

Wren Urban Nest A Net Zero Carbon Case Study



Patrick Kavanagh – BDP

1st Runner Up in 2023 EFCA Future Leader Awards

Patrick Kavanagh



Engineering Director with **BDP**.
Chartered Engineer

12+ years of Sustainable Design Experience in
Australia and Ireland

Sustainability Accreditations:

BREEAM AP
LEED GA
WELL AP

BER Assessor
DEC Assessor
SEAI Energy Auditor

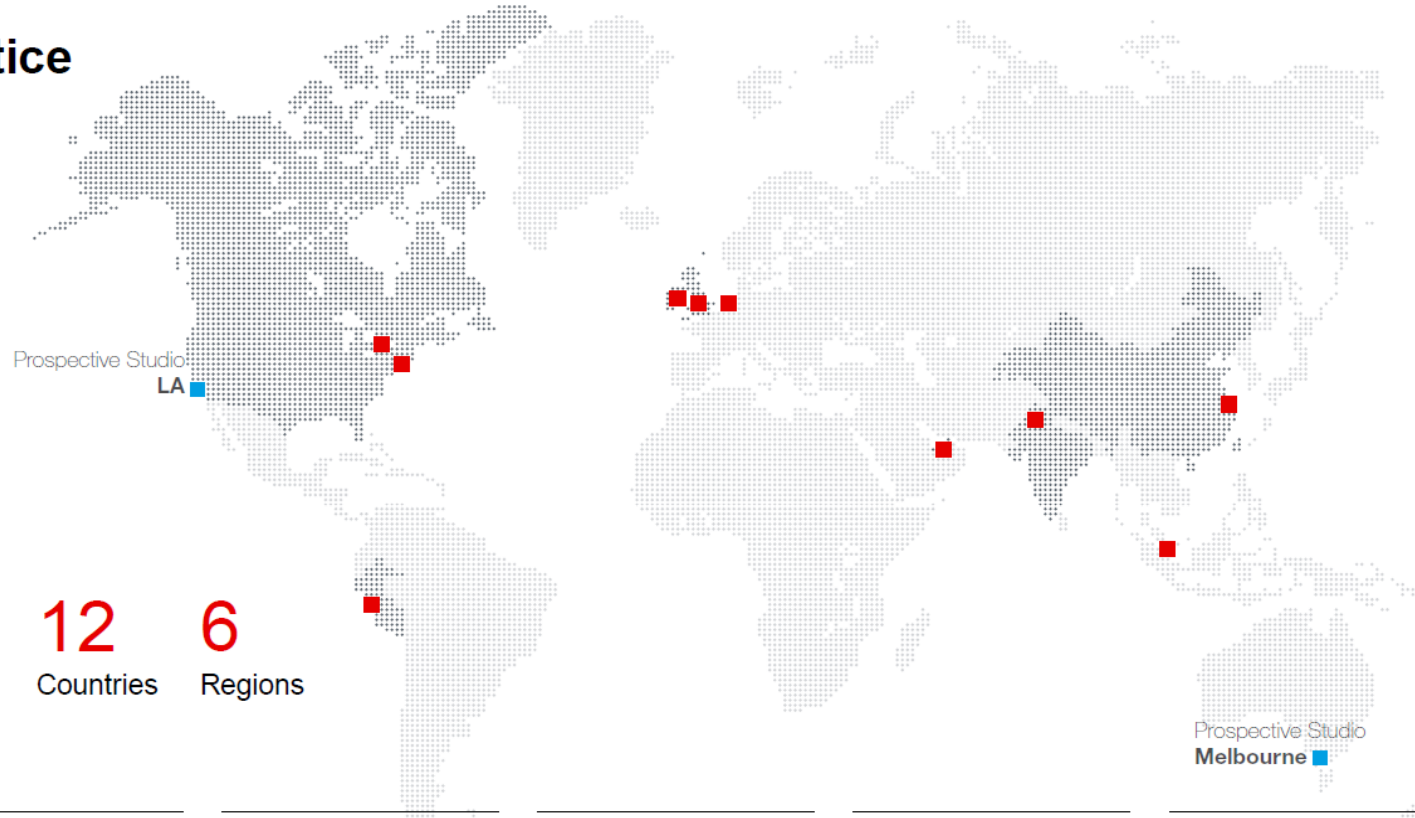
TUD External Examiner & Guest Lecturer



Our Global Practice

Our professions

- Architecture
- Acoustics
- Building Services Engineering
- Civil and Structural Engineering
- Design Management
- Graphic Design
- Inclusive Design
- Interior Design
- Landscape Architecture
- Lighting
- Masterplanning
- Planning
- Principal Designer
- Sustainability
- Urban Design



19 Studios
12 Countries
6 Regions

Prospective Studio
Melbourne

N America

New York
Toronto

S America

Lima

UK

Birmingham
Bristol
Cardiff
Edinburgh
Glasgow
Leeds
Liverpool
London
Manchester
Sheffield

Europe

Dublin
Rotterdam

MENA

Abu Dhabi

Asia Pacific

New Delhi
Shanghai
Singapore

25,000+ Projects / 2,000+ Design Awards

Introducing Wren Urban Nest

Opened to guests in September 2021

137 Hotel rooms that come in three sizes;

- Snug Nests (9.5sq.m)
- Cosy Rooms (12sq.m)
- Roomy Nests (18sq.m)

Lower Ground Floor Bar / Restaurant

Hotel Operator - Moran Hospitality

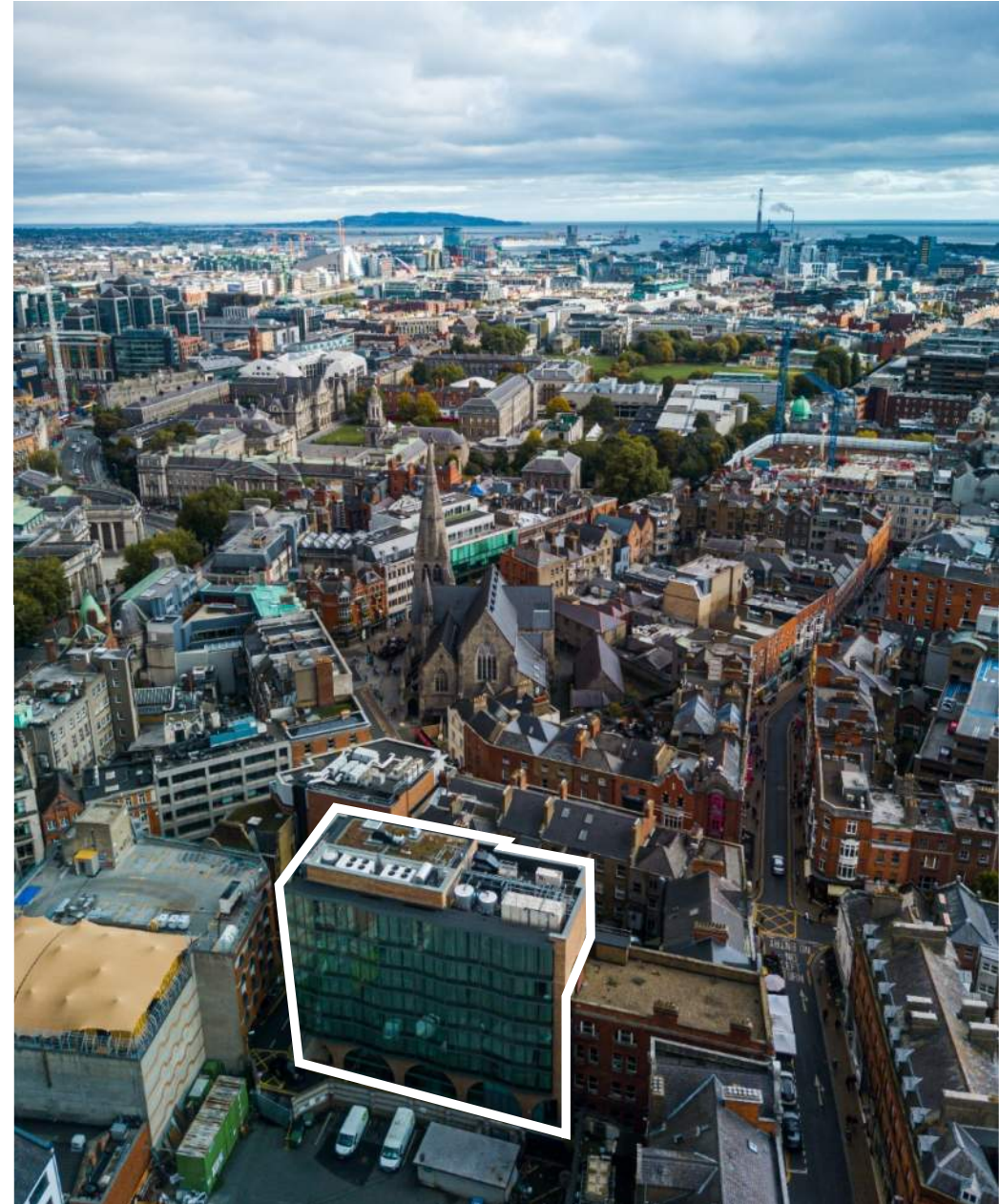
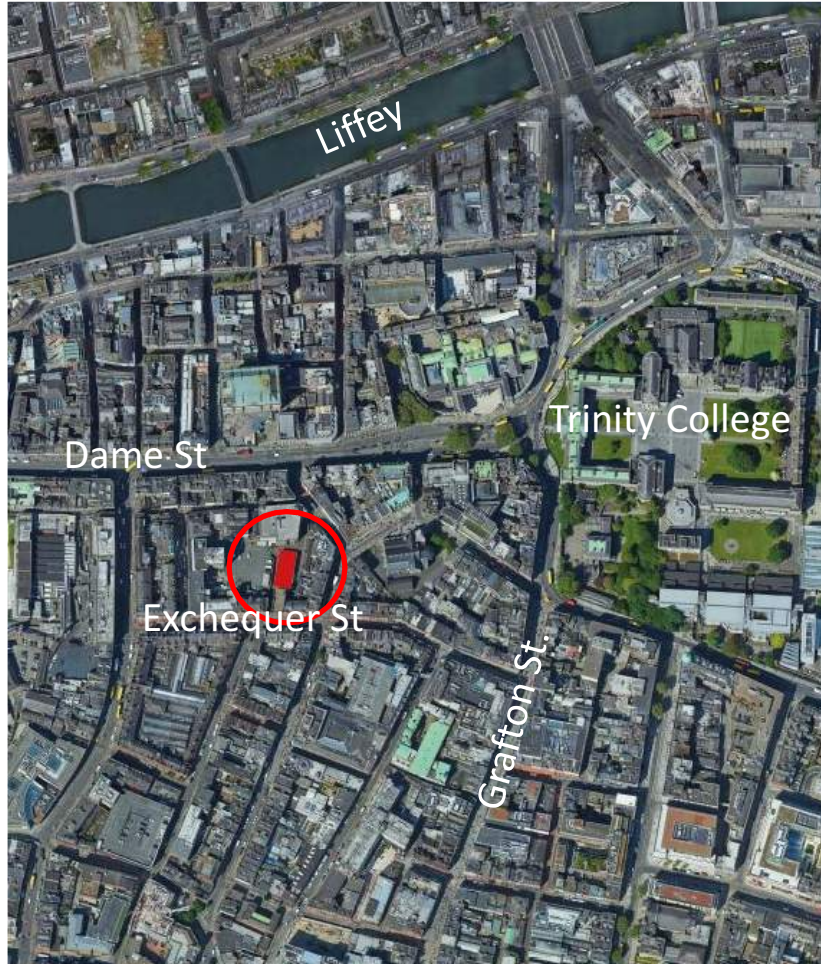
Team:

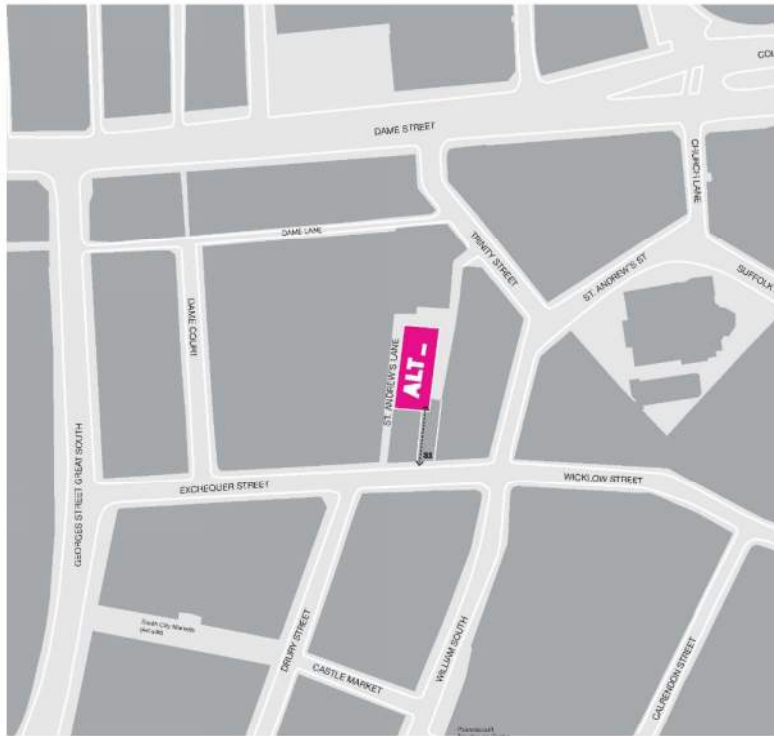
Architecture
Civil Structural
M&E Building Services
Acoustics
Disability Access Consultancy
Specialist Lighting



Context / Location

St. Andrews Lane, Dublin 2, Ireland





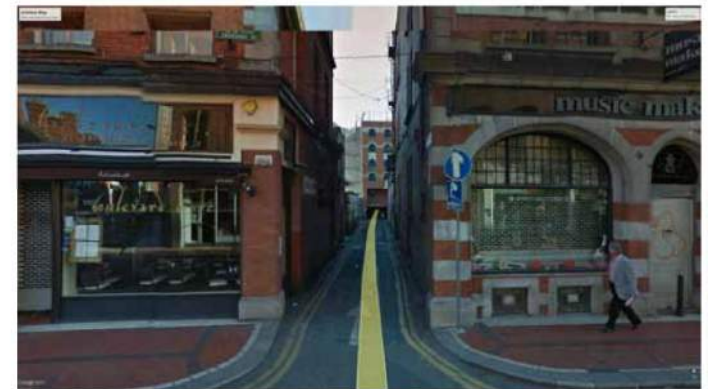
Site Location



View A

Site Challenges:

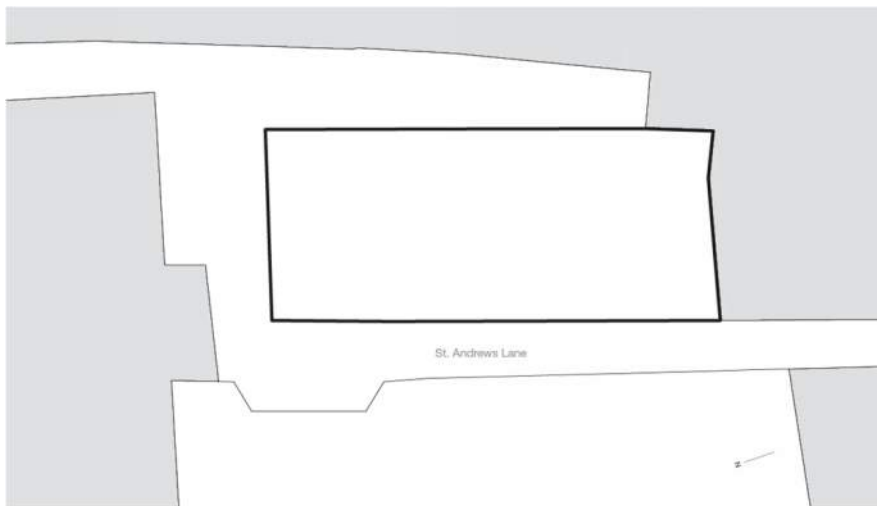
- Very small site footprint (32m x 14m)
- Neighbours were listed buildings
- Difficult Site Access
- Strict FSC requirements
- Poor line of sight



View B

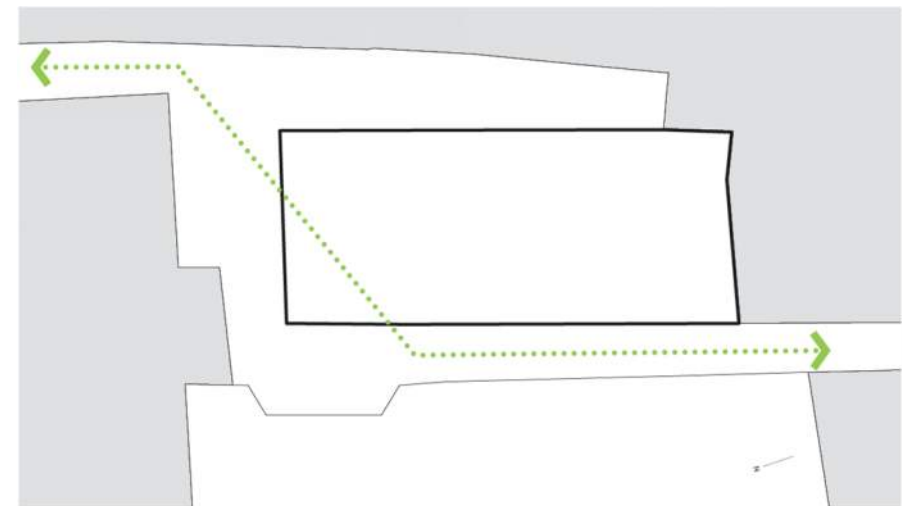
Response / Building form & passive design

Site



Existing Building

The existing Andrew's Lane Theatre building covered 100% of the site.

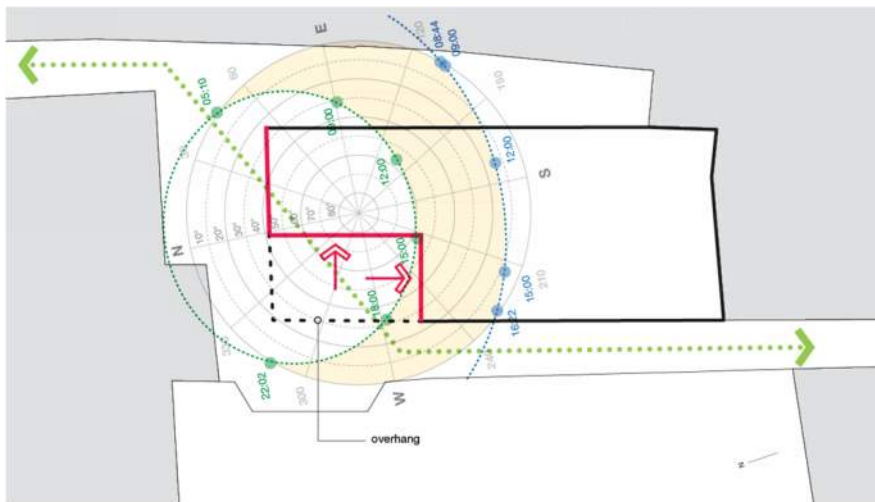


Desire Line

A pinch-point and blind spot exists on the north west corner of the site which creates an unwanted sense of enclosure. The diagram above indicates a notional desire line which will improve visibility and transparency.

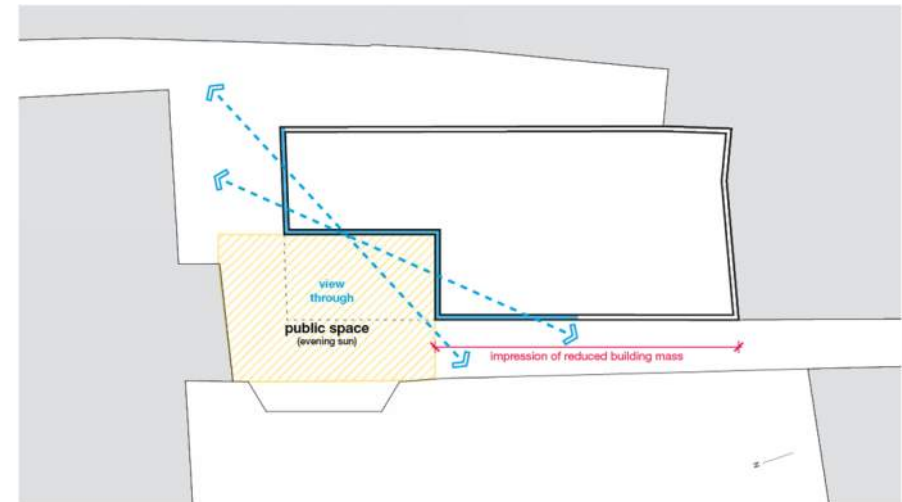
Response / Building form & passive design

Site



Porte Cochère

A double height setback on the north west corner of the site creates a sense of arrival while also improving sight lines. The new space avails of afternoon sunlight from the west.

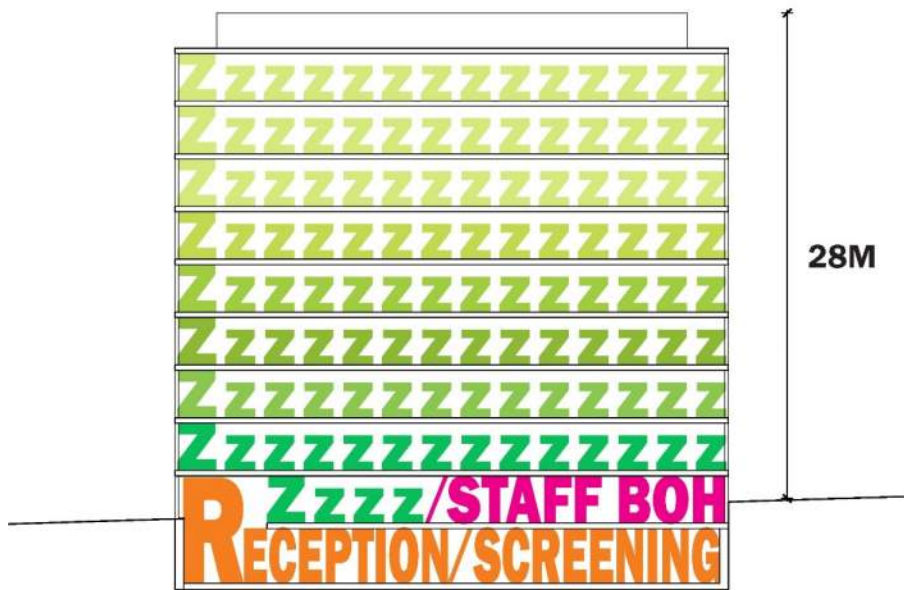


Transparency

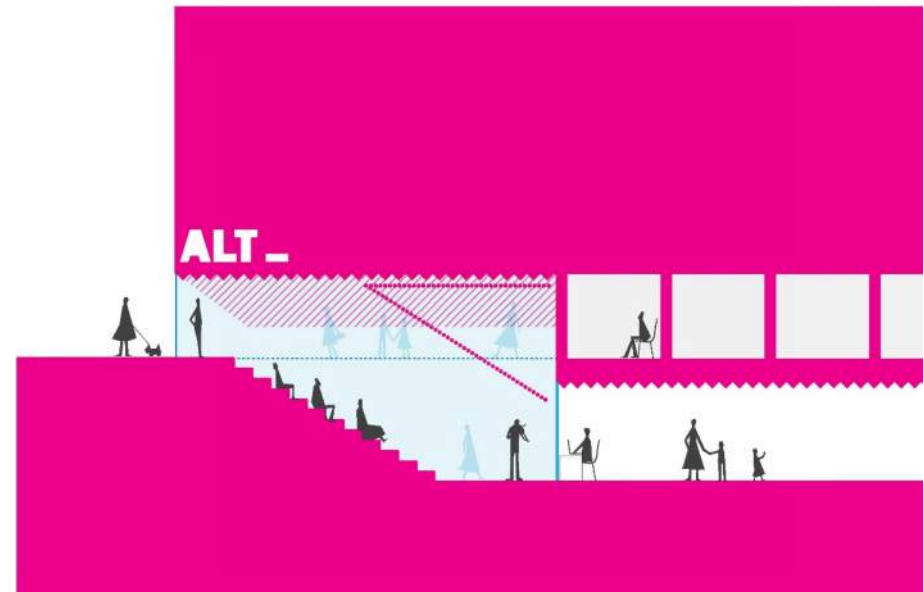
The creation of a public space along St. Andrew's Lane breaks down the perceived length of the lane

Response / Building form & passive design

Section



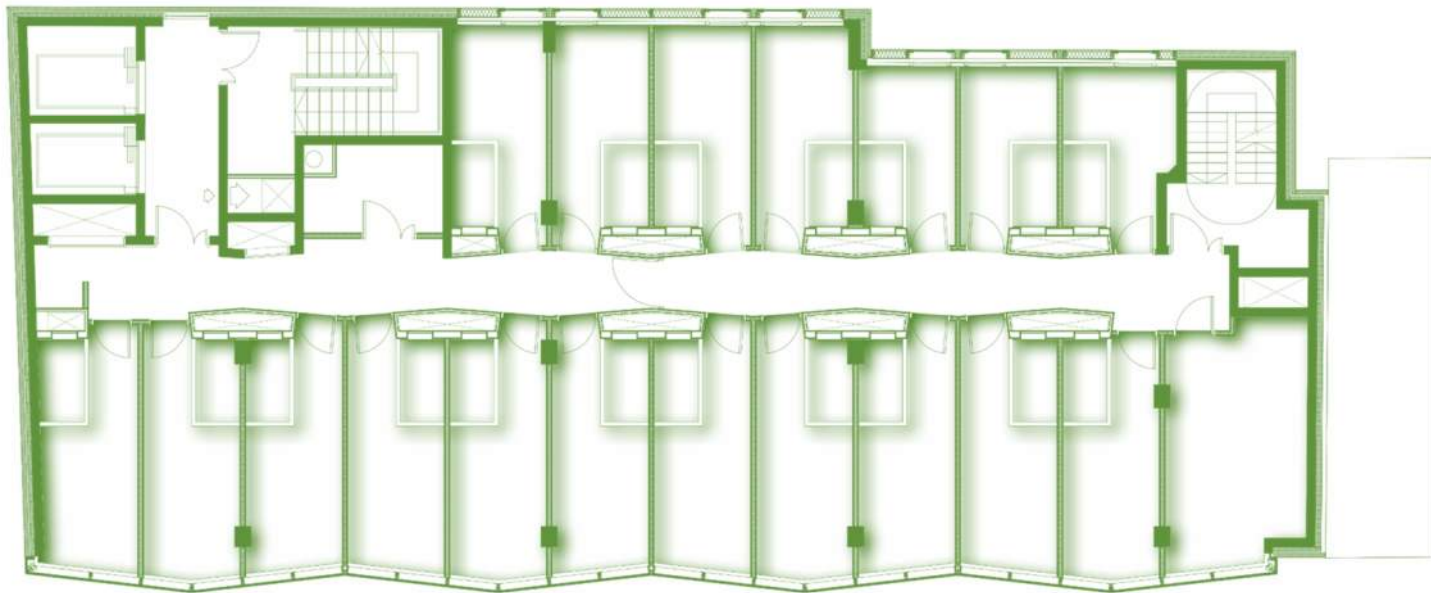
Overall Section Arrangement



Arrival Section

Response / Building form & passive design

Site



Typical guestroom floor

Pushing for maximum efficiency in the *boutique luxury* model

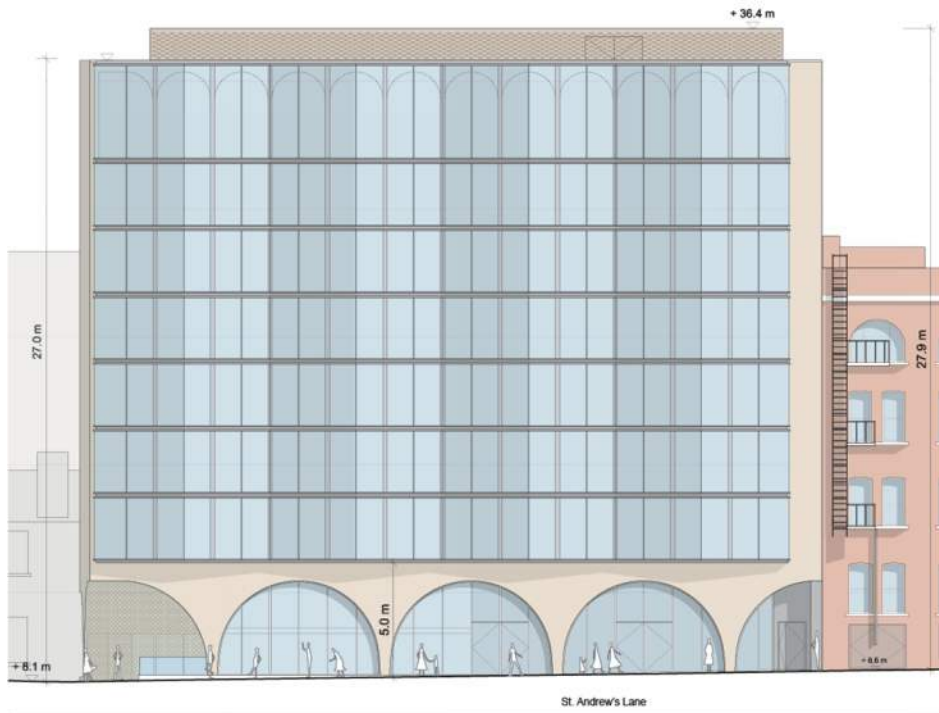
Response / Building form & passive design

Entrance



Response / Building form & passive design

Envelope – Passive Design



Façade Performance:

- External Walls – $0.15 \text{ W/m}^2\text{k}$
- Roof – $0.15 \text{ W/m}^2\text{k}$
- Ground Floor – $0.15 \text{ W/m}^2\text{k}$
- Glazing – $1.2 \text{ W/m}^2\text{k}$
- Air Permeability – $2.3 \text{ m}^3/\text{m}^2/\text{hr}@50\text{Pa}$

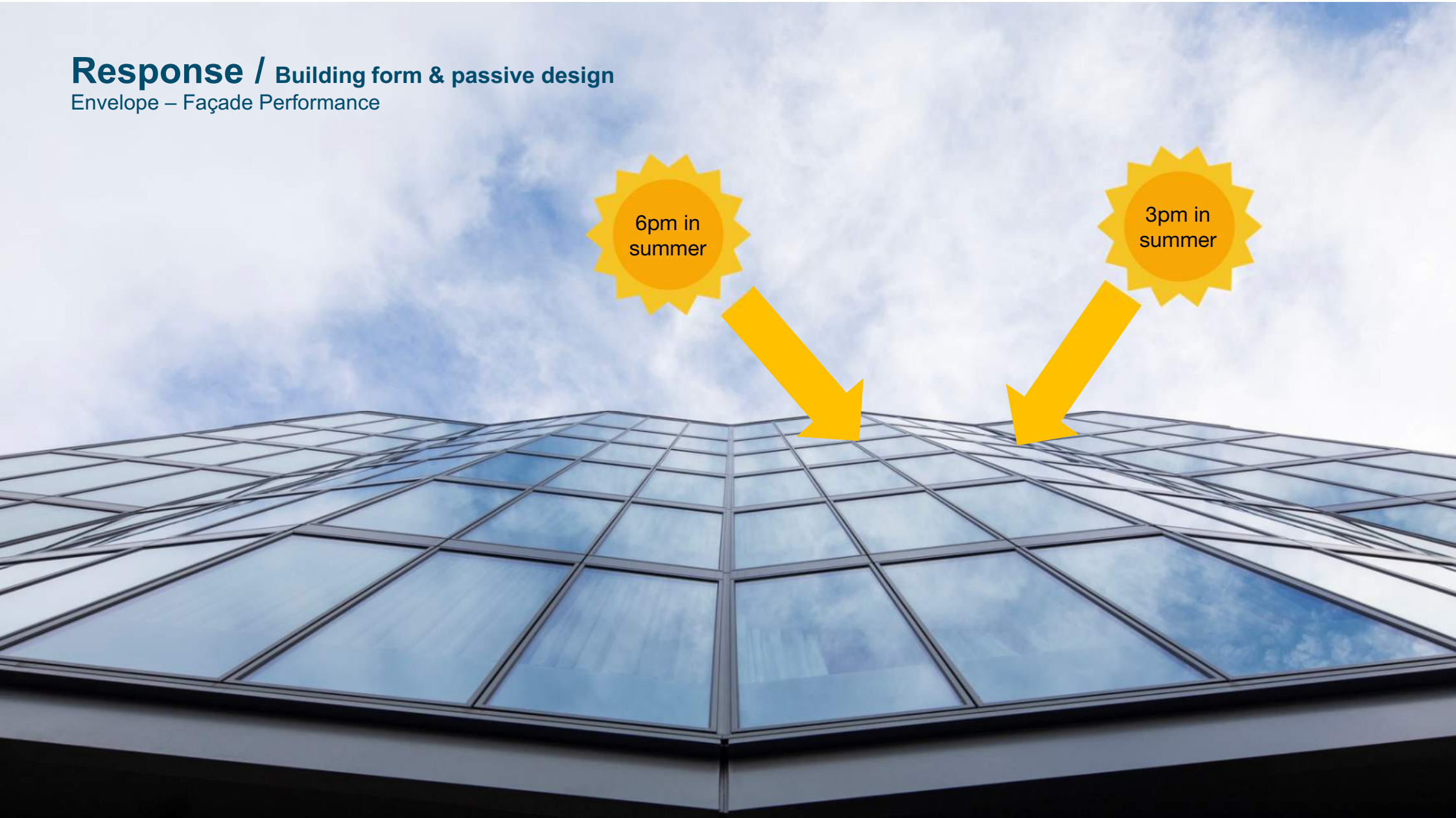
Response / Building form & passive design

Envelope – Façade Performance



Response / Building form & passive design

Envelope – Façade Performance



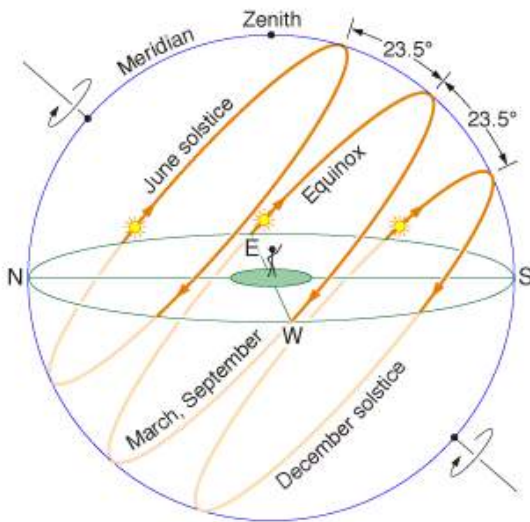
Response / Building form & passive design

Envelope – Façade Performance

Sun rises in the east and sets in the west.

In the afternoon we wanted to reduce the solar gain on the west façade but not compromise on daylight, views and Architectural design aspiration

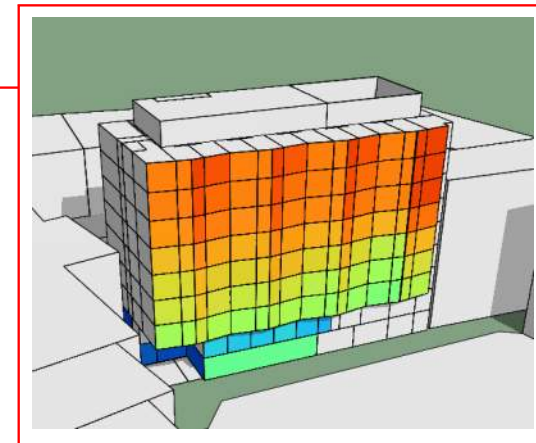
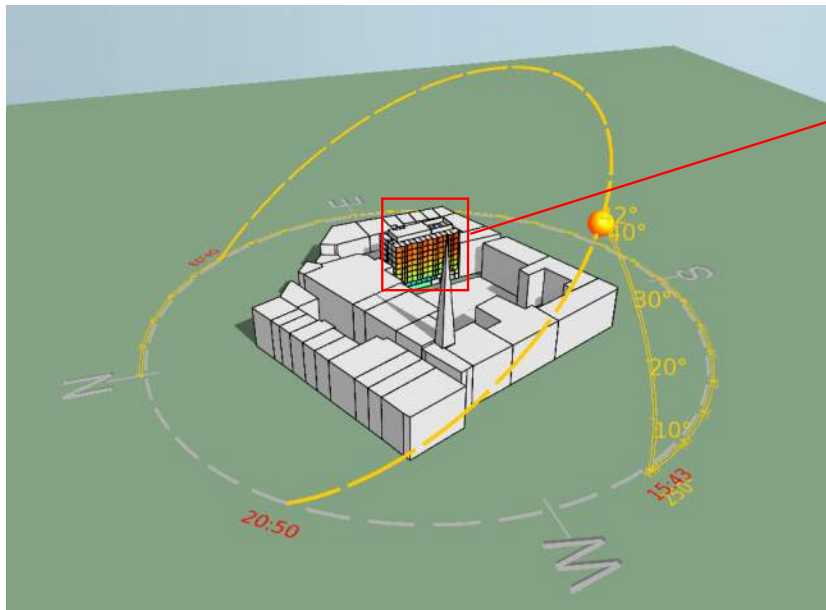
So we created different orientations with the curtain walling which reduced the peak cooling load on the west façade by 45%.



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Response / Building form & passive design

Envelope – Façade Performance



Bedrooms on the west façade in winter will still need to be cooled and there is always a hot water load in a hotel building.

So we designed the system in a way that it transfers the solar energy from the rooms on the west façade to the rooms in the shadow on the east façade or to hot water.

Response / Active Design

Sharing Energy

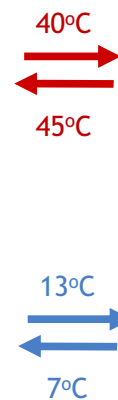


WINTER

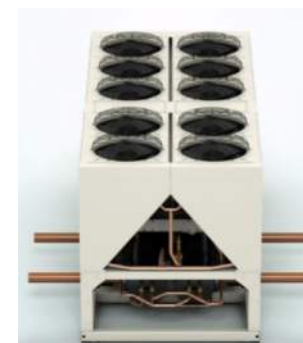
Bedrooms on east façade in heating mode



Bedrooms on west façade in cooling mode



AIR SOURCE HEAT PUMP
HEAT TRANSFER

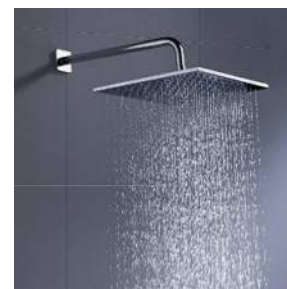


Response / Active Design

Sharing Energy



SUMMER



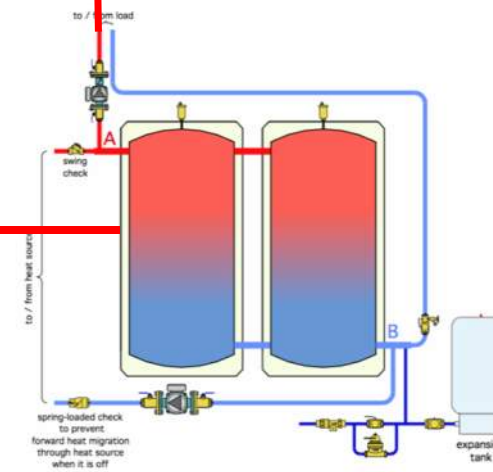
Bedrooms on east façade in cooling mode



Bedrooms on west façade in cooling mode

40°C
45°C

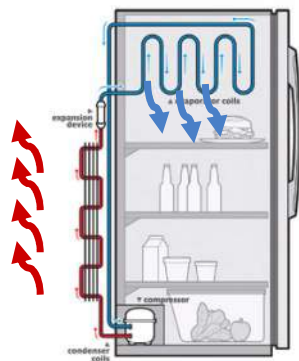
13°C
7°C



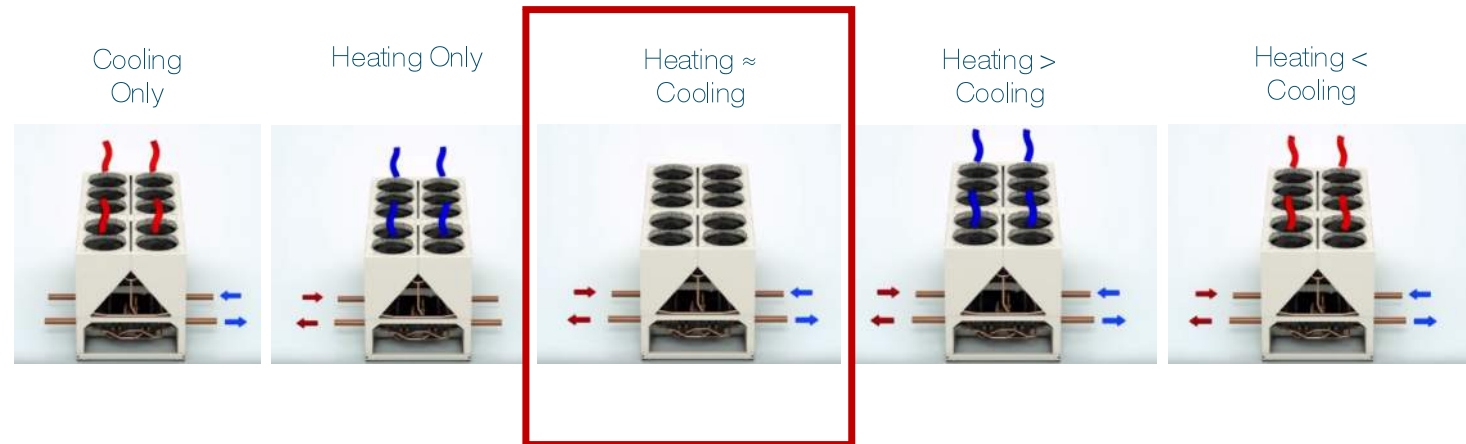
Response / Active Design

Sharing Energy

Leaving the fridge door open will actually heat the kitchen.....



Two circuits with 5 different operating modes:



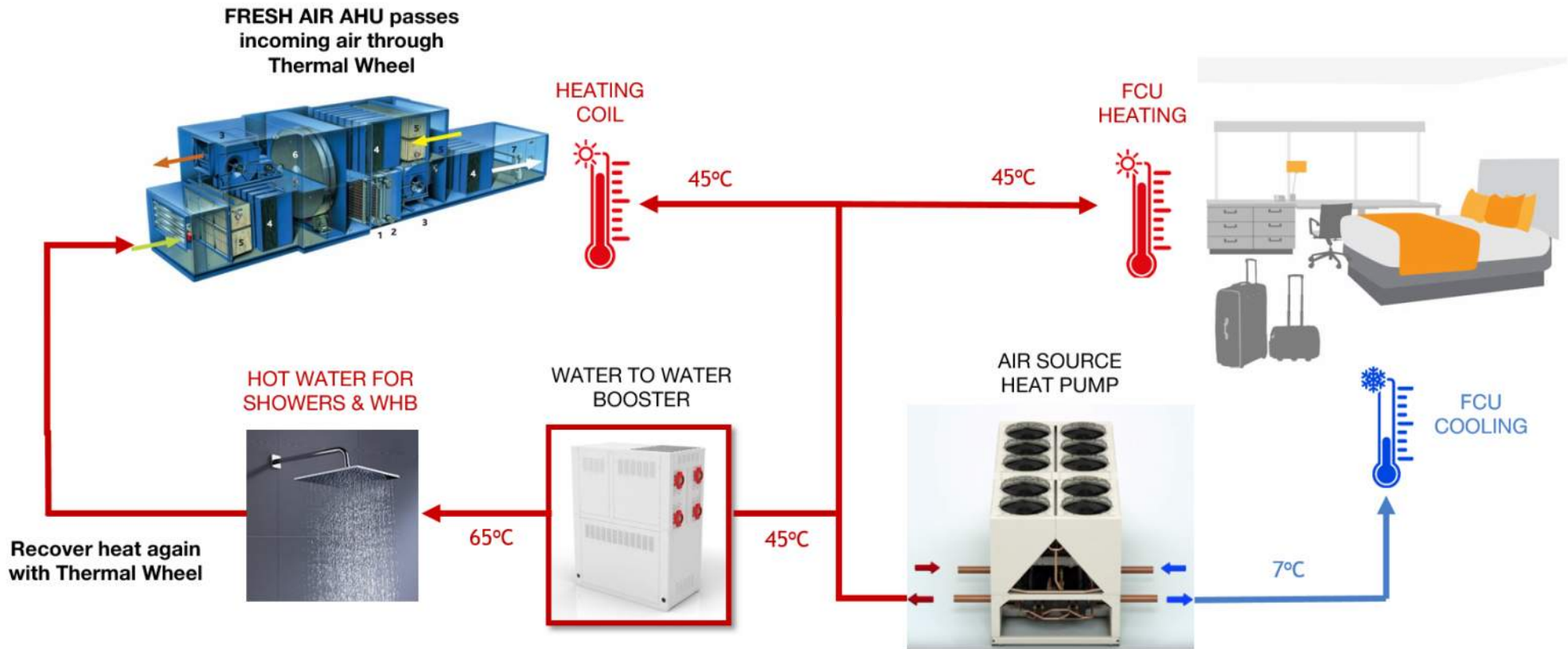
COP > 8.0 (1 kW Electricity In = 8 kW Out)

Chilled Water @ 7°C

Heating Hot Water @ 45°C

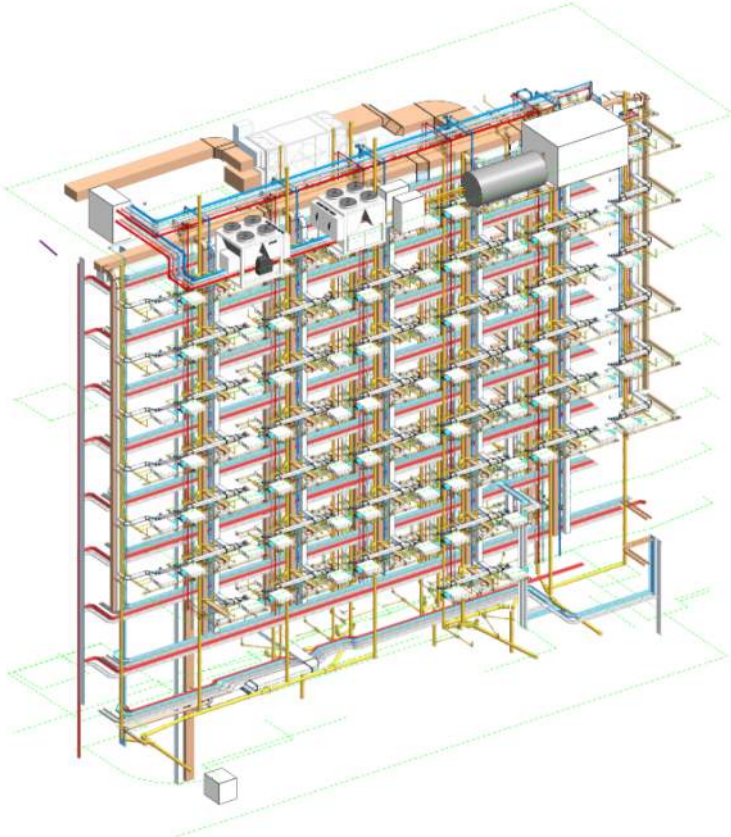
Response / Active Design

So we captured all the waste heat and used it wherever we could!



Response / Active Design

Complex Design Coordination



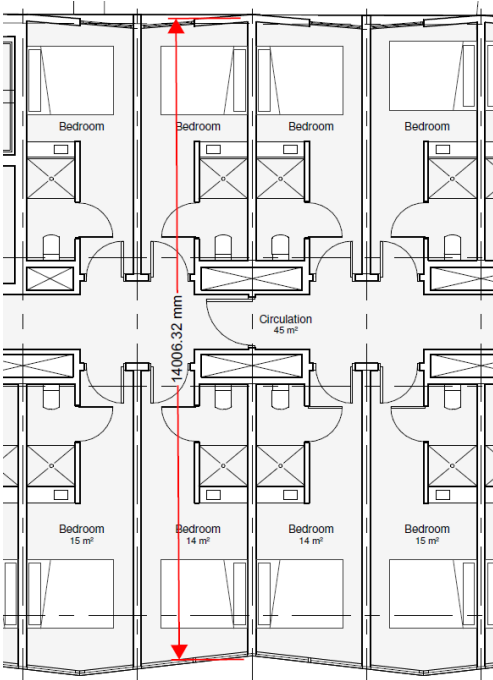
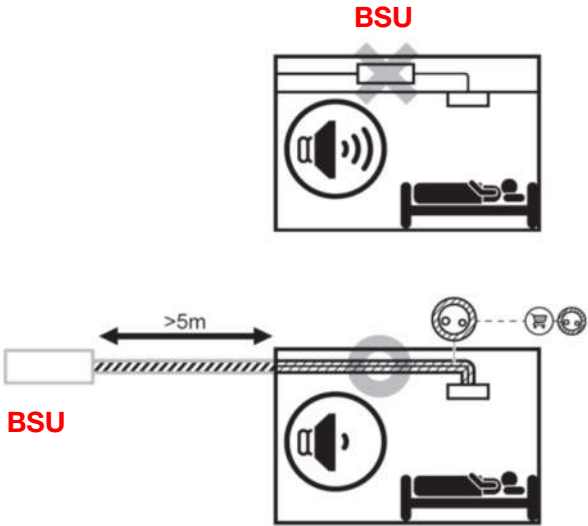
Takes time and dedication but it's worth it to be innovative!



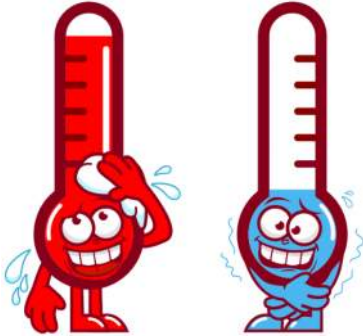
Response / Active Design

Acoustic and comfort decisions often overlooked

Traditional VRF System in Hotel



40°C supply air in heating
11°C supply air in cooling

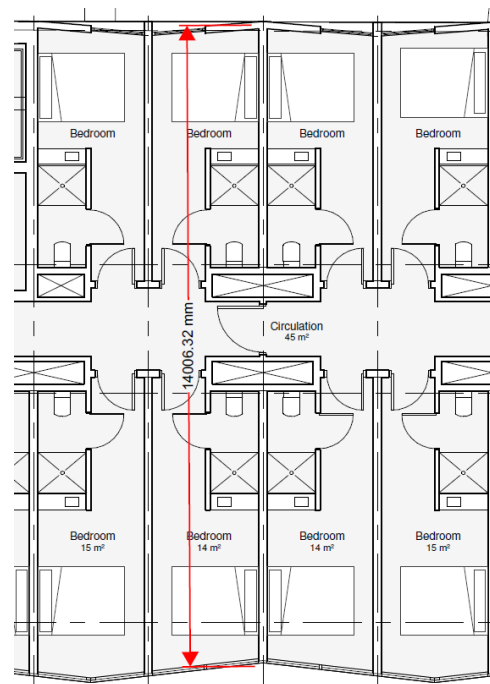


Response / Active Design

Acoustic and comfort decisions often overlooked



Water Based System Used



40°C supply air in heating
11°C supply air in cooling

29°C supply air in heating
13°C supply air in cooling

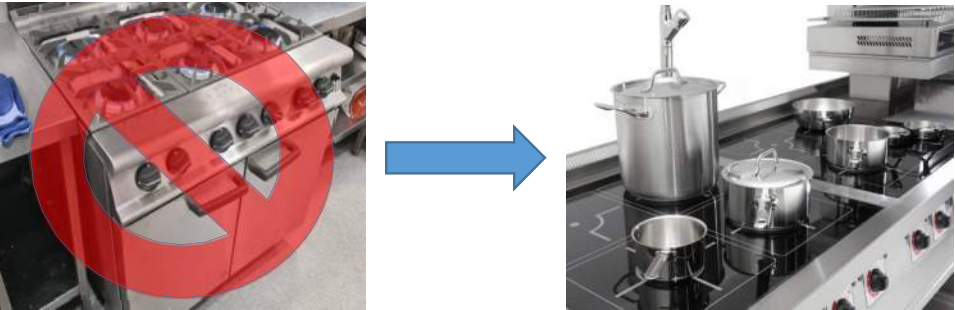


Low refrigerant use = Lower embodied carbon

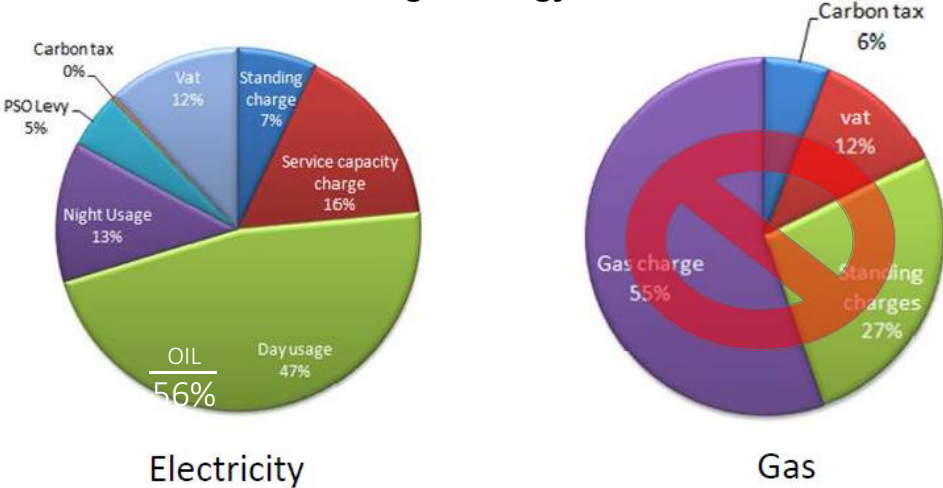


Response / Active Design

Kitchen Design – we designed out fossil fuels



A Single Energy Bill

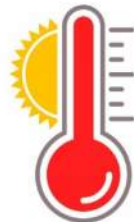


Result = No Gas Connection, No Boiler Room, No Flues & Zero Pollution

Response / Passive Design

Use of Thermal Mass to reduce heating and cooling loads

Exposed slab absorbs solar gain during the day



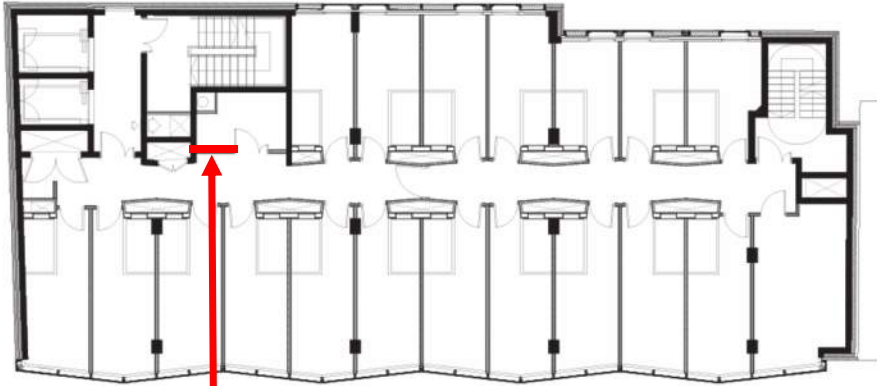
Exposed slab releases heat at night



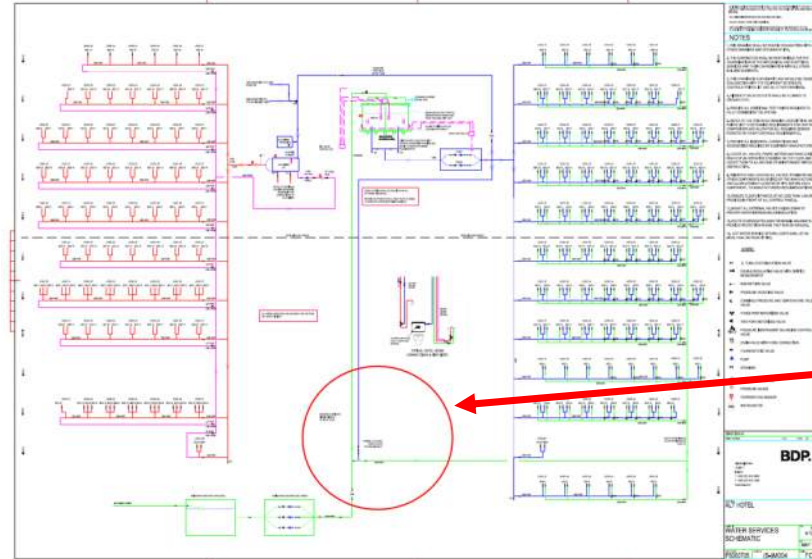
Response / Experience

Reducing Plastic Waste

We also developed a concept providing free chilled water to guests to remove the need for plastic bottles.



Providing free chilled water for guests on every floor...



Simple but clever valve arrangement allows mains water to be replaced by stored cold water in the event of an outage



... & fresh water from the wash hand basins



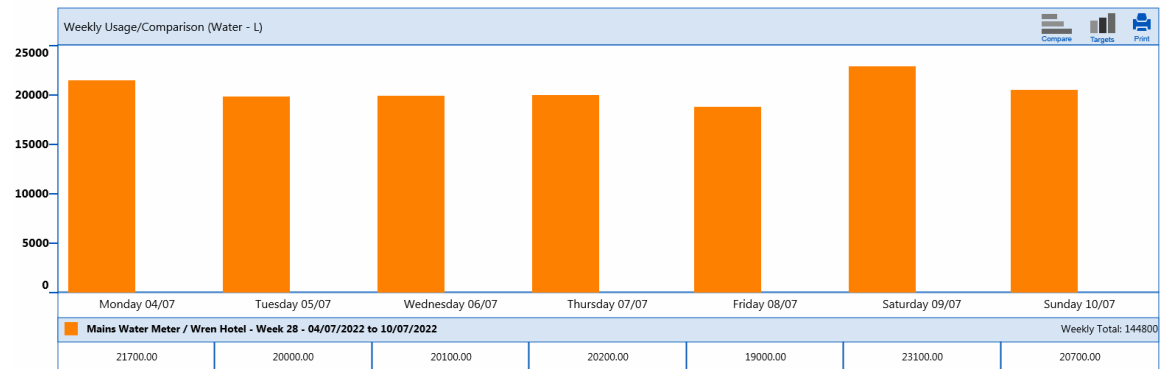
Response / Active Design

Water Conservation

Careful selection of sanitaryware i.e. rain showers 8 LPM vs 25 LPM (approx. 80% of hotels water use is for showers)

The Wren Hotel is tracking less than 160 Litres of water per day per room versus DCC guidance which recommends 1,050 Litres of storage per room.

- Reduced cold water storage requirements for hotel
- Reduced hot water generation bills by >60% (compared with typical hotel with baths)
- Monitored metering system to highlight inefficiencies / leaks

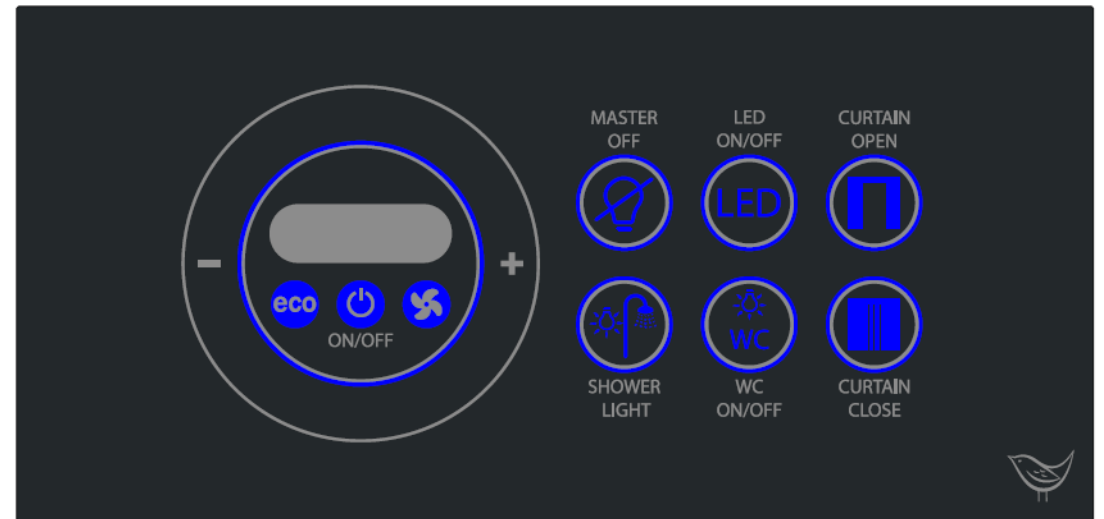


Response / Active Design

Room Controls

Advanced room controls system to reduce energy (VDA System)

- Turns off non-essential room loads
- Automatic control of blinds to reduce solar gain on West façade (added wake up function)
- Setback of room temperature during unoccupied hours and overnight
- Limits on user control can be adjusted
- Lighting scene selection and dimming to reduce lighting energy
- All adjustable set points
- System knows who's in the room and for how long (management of house keeping)
- Room Preferences can be adjusted at Check-In (°C / F)



Response / Operation

A building design that encourages the operator to adopt their own sustainable operation



Using local suppliers for ingredients, toiletries, soaps etc.

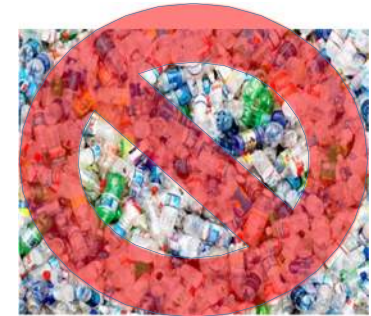


Bio-diverse garden on the roof



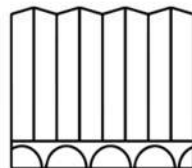
Too Good To Go

Too Good To Go app users buy surplus food from the hotel restaurant that would otherwise be going to waste



No single use plastics

<https://www.wrenhotel.ie/little-steps>



Our Commitment

We believe in quality over quantity. We try to do our bit for the planet quietly and efficiently. We don't do single use plastics. We use local organic produce and we are committed to recycling.

Summary:

- BER A rated (only a handful in Ireland)
- On Site Renewable Energy Ratio >40%
- Net Zero Carbon (WGBC definition)
- Low Water Use
- Low Embodied Carbon
- No Fossil Fuels
- No Local Pollution
- Sustainable Hotel Operation
- Provides a Low Carbon footprint alternative for Dublin's visitors
- Wren Hotel "Luxury without the guilt"

RECOGNISED FOR SETTING A NEW HOTEL PRECEDENT:

Construction Excellence Award 2022
– Leisure or Tourism over €10m Category

Building & Architect of the Year Award 2022
– Sustainability Award for a Single Building or Development

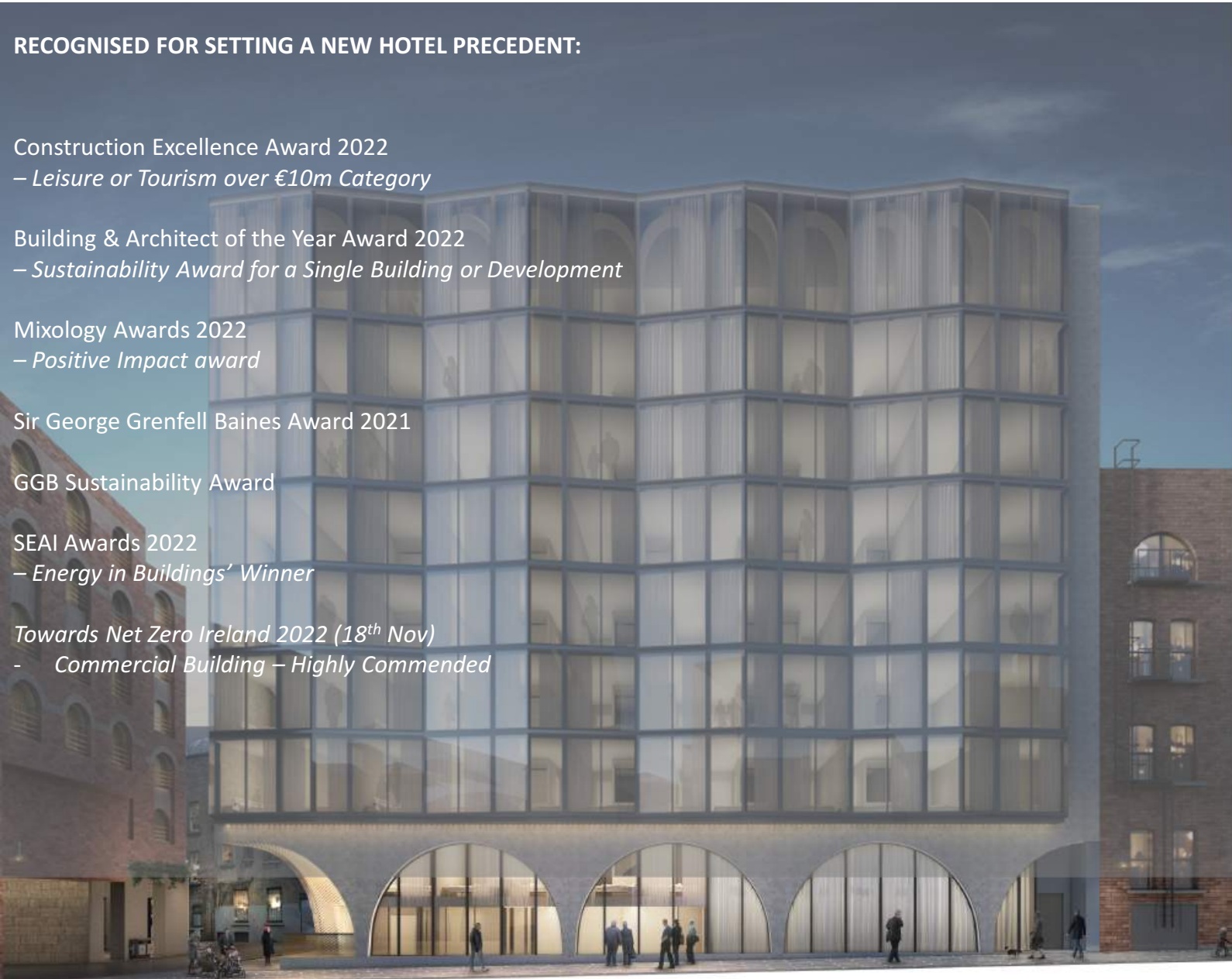
Mixology Awards 2022
– Positive Impact award

Sir George Grenfell Baines Award 2021

GGB Sustainability Award

SEAI Awards 2022
– Energy in Buildings' Winner

Towards Net Zero Ireland 2022 (18th Nov)
– Commercial Building – Highly Commended



For any questions, please contact patrick.kavanagh@bdp.com

BDP.

ARCHITECTURE ■ DESIGN ■ ENGINEERING ■ URBANISM ■ SUSTAINABILITY ■ LIGHTING ■ ACOUSTICS