Scaling up for large commercial

Rob Brimblecombe with special guest Johanna Trickett
Scaling up for large commercial

Series of interim steps and proof of concepts

1. B56 – Proof of concept
2. Financial models
3. Building capacity
4. Interim targets
5. Putting it all together
B56: Proof of concept
Integrated Design Team

• At the table: Architect, Engineer, PM, Passive House Advisor, Client, QS and Builder
• Key design debates
  • The thermal and air tight layers
  • Thermal bridges
  • Windows
  • Heat recovery mechanical system
  • Solar control and daylight
  • Cost and Program
Building 56 – Consumption vs Solar

Electricity consumption (kWh)

- Rooftop Solar
- Grid electricity
- Exported Solar

Average solar exposure

Monthly mean solar exposure (MJ/m²)
Office Energy Benchmarking

27% reduction

~90% reduction
Lessons Learned

1. Set a clear target and expectations from the start
2. Need buy in from every part of the team
3. Integrated design with early contractor engagement
4. Design has to accommodate local market and industry capability
5. Need to educate all of the sub-contractors
6. Some parts of the build will cost more than code
Moving from concept to certification

1. Building the value of Passive House
2. Addressing perceived cost premium
3. Building/finding design expertise in big firms
4. Setting documentation expectations
5. Building air tight construction experience
6. Sourcing suitable products e.g. HRV
7. Managing contractor risk premium
Building Exposure for Passive House

- 2016 Architecture and Design Sustainability Award in the large commercial category.
- Green Gown Award: Built Environment - 16th International ACTS Conference
- 2016 Premiers (Victorian) Sustainability Awards - Finalist
5 Star Green Star cost premium vs performance
Passive House – Perceived cost premium

- Actual Green Star
  Capital Cost = $4,640 /m² p.a.
  Energy cost = $14.60 /m² p.a.

- Predicted Passive House
  Capital Cost = $4,570 /m² p.a.
  Energy cost = $5.30 /m² p.a.
Building Capability – Air Tightness

- Detailing and testing on all fabric projects
  - Tested a range of small projects
  - Aiming to test 20,000m² building later this year
Building Capacity – Documentation

Biomedical Teaching Building

- Modeling in PHPP
- Targeting 3 ACH50
- Targeting $\Psi < 0.04 W/mK$
- Briefed for 5 Star Green Star*
### Setting Documentation Expectations

#### Principle Project Requirements (PPRrs)

<table>
<thead>
<tr>
<th>Performance Criteria:</th>
<th>Requirement:</th>
<th>Allocation of Responsibility:</th>
</tr>
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<tbody>
<tr>
<td>Building Air-Tightness</td>
<td>Project team to design and deliver a building that achieves &lt;0.6ach at 50Pa (under +ve and -ve pressure) (ACH50), as verified with an on-site pressure test (in both pressurized and depressurized states).</td>
<td>Architect + Façade Engineer + Contractor</td>
</tr>
<tr>
<td>References:</td>
<td></td>
<td></td>
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<tr>
<td>• Passive House</td>
<td></td>
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<td>• AS/NZS ISO9972</td>
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**Concept Design Stage:**
- Architect to articulate how the concept form of the building will facilitate cost effective airtight construction.

**Scheme Design Stage:**
- Architect and façade engineer to produce drawings to identify how the air layer (roof, walls, glazing installation details and floor) will provide a continuous airtight seal around the building, identifying the main airtight elements/materials, any potentially challenging details and appropriate mitigation strategies.
# Facilitate Integrated Design

## Key IDP Workshops
- Initial Research
- Workshop 1 Initial Evaluation
- Research + Analysis 1
- Workshop 2 Concept Exploration
- Research + Analysis 2
- Workshop 3 Scheme Integration
- Research + Analysis 3
- Workshop 4 Scheme Validation
- Research + Analysis 4

## Key Small Group Focus Workshops
- Workshop 1 Objectives:
  - Define project scope and goals
  - Establish team roles and responsibilities

## Objectives
- Project Set-Up
- Briefing Stage
- Concept Design
- Scheme Design
- Design Development

## Energy
- Workshop 1 Outcomes:
  - Develop Energy Performance Targets
  - Identify energy savings opportunities
  - Concept design sketches for site and building

## IEQ
- Workshop 1 Outcomes:
  - Develop IEQ Performance Targets
  - Identify IEQ performance improvements

## Integrated Design Process Deliverables
- Concept Design Key Deliverables:
  - Initial Energy and daylight analysis
  - Review and optimization
  - Initial budget cost model

## Schematic Design Key Deliverables:
- Review of daylighting and daylighting analysis
- Energy performance report
- OPR document incorporating energy and performance targets

## Research + Analysis
- Workshop 4 Objectives:
  - Collect data and analysis
  - Identify opportunities for improvements
  - Finalize project proposal and recommendations

## Design Development
- Workshop 5 Objectives:
  - Optimize design
  - Finalize project proposal
  - Prepare for presentation
Putting it all together

Technology Education (TEd) Building

- 10,000m² Engineering teaching & office
- Passive House Certification and IEQ PPRs included in tender
- Certified Passive House Designers on team
- Integrated design approach to Concept Design
TEd Concept Design

Workshops discussed:

- Benefits for the project
- Design for construction
- Daylight and solar control
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The LENSES Framework
Future ready and adaptable
Advances our understanding of sustainability and pathways to a regenerative future

Thriving community
Nurture and build community relationships within and beyond the campus

Living within limits
Contribute positively to living systems through greater alignment between human engineering and nature

Continuous learning
Promote a passion for learning and new horizons of discovery

Well loved
Create an open and inviting building that draws in the campus community

Biophilic and healthy environment
Increase health, well-being and a renewed connection to nature
Daylight Model Setup

Figure 1

138m x 41m x 18m

Figure 2

Overview Glazing
Daylight Modeling – Lower Ground

Daylight Autonomy
sDA 53.61%

Lower Floor, 30% Facade Glazing

Daylight Autonomy
Area of sDA compliance 61.44%

Lower Floor, 30% Facade Glazing Plus Skylights
Daylight Modeling – Upper Floor

Daylight Autonomy
Area of sDA compliance 44.11%

Upper Floor, 30% Facade Glazing

Daylight Autonomy
Area of sDA compliance 61.19%

Upper Floor, 50% Facade Glazing

Daylight Autonomy
Area of sDA compliance 80.31%

Upper Floor, 30% Facade Glazing Plus Skylights
TEd Passive House Blog

WHAT’S NEXT?
TED Building Project

MONASH University
First architectural render....