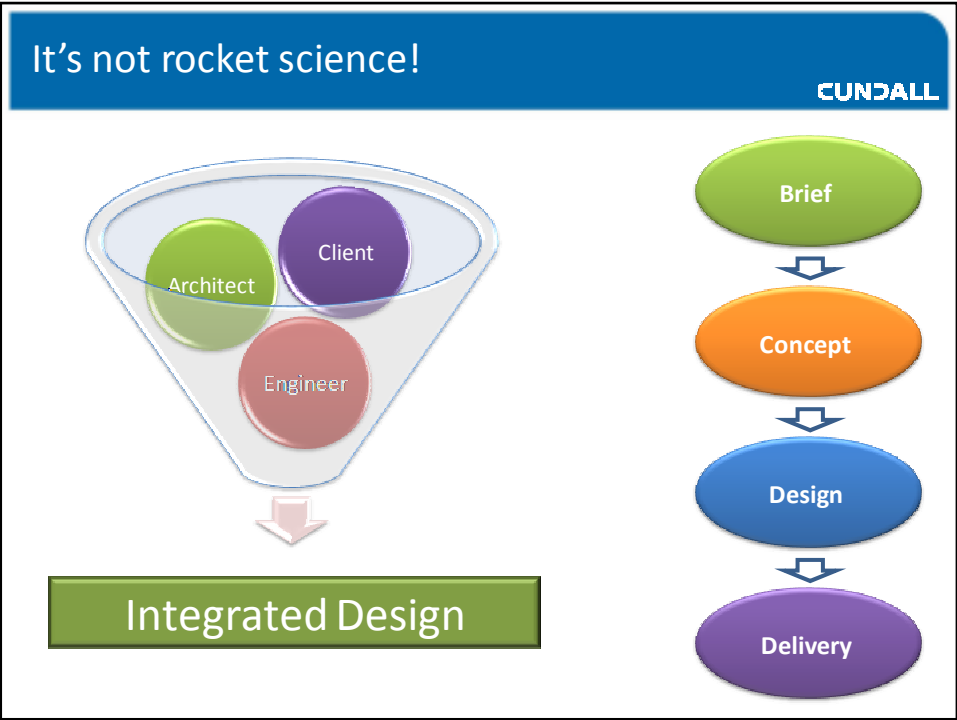


David Clark
Partner
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How to move towards greener buildings? **CUNDALL**



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Needs a multi-disciplinary approach

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Building Services

Environmentally Sustainable Design (ESD)

Civil and Structural

Light

Lifts

Environment

Fire

Civil systems

Geotechnical

Sustainability

Transportation

Different countries = different solutions

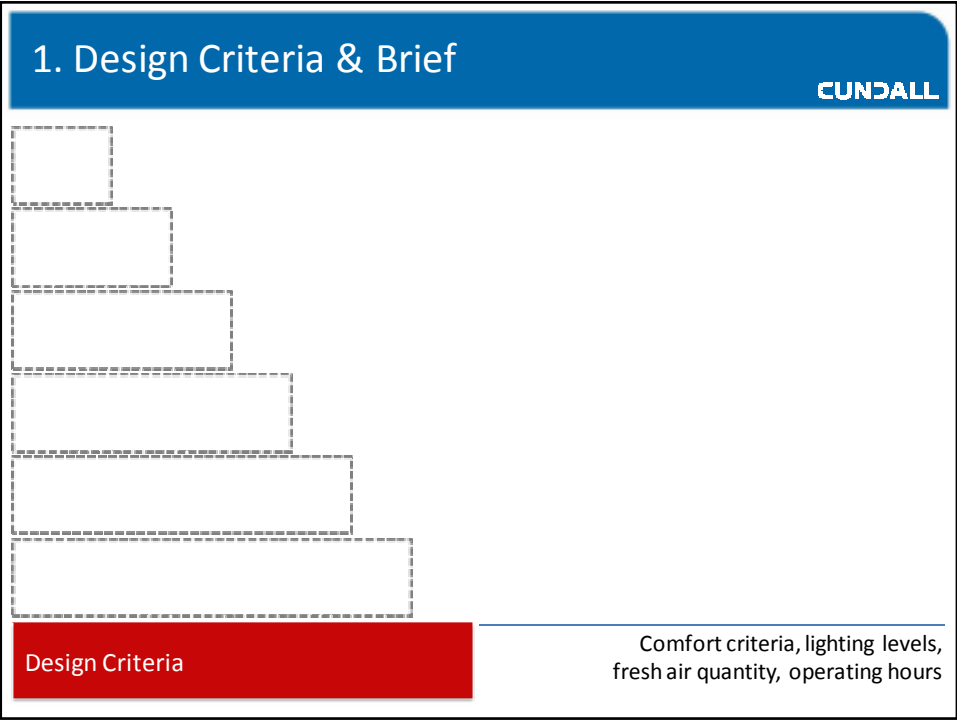
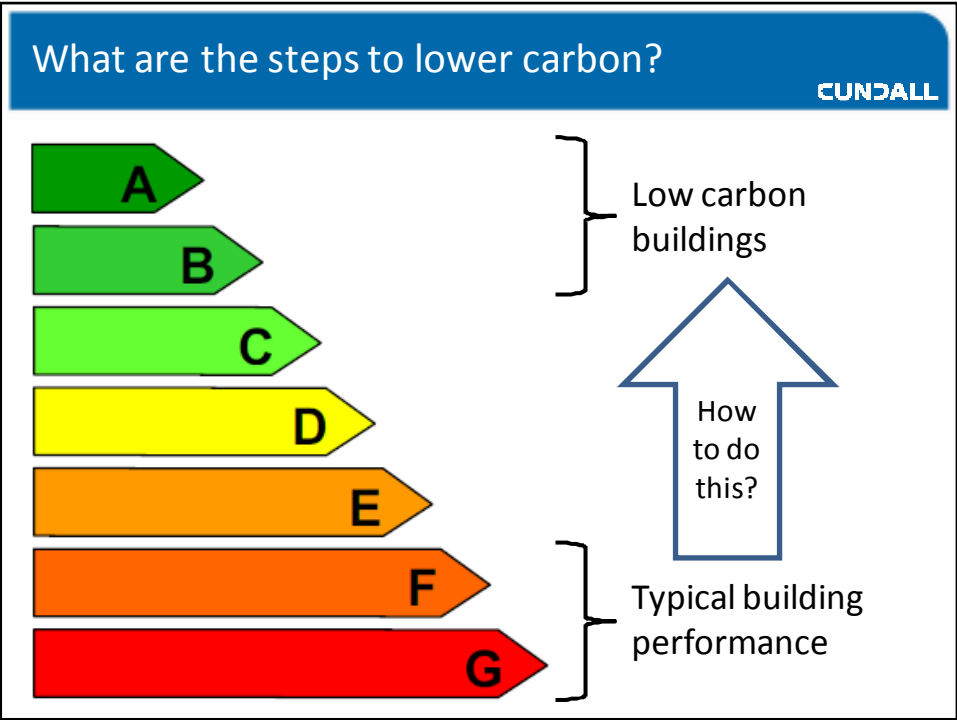
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Legislation will get tougher

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Certificat de performanță energetică	Performanța energetică a clădirii		Notare energetică: 59,2	
	Sistemul de certificare: Metodologia de calcul al Performanței Energetice a Clădirilor elaborată în aplicarea Legii 372/2005		Căldirea certificată	Căldirea de referință
	Eficiență energetică ridicată			
				B
	Eficiență energetică scăzută		E	
	Consum anual specific de energie [kWh/m²an]		430	180
	Indice de emisii echivalent CO ₂ [kg _{CO2} /m²an]		85	40
	Consumi anual specifici de energie [kWh/m²an] pentru:		Clasă energetică	
			Căldirea certificată	Căldirea de referință
	Încălzire:	240	D	B
Apă caldă de consum:	110	E	C	
Climatizare:	-	-	-	
Ventilație mecanică:	-	-	-	
Iluminat artificial:	80	E	C	
Consum anual specific de energie din surse regenerabile [kWh/m²an]:		0		



Define comfort criteria **CUNDALL**



VS1, Adelaide
6 Star Green Star

Setpoint Changes




Design Temp (°C)	Peak Cooling (%)	CO2 saving (cooling) (%)
22	100	0
24	~90	~5
26	~80	~15

Green Lease: design temp 20°C – 26°C

Trade off: 100% outside air & user control of air grilles

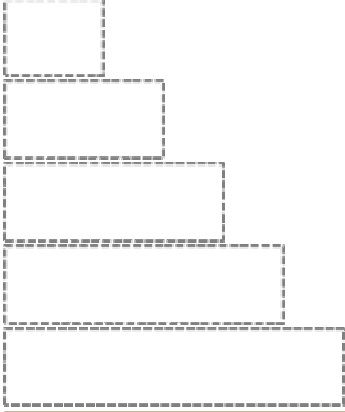
Lighting design **CUNDALL**



Avoid excessive lighting levels
Provide lighting to suit tasks

2. Passive Design

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Passive Design

Design Criteria

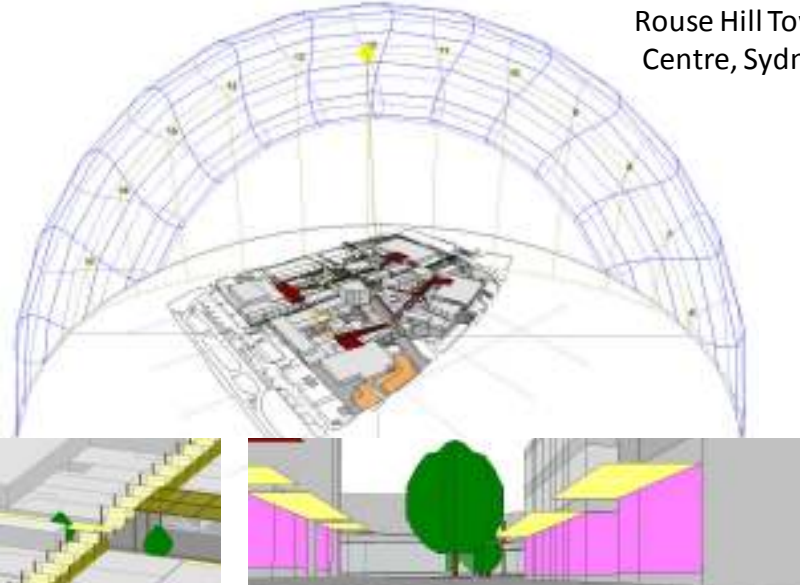
Form: daylight & natural ventilation
Fabric: insulation, facade, thermal mass

Comfort criteria, lighting levels,
fresh air quantity, operating hours

Site layout for optimum solar

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Rouse Hill Town Centre, Sydney



Comfortable outdoor retail spaces

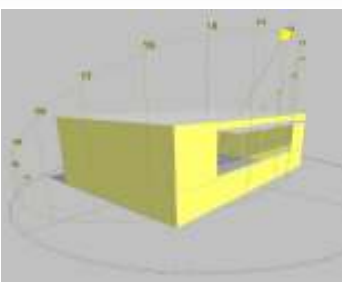
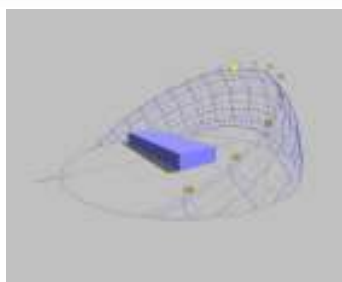
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Rouse Hill Town Centre, Sydney
Banksia Awards – People's Choice Award 2008

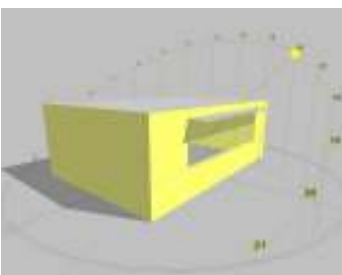
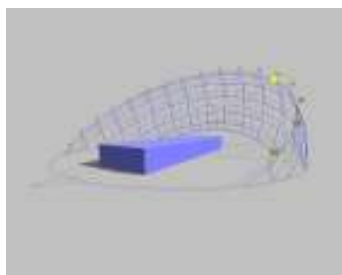
Built Form – orientation

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North South
Orientation

Effective
External
Shading



East West
Orientation

Difficult to
Shade

Layout – ideal for daylight / nat vent

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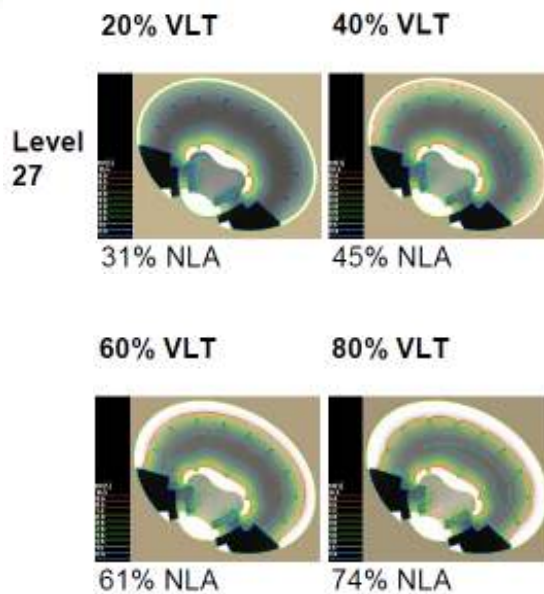
Vodafone HQ, Newbury

Daylight studies to inform fabric

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Space - 1 Bligh St, Sydney

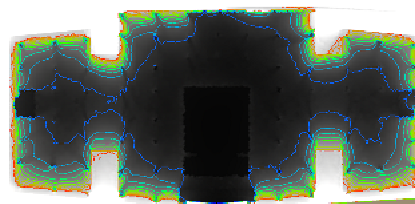
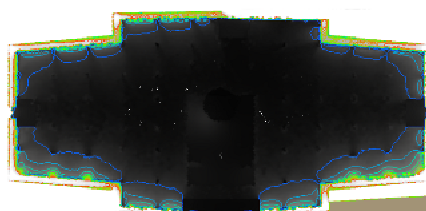


Daylight studies to develop form

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Westfield Centrepoint, Sydney



Facade design

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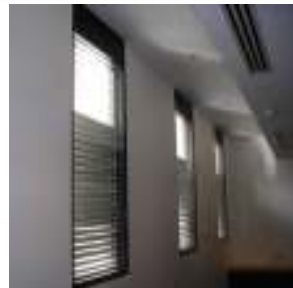


facade prototype

- Impacts
 - Energy (HVAC, lighting)
 - Comfort
 - Daylight / Views / Glare
 - Aesthetics
 - Cost (capital / maintenance)
- Issues
 - Area / type of glass
 - Natural ventilation
 - Shading
 - U-value / permeability

Achieving both daylight & solar/glare control

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55 St Andrews Place, Melbourne

Sustainable Refurbishment of the Year 2007



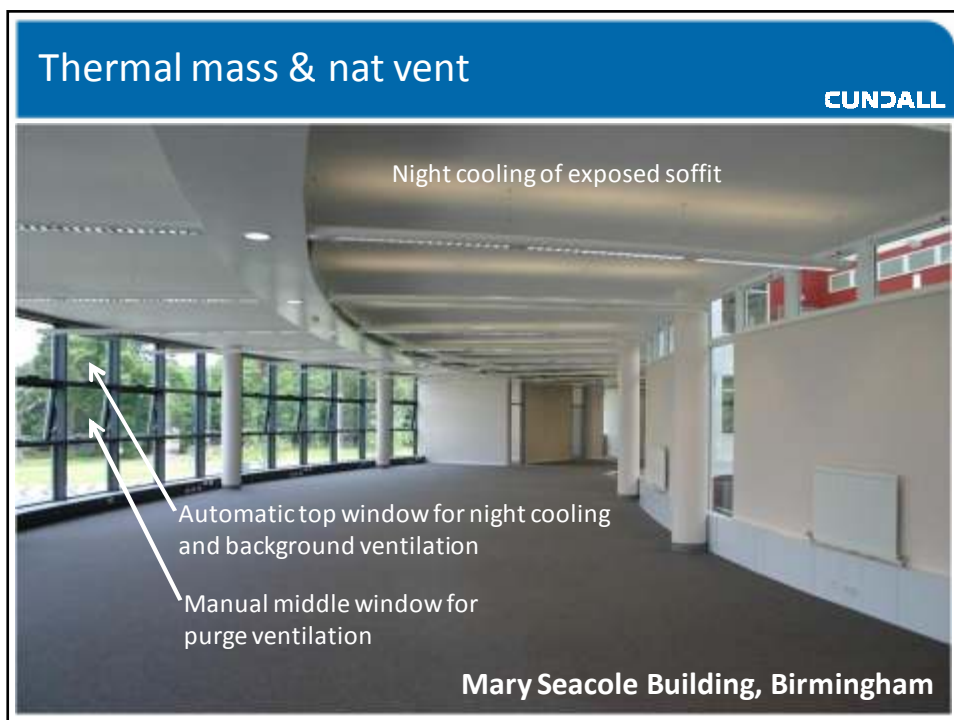
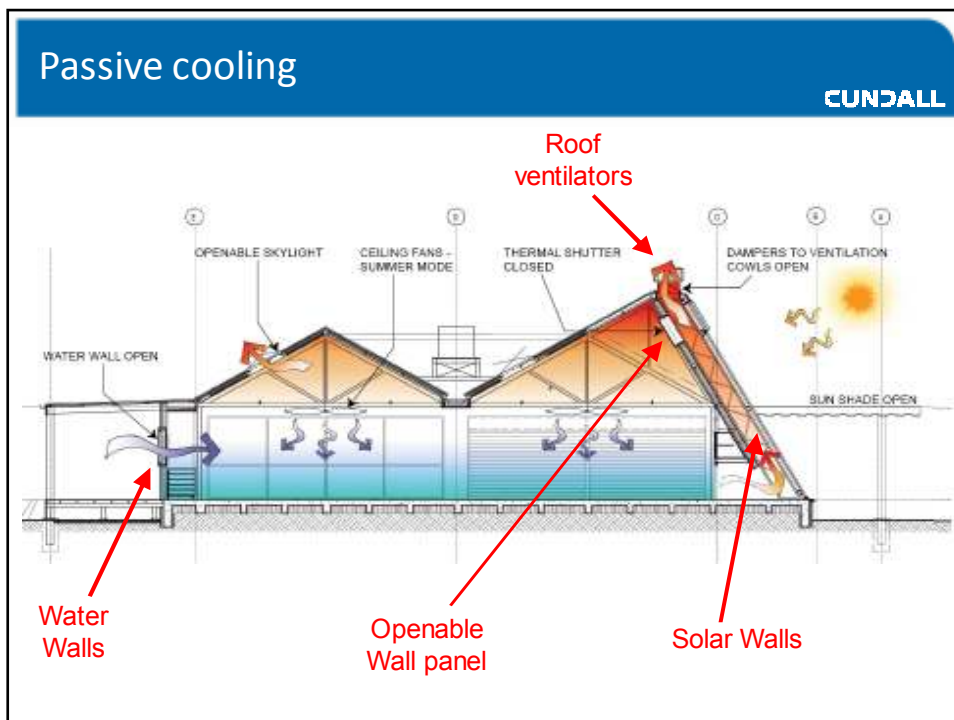
Natural Ventilation & Passive Design

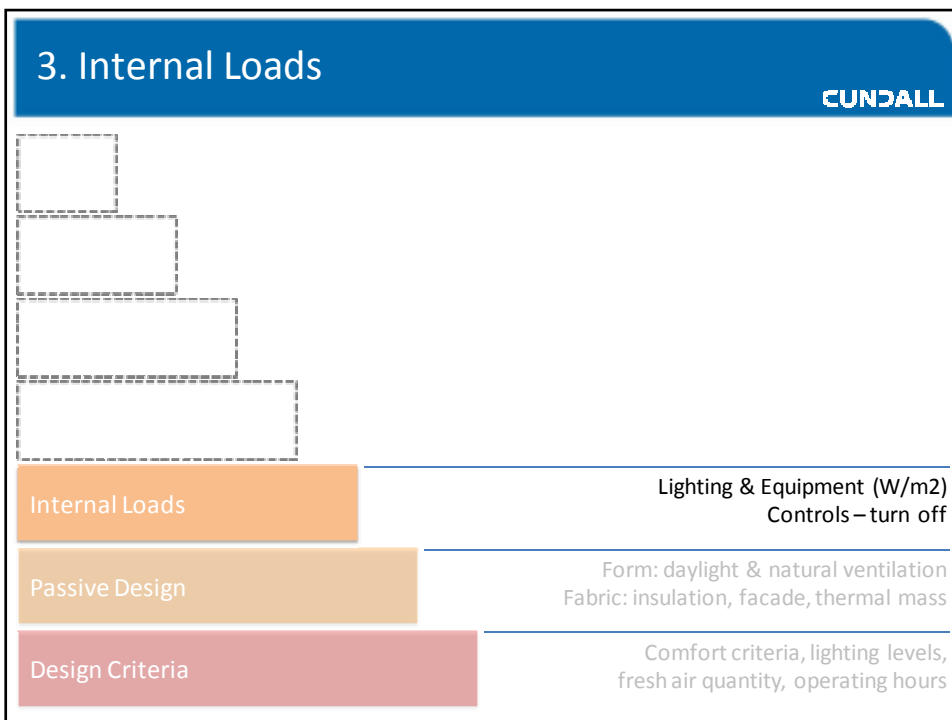
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Sustainable Living Centre, St Leonards College, Melbourne

United Nations Assoc. Of Australia Green Building Award 2008







Efficient lighting

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Task lights




Modelling lighting options





61W light fitting

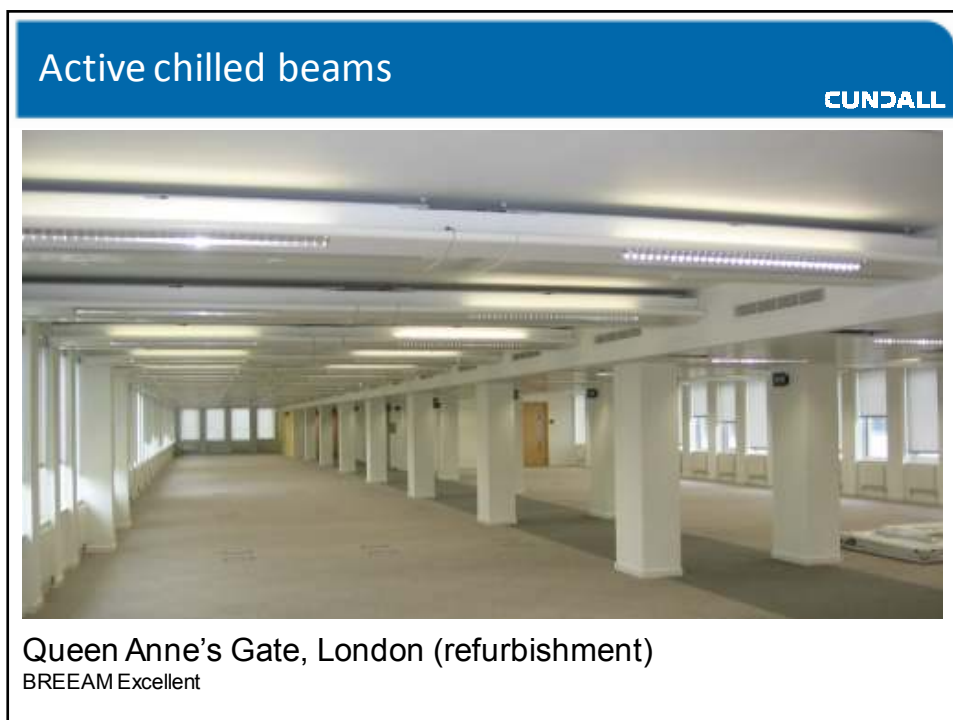
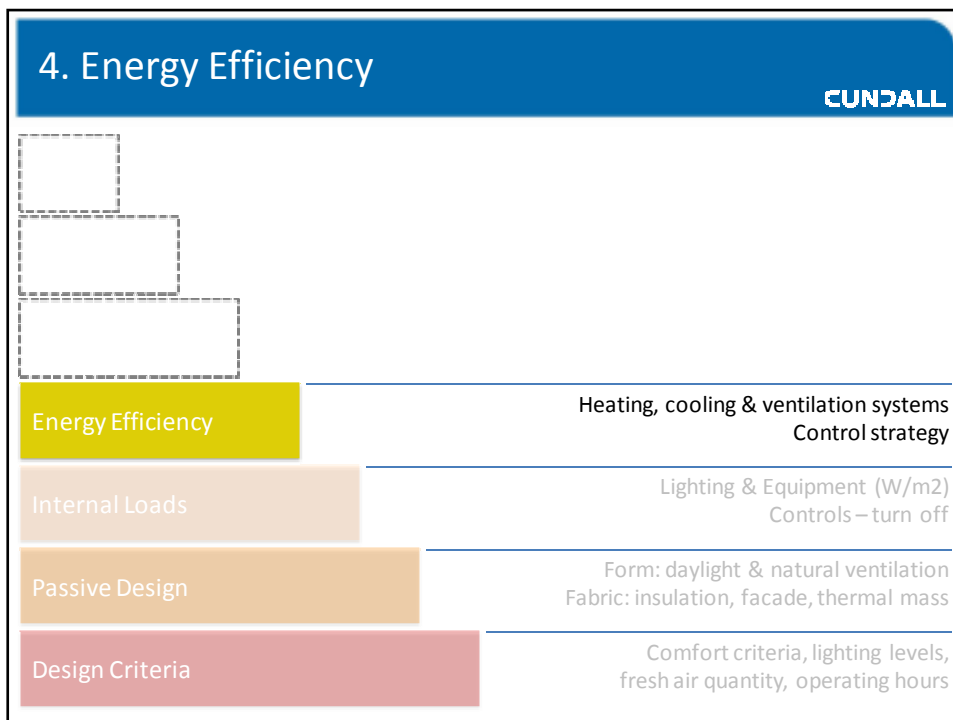


62W but 30% more light output



Improving Technologies
*GaN LED – 10x cheaper
(available in 2011?)*

Not all light fittings are the same!



Passive chilled beams

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The Gauge, Melbourne
6 Star Green Star




Displacement

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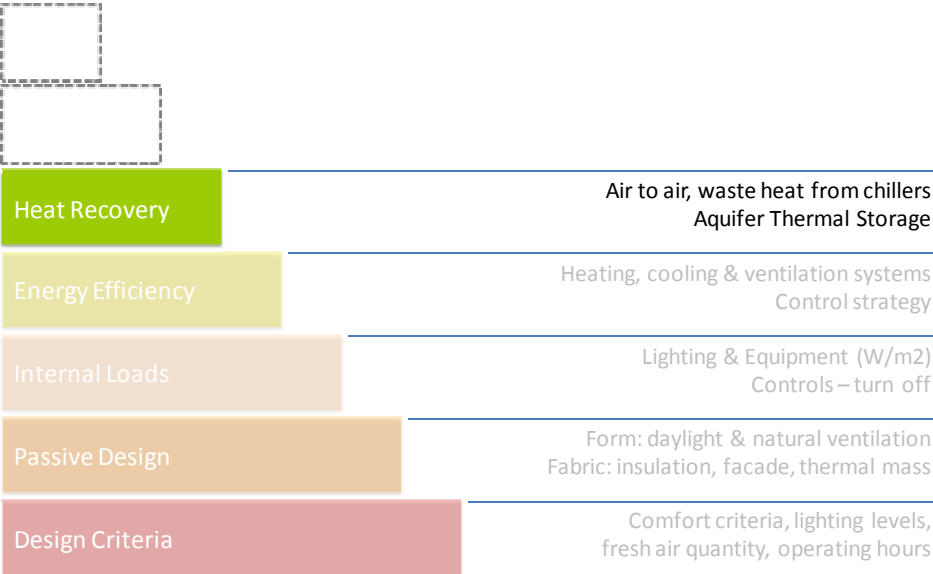
Cadburys, Birmingham
BCO & Civic Trust Awards 2009

Displacement & chilled ceiling **CUNDALL**



Wellcome Trust HQ, London
BREEAM Excellent & numerous awards


5. Heat Recovery **CUNDALL**



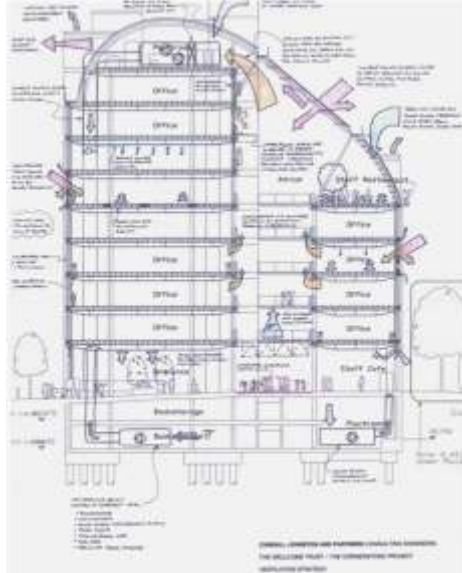
Heat Recovery	Air to air, waste heat from chillers Aquifer Thermal Storage
Energy Efficiency	Heating, cooling & ventilation systems Control strategy
Internal Loads	Lighting & Equipment (W/m ²) Controls – turn off
Passive Design	Form: daylight & natural ventilation Fabric: insulation, facade, thermal mass
Design Criteria	Comfort criteria, lighting levels, fresh air quantity, operating hours

Atrium heat recovery

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Wellcome Trust HQ



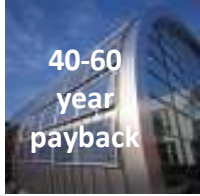
6. On-site renewables

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On-site renewables		biomass, geothermal, solar, wind fuel cells?
Heat Recovery		Air to air, waste heat from chillers Aquifer Thermal Storage
Energy Efficiency		Heating, cooling & ventilation systems Control strategy
Internal Loads		Lighting & Equipment (W/m ²) Controls – turn off
Passive Design		Form: daylight & natural ventilation Fabric: insulation, facade, thermal mass
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On-site renewables

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**40-60
year
payback**

PV cells - electricity



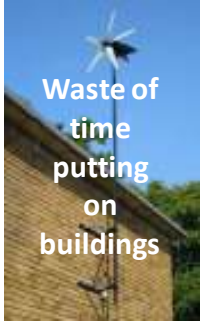
**More effective if
used for heating &
cooling**

Geothermal: heating & cooling



**10-15 year
payback**

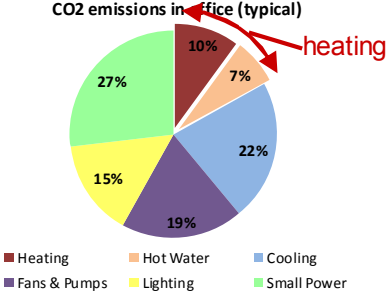
Solar hot water



**Waste of
time
putting
on
buildings**


Wind turbine - electricity

CO2 emissions in office (typical)



Category	Percentage
Heating	10%
Hot Water	7%
Cooling	22%
Fans & Pumps	19%
Lighting	15%
Small Power	27%

■ Heating
 ■ Hot Water
 ■ Cooling
■ Fans & Pumps
 ■ Lighting
 ■ Small Power



**Most cost
effective**

Biomass – heating / CHP

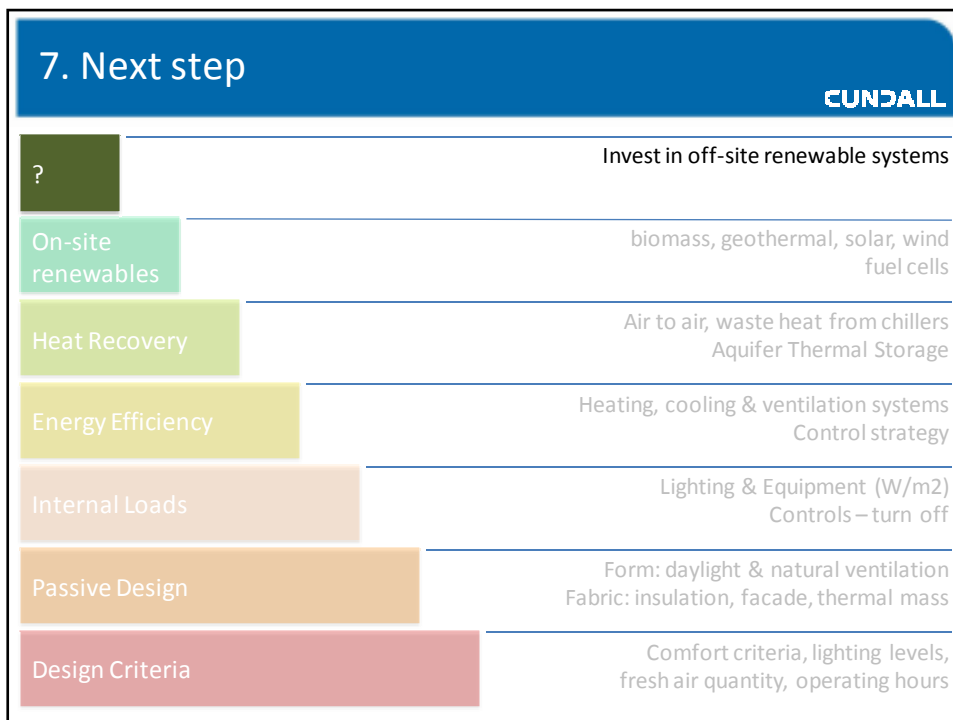
District Heating (biomass)

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Biomass & solar thermal district heating
Ry, Denmark




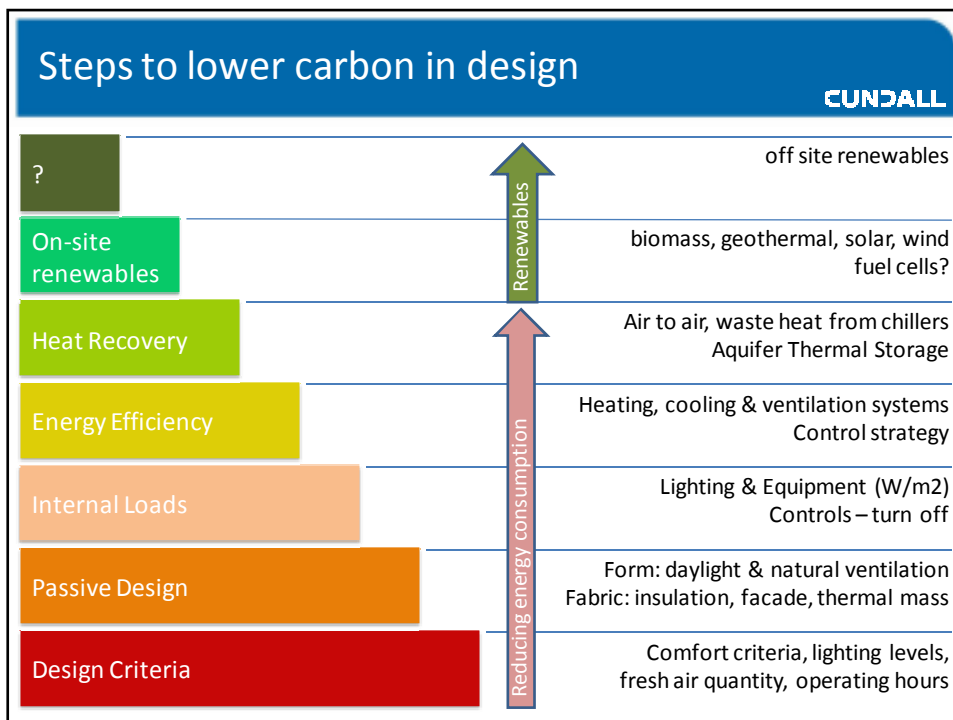
Off-site renewables (economy of scale) CUNDALL



**Large wind turbines
where it is windy**



**Solar panels where it is
sunny**



Thank You

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