

Carbon tracking and calculation

16 January 2024

@buildoffsite @CIRIAupdates

Project calculation



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Buildoffsite
22 January 2024

SHEPPARD ROBSON



360 people
200 awards
80+ years
3 locations
36 languages

Overview



About

Sheppard Robson

Community
Health + Care
Homes
Hotels + Leisure
Interior Design
Masterplanning
Retail
Schools + Colleges
Science + Tech
Student Living
Universities
Workplaces

Sectors



Our Experience
About

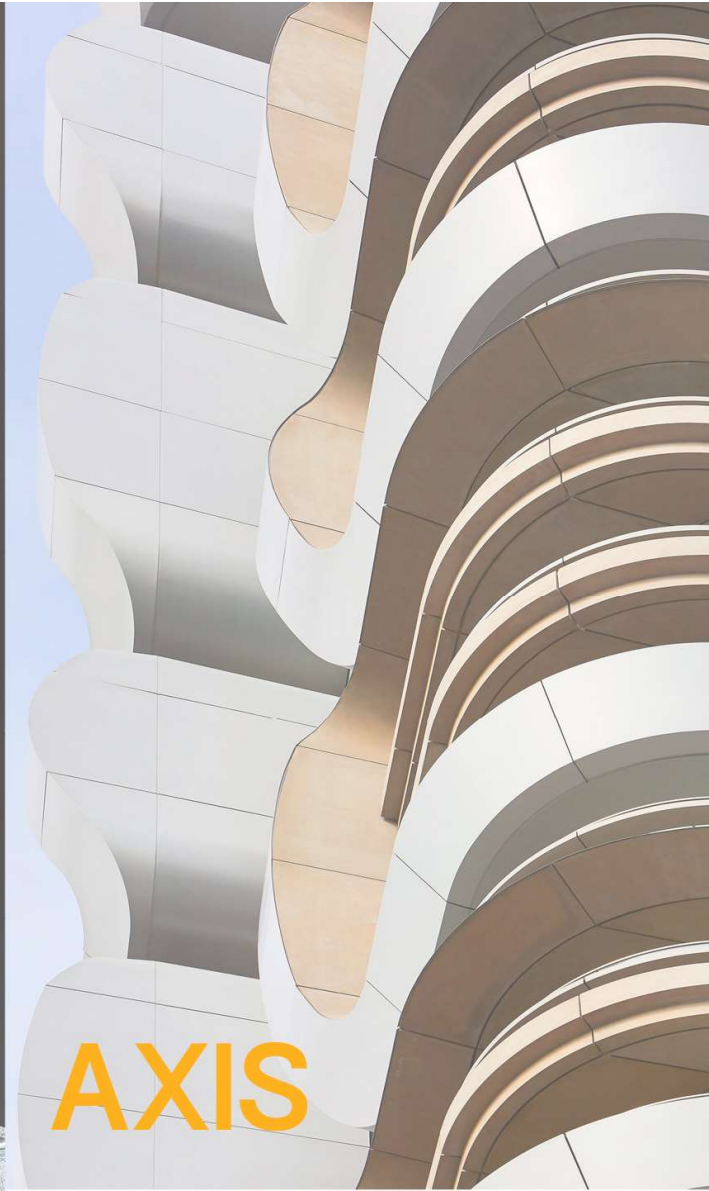
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**SHEPPARD
ROBSON**



ID:SR

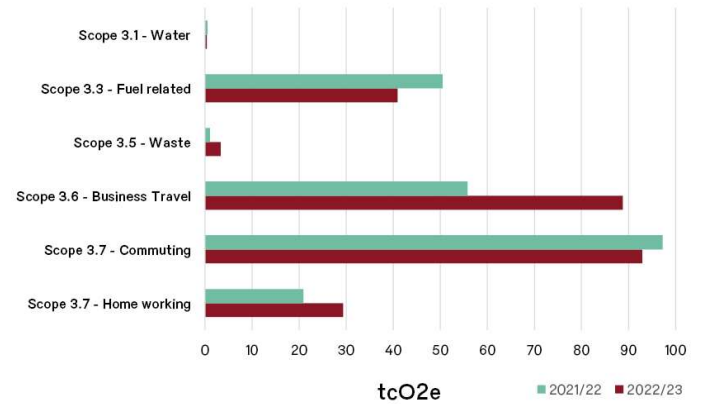
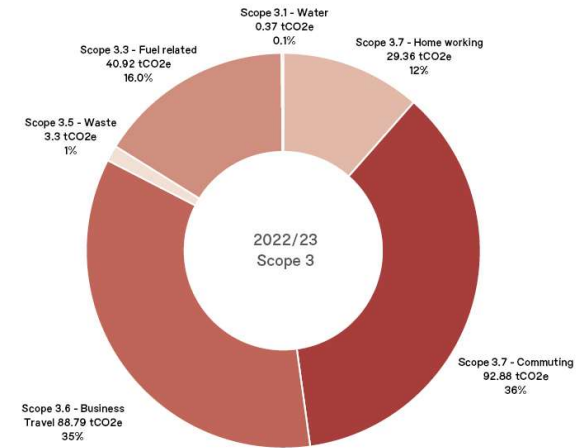
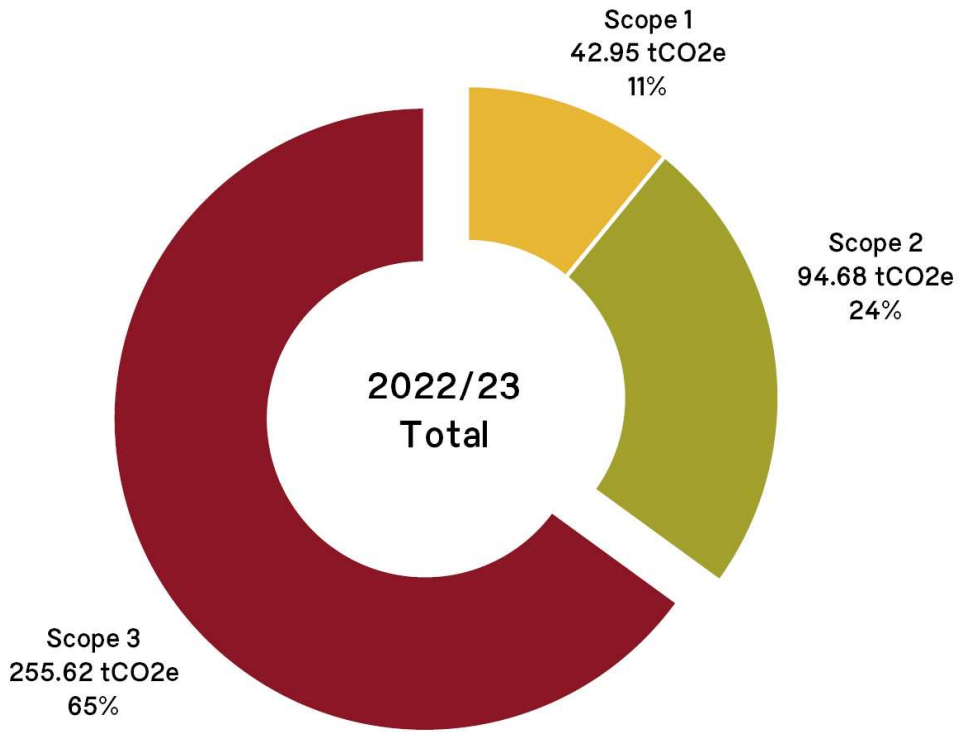


AXIS

- ISO 9001 + 14001 certified
- Certified Passivhaus Designers
- UKGBC Advisory Group Board
- Signatories of UK's Architects Declare Climate + Biodiversity Emergency Commitment
- Former Sustainability Advisor to RIBA
- Signatories of RIBA 2030 Climate Challenge
- Signatories of AJ Retrofirst Campaign

Sustainable innovation since 1938

Sheppard Robson




Overall carbon footprint



UK AVERAGE CARBON
FOOTPRINT PER PERSON
12.7 TCO2E

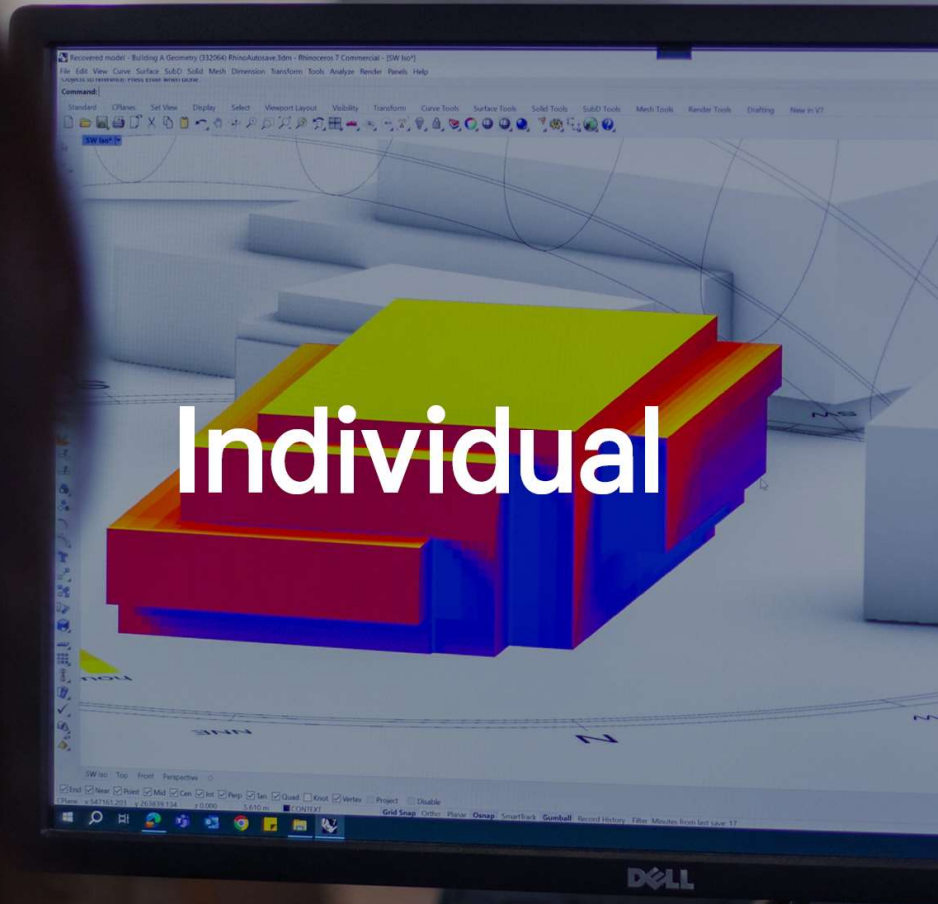


SR CARBON FOOTPRINT
393.25 TCO2E

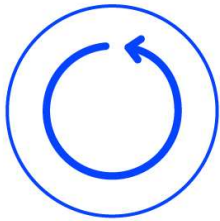


EXAMPLE PROJECT CARBON
FOOTPRINT (A1-A5 ONLY)
APPROX 17,000 TCO2E

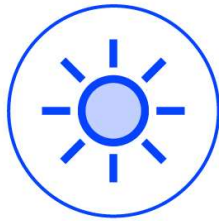
Carbon footprint



Holistic design



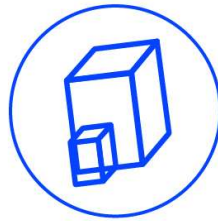
Passive design



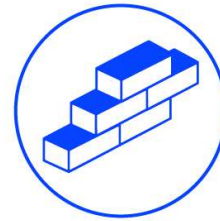
Active design



Parametric design



Embodied carbon



Health + wellbeing



Measurement POE



Nelson Mandela Children's Hospital



245 Hammersmith Road



Collaborative Teaching Laboratories



Siemens Middle East HQ



20 Finsbury Circus

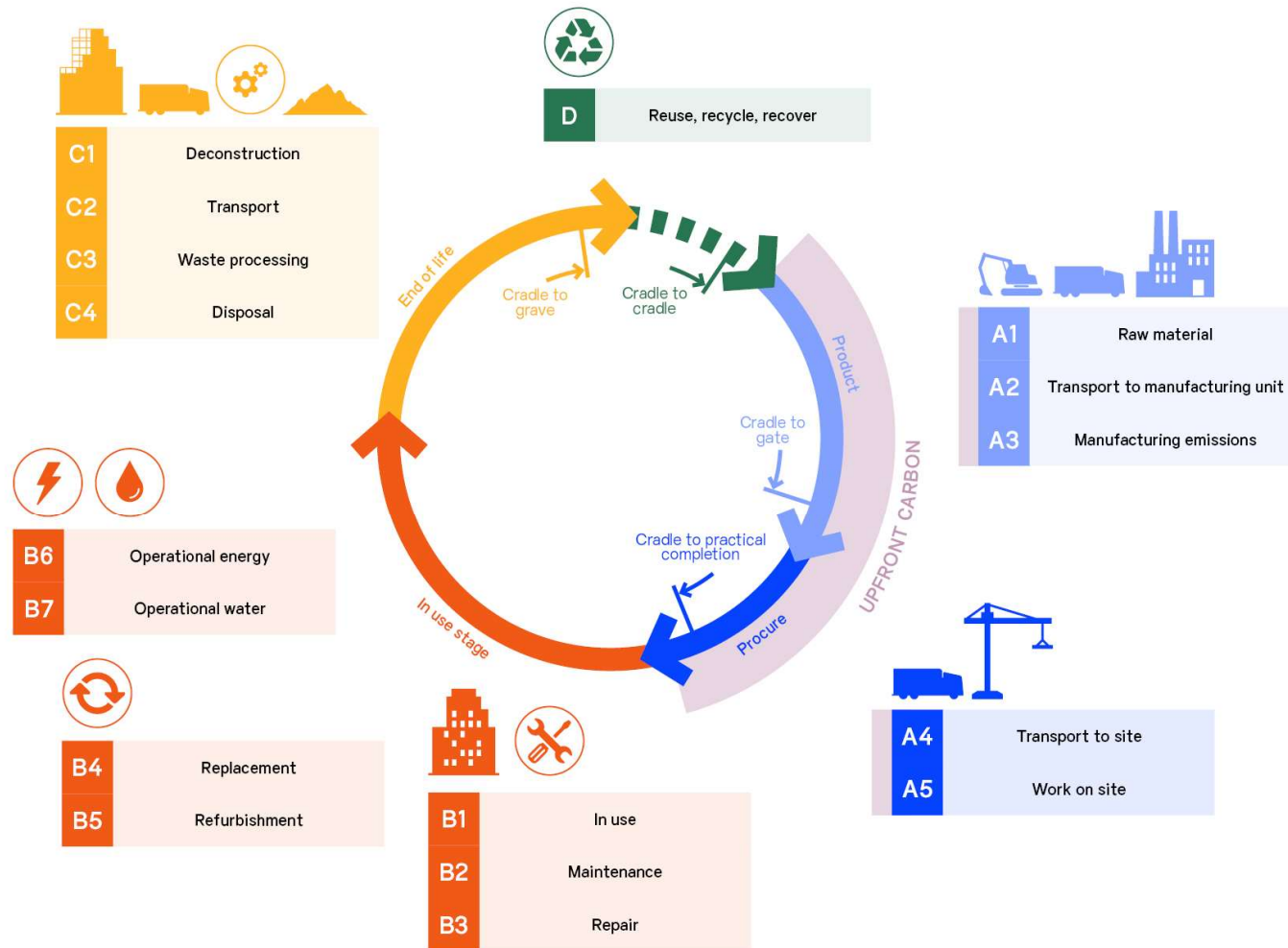


Deloitte HQ



Lancaster Institute for the Contemporary Arts

Sustainable design approach

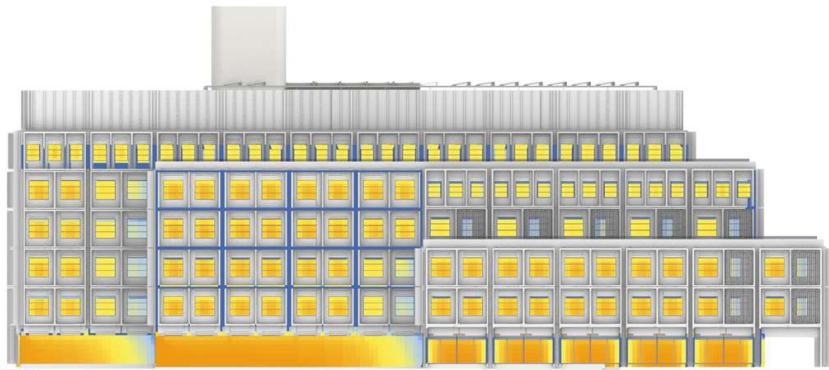


Whole Life Carbon Modules BS EN 15978

Note:
Steps aligned with UKGBC Net Zero
Carbon Buildings Framework.



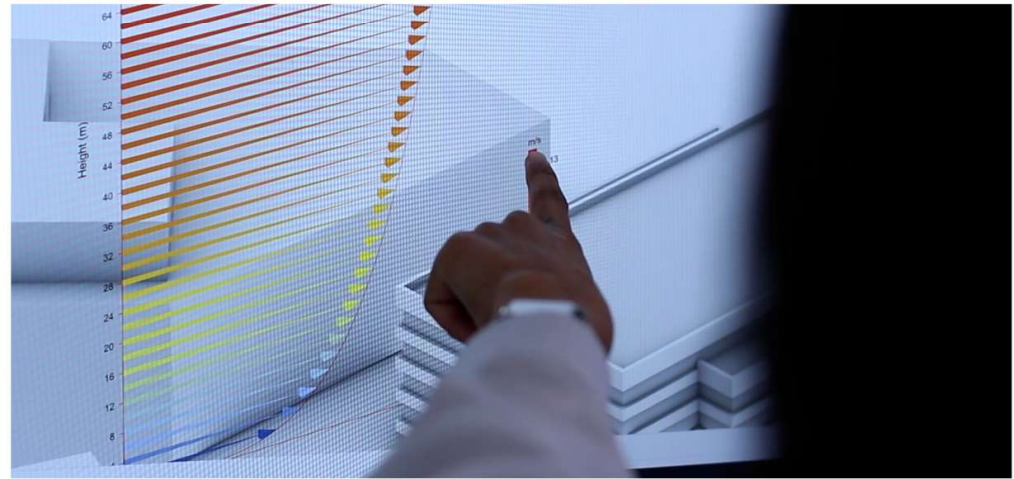
Net zero carbon roadmap



Project Seed
Image credit:
Laura Lapadat



- PHPP
- Ladybug and Honeybee
- Forma

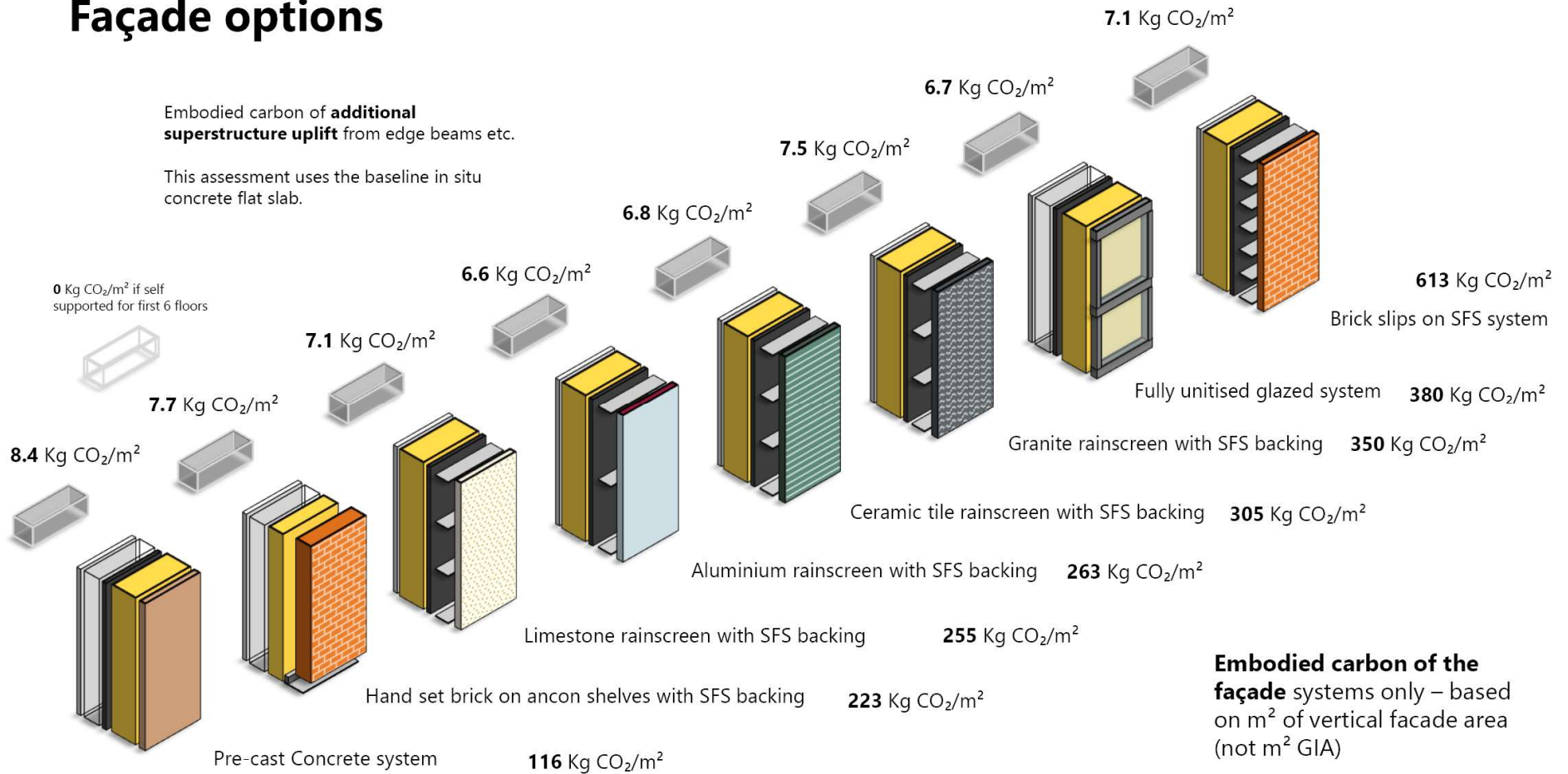


In-house Passive Design Tools

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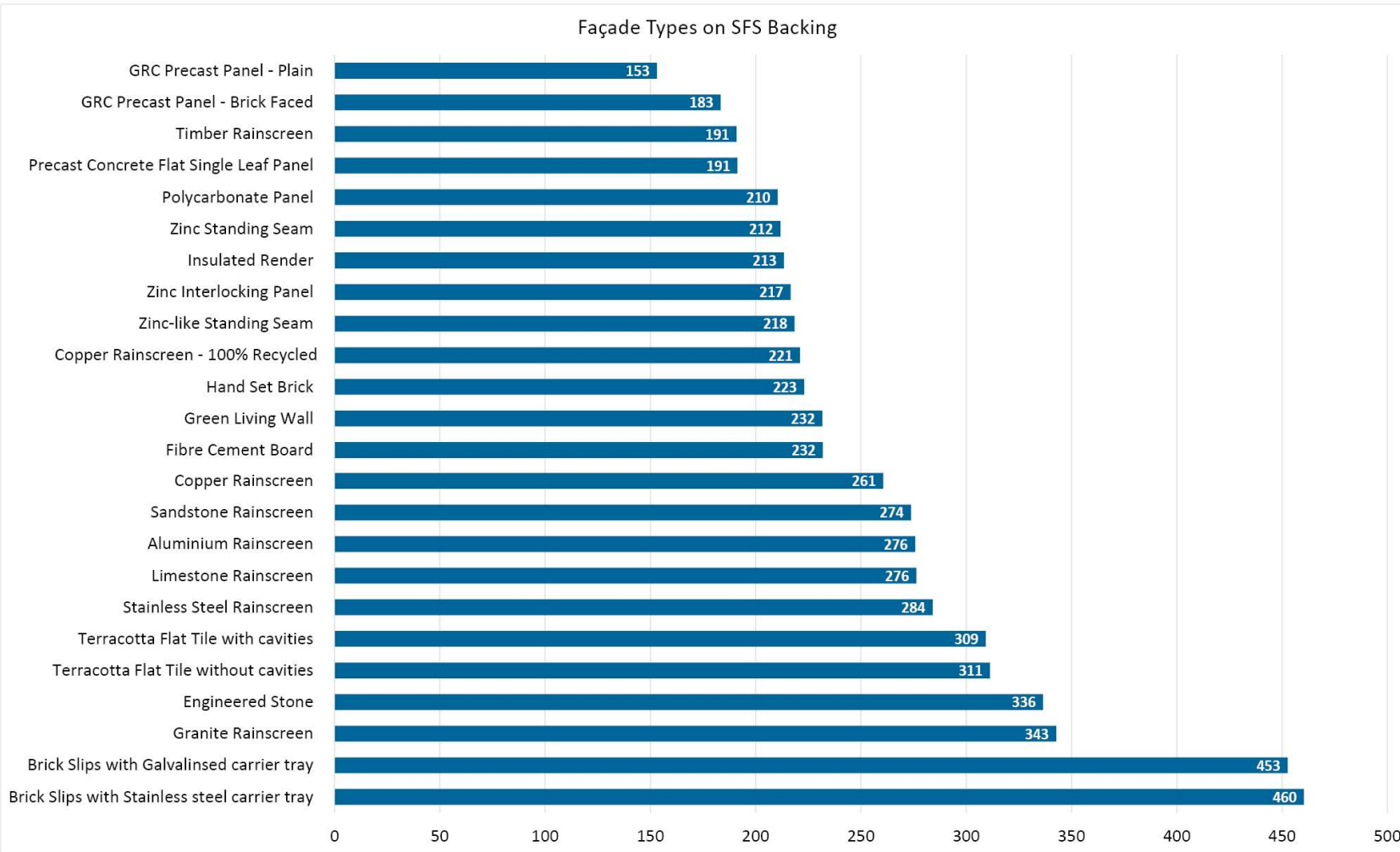
Courtesy of Buro Happold

Façade options



Façade Analysis

Façade Types on SFS Backing



Façade Analysis from In-House Tool

Applied Finishes

Walls and Joinery Finishes

SEED Library



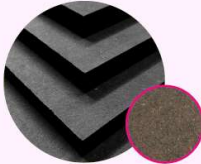
Dulux Airture Paint

- 99.9% Volatile Organic Compound (VOC) free
- Classified as low-toxicity product
- Greatly improving indoor Air Quality
- BREEAM and LEED compliant



DeVorm Acoustic Panels

- Acoustic wall panels fabricated from PET Felt, made from recycled plastic bottles
- Recyclable product manufactured in Europe
- Acoustic properties that improve sound absorption and room privacy
- Recycled bottles sourced from Europe



Valchromat

- Neutral product made from wood fibres that would otherwise be discarded
- Organic colouring agents
- Recyclable product

2 SEED LIBRARY | ID-08

Flooring

Teapoint Flooring and Feature Carpets

SEED Library



Forbo Linoleum

- Natural flooring product consisting mainly of linseed oil, pine resin and upcycled wood flour
- Carbon Neutral circular product
- Produced with 100% green electricity derived from the sun and wind
- Marmoleum products are proven to inhibit the growth and spread of infections



Milliken Carpets

- All products are certified Carbon Neutral
- Carpet tiles supplied in the UK are designed and manufactured in Greater Manchester
- All carpet tiles have a recycled content by total weight of 59% or higher
- Cushion backing has 90% recycled content
- Take Back at End of Life for reprocessing



Bolon Flooring

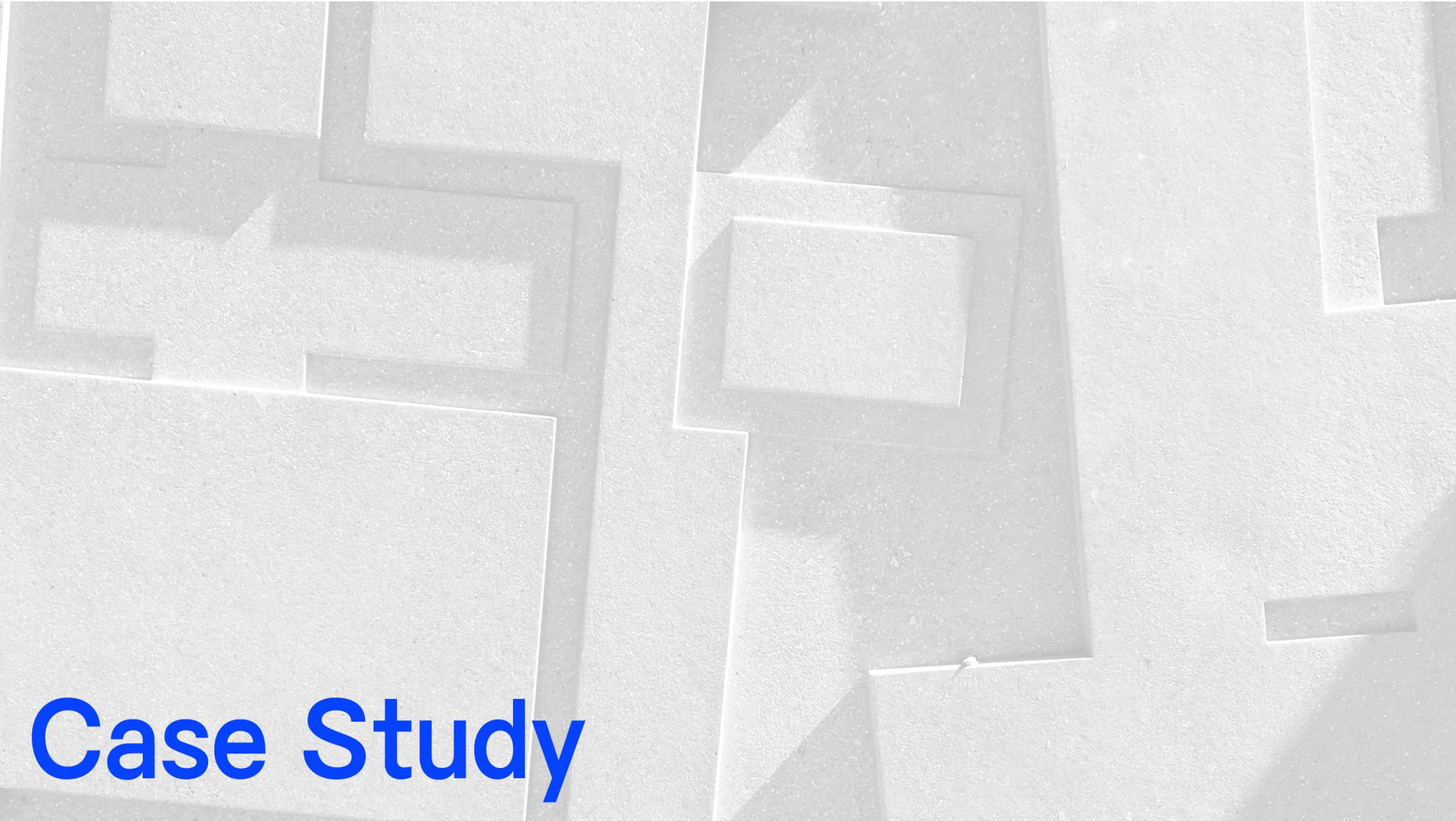
- 100% of collections contain recycled material
- 100% renewable energy used in all production
- Made in Sweden
- PVC in flooring is environmentally labelled

3 SEED LIBRARY | ID-08



Low Carbon Materials Library

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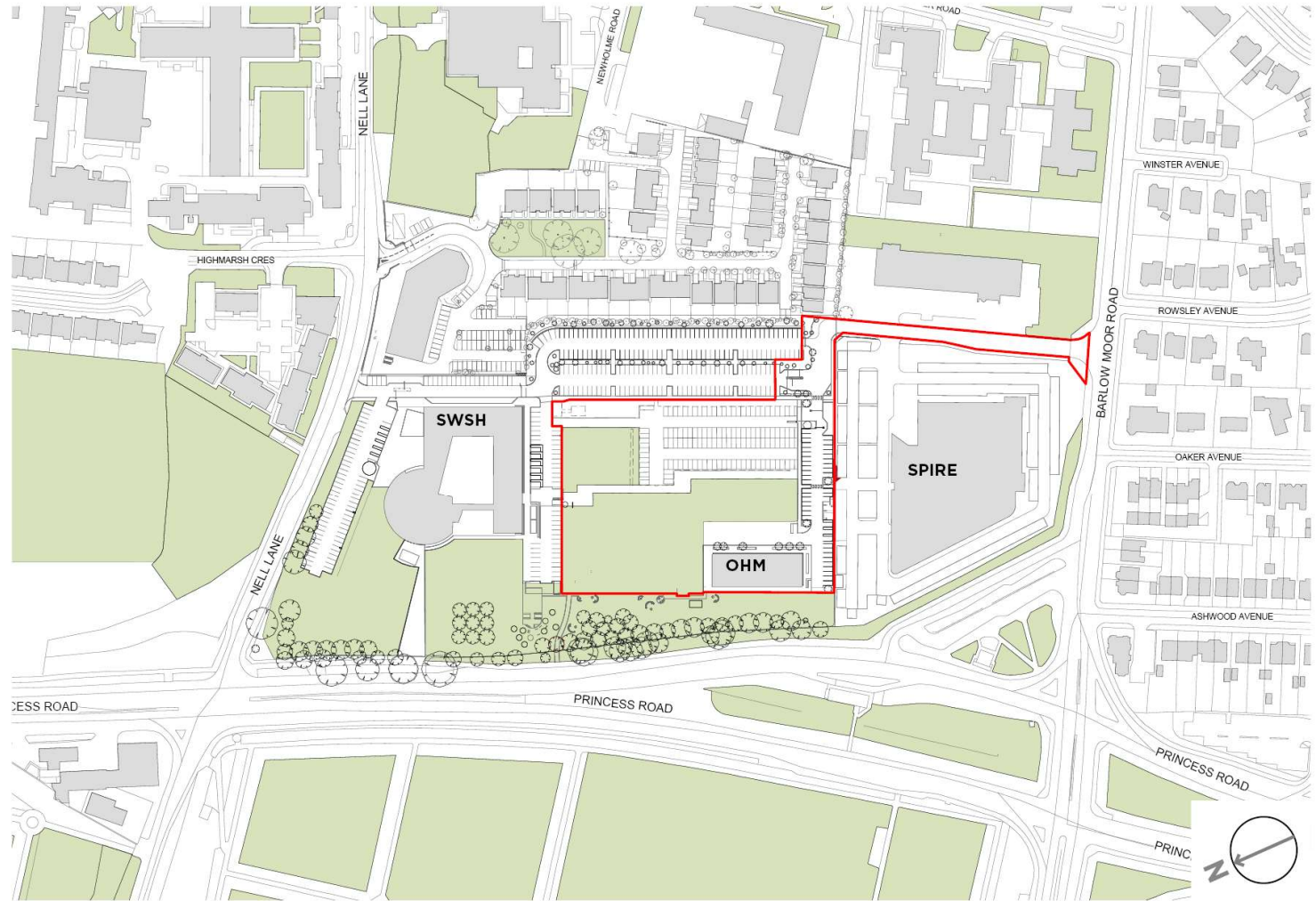


Case Study

- Location: Manchester
- Client: Bruntwood

EvO Building

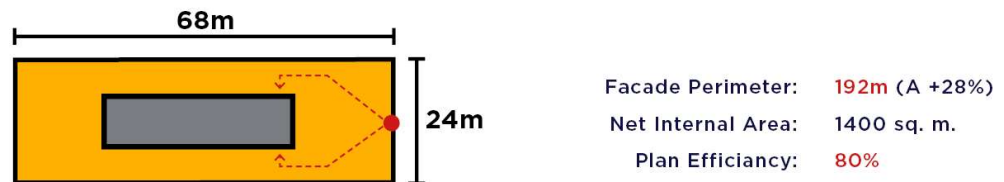




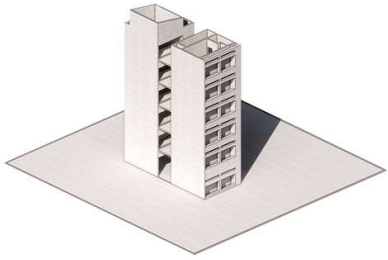
- Edge of town
- Flat Site
- Near busy road

Site Location

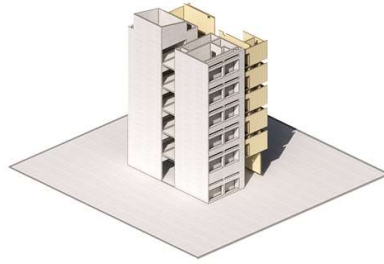
- From factor 0.76, LETI recommend less than 2
- Low form = less heat loss and gain
- Low form factor = less material required to build the facade
- Simple square plan = high efficiency and less material to build building



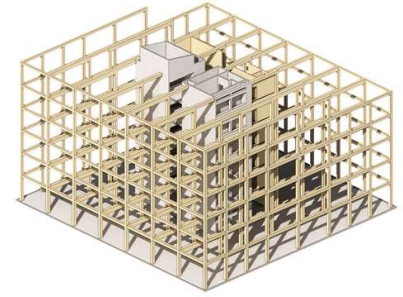
Form Factor



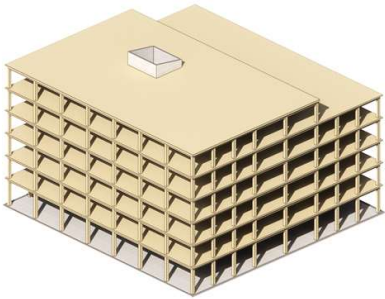
Minimal use of concrete where required for fire compartmentalisation / fire escape.



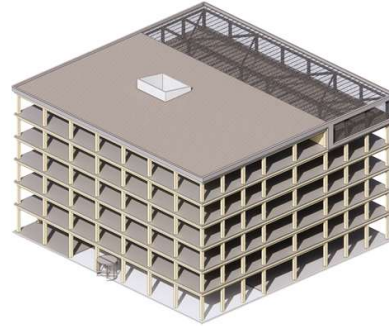
Cross Laminated Timber (CLT) used for non-structural elements



Glulam columns & beams with minimal spans to reduce embodied carbon.



CLT floor slabs at optimal span to reduce embodied carbon

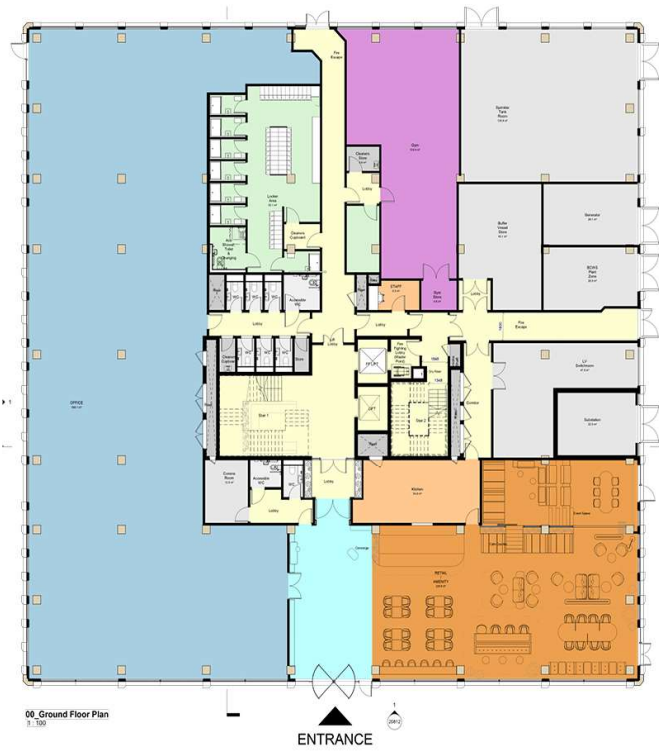


Raised Access Flooring / Roof / Plant Screen



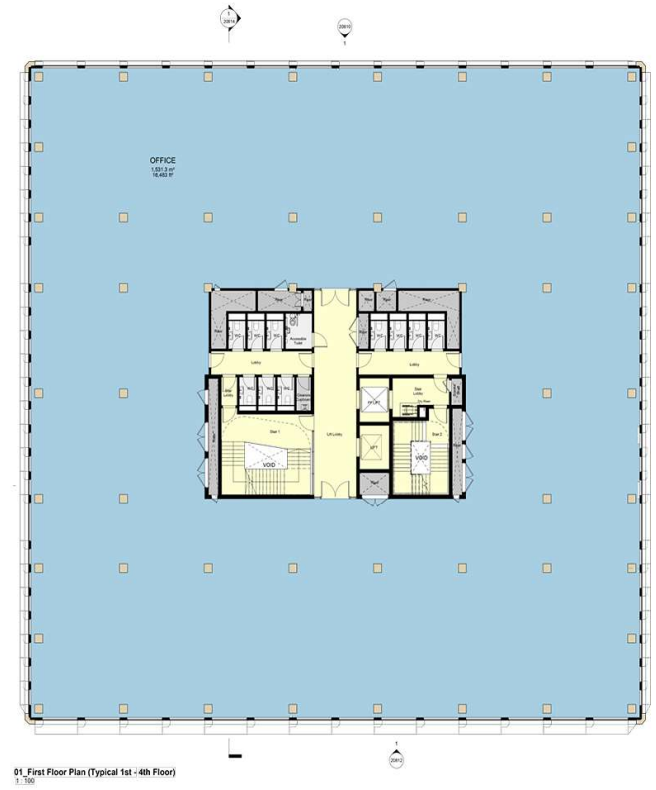
Air tight envelope combining solid and glazed elements

Building Structure



Key

- 1. Core Circulation
- 2. Office
- 3. Riser / BOH
- 4. WC
- 5. Plant
- 6. Reception
- 7. Retail / Amenity Space
- 8. Kitchen
- 9. Staff Office
- 10. Shower / Changing Facilities
- 11. Gym / Gym Store

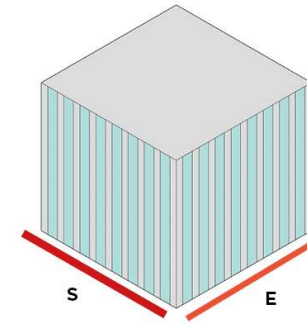
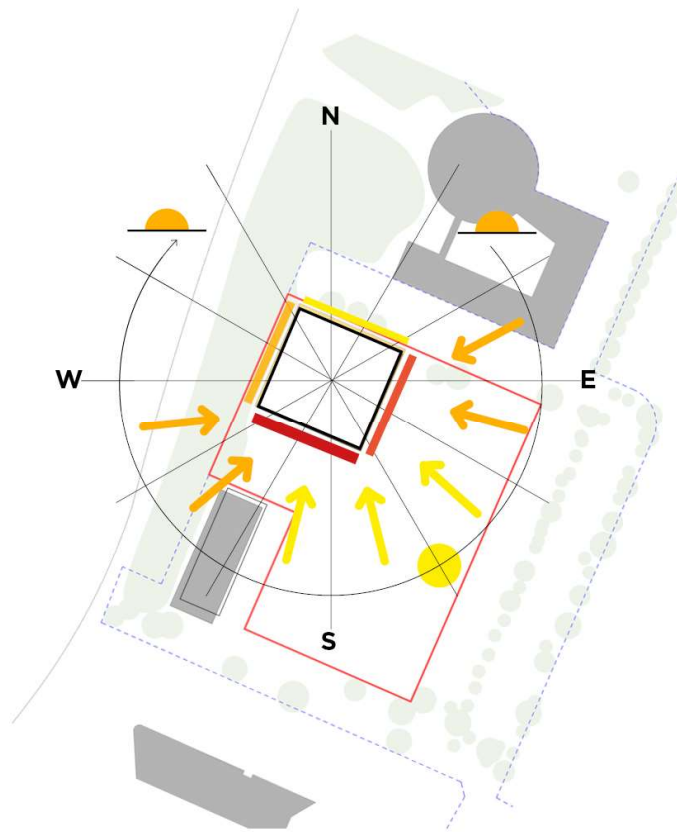


Ground floor Plan

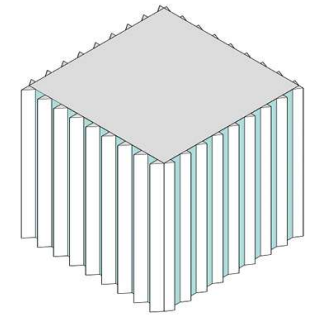
Typical Floor Plan

Building Layout

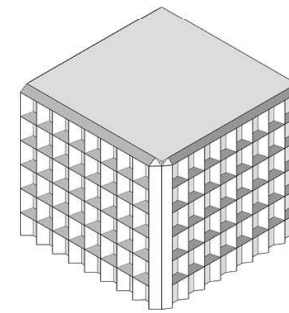
- Conclusions from studies
- Low U-value facade not required due to internal heat sources (people, lighting, computers)
- Square floor plate limited peak heating requirements
- Minimising solar gain was important in reducing peak cooling load and annual energy requirements.
- Orientation alone had little impact but when combined with maximising shading to suit sun path the impact was significant



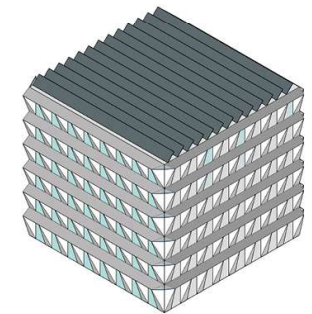
OPTIMISE PERFORMANCE -
MAXIMISE DAYLIGHT & MINIMISE
HEAT LOSS / SOLAR GAIN



MINIMISE SOLAR GAIN -
VERTICAL SHADING

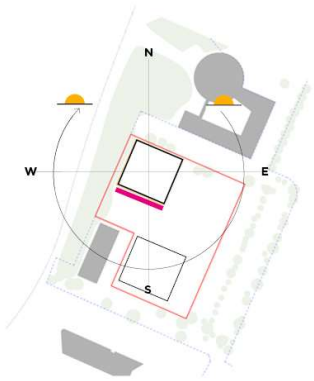


MINIMISE SOLAR GAIN -
HORIZONTAL SHADING



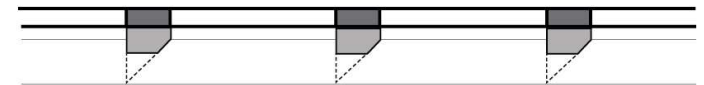
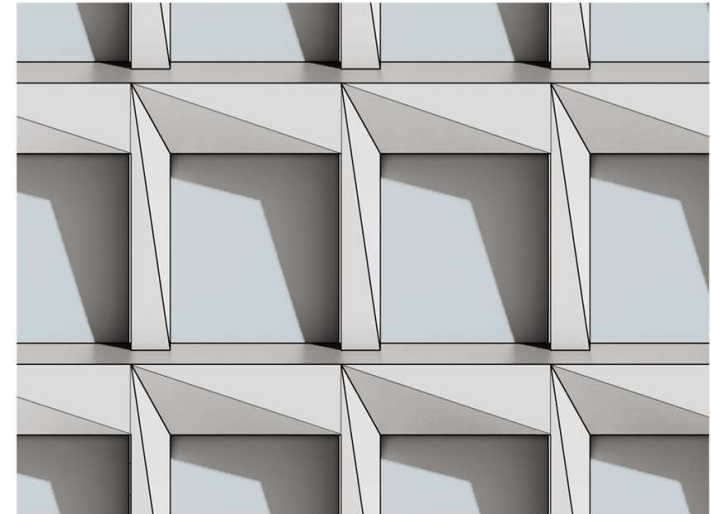
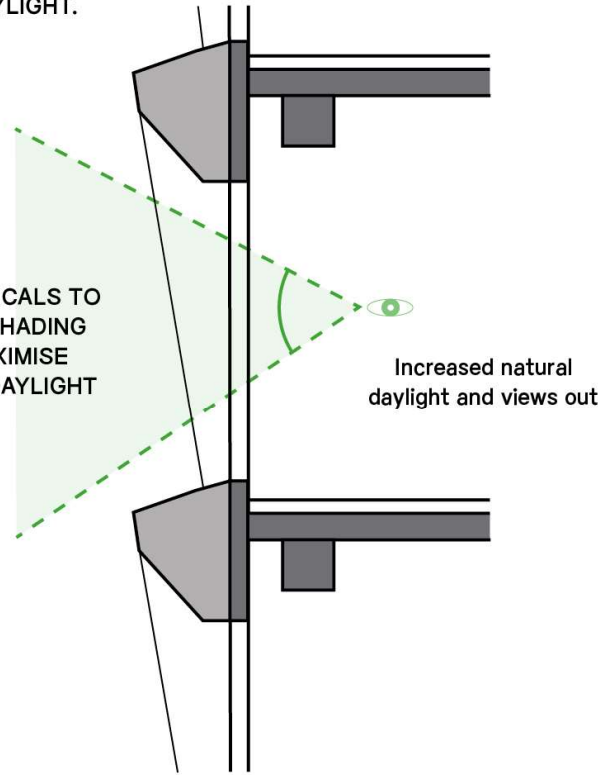
OPTIMISE VIEWS /
PERFORMANCE WITH
SOLAR GENERATION (PV / PVT)

Façade Analysis



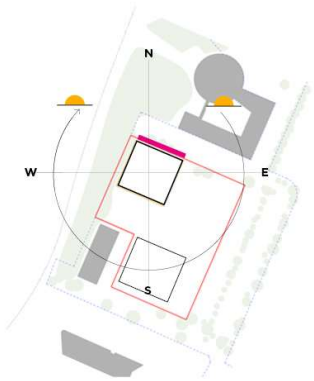
SOFFIT HAS STEEP PITCH TO INCREASE NATURAL DAYLIGHT.

LESS VERTICALS TO REDUCE SHADING AND MAXIMISE NATURAL DAYLIGHT



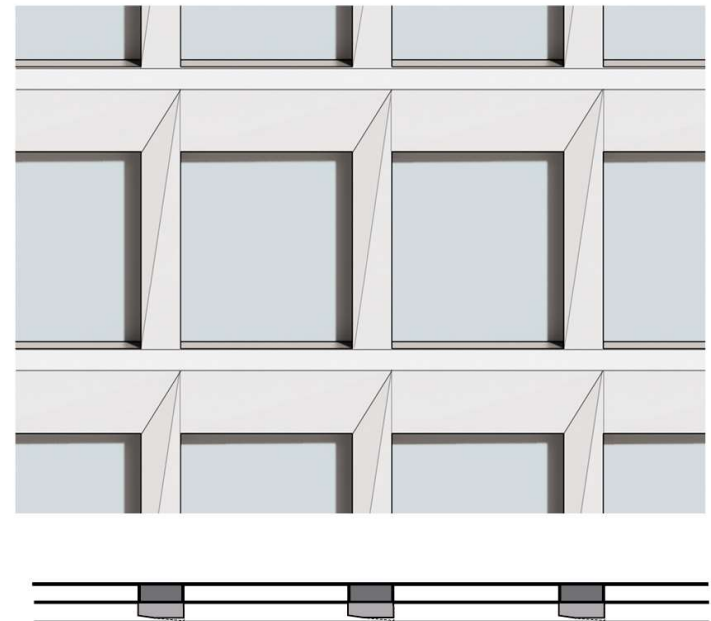
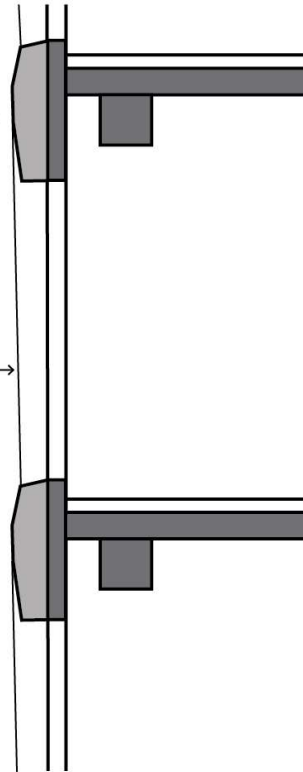
- Minimise solar gain from high south sun via horizontal shading
- Minimise solar gain from hot afternoon west sun from vertical shading
- Angle soffit to maximise daylight

South Façade



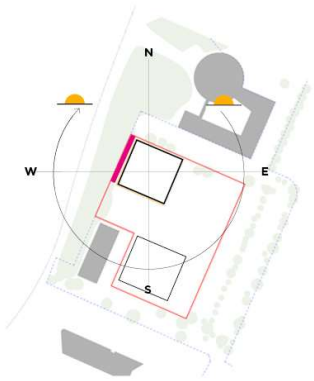
Shallow projection
where less solar
shading is necessary,
reducing material use.

Fewer verticals to
reduce shading and
maximise natural
daylight



- Minimal shading
- Maximise daylight

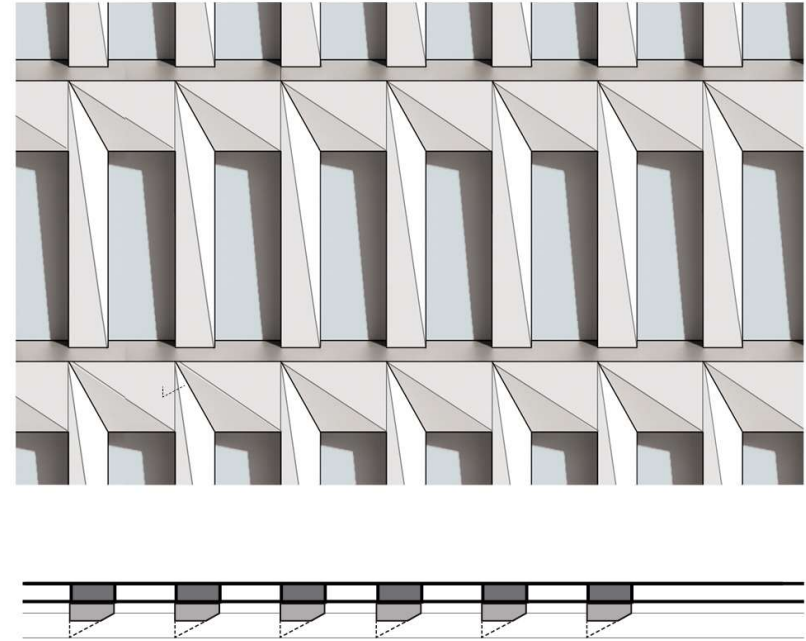
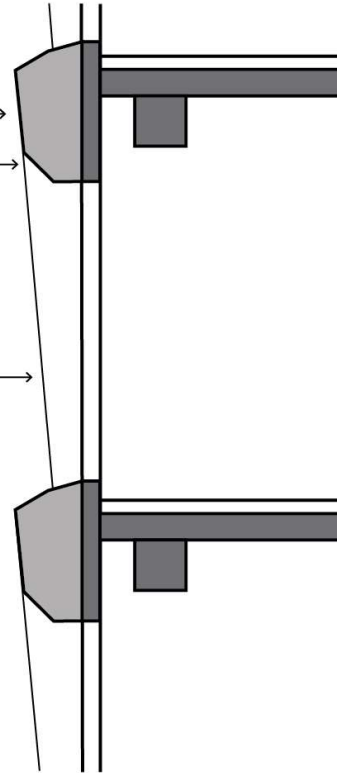
North Façade



Reduced projection
where less solar
shading is necessary.

Soffit has steep
pitch to increase
natural daylight

Vertical cladding at
closer centres to
increase shading



- Minimise solar gain from hot afternoon west sun from vertical shading
- Reduce spacing of vertical cladding to increase shading

West Façade



Entrance Reception



Typical Office Floor



The Ev0 Building Didsbury

Sheppard Robson

Upfront carbon

- This is the total carbon generated to produce a built asset, including emissions caused by extraction, manufacturing, transportation and assembly.
- 124kg CO₂e/m² of the gross internal area (GIA) when taking carbon sequestration into account. 516kg CO₂e/m² (GIA) without taking sequestration into account, which is 14% lower than the 2020 LETI design target of 600kg CO₂e/M²
- The Whole Life Carbon assessment for the development is currently calculated at 871kg CO₂e/m² (GIA), below the RIBA 2025 target of 970kg CO₂e/m² (GIA), with the ambition of meeting the RIBA 2030 target of 750kg CO₂e/m² (GIA) during design development.

Operational carbon

- The base building operational energy use has been calculated at 28kWh/m²/year (GIA), which is slightly below the UKGBC's Paris Proof Target of 30kWh/m²/year (GIA).
- Occupier energy has been assumed at 35kWh/m²/year (NIA) in line with the UKGBC's Paris Proof Target, whole building energy intensity is at 54kWh/m²/year (GIA), again slightly below the UKGBC's Paris Proof Target of 55kWh/m²/year (GIA).
- If the onsite generation is included, i.e. if only energy demand imported from the grid is assessed, the operational energy demand for the building is calculated at 5kWh/m²/year (GIA), The remaining energy demand of the building will be met by green energy generated from Bruntwood's co-operative wind farm.

Net-zero Carbon

- Re-using an existing structure would save 40% embodied carbon
- Form factor is hugely important
- SFS with punched windows preferable to curtain walling
- Efficiency is key, i.e build with less
- Reducing peak loads is key - i.e cooling
- Reducing cost can be associated to reducing carbon
- Exposed timber structure minimises need for finishes and adds tenant appeal
- Design programme needs to account for iterative design process

Lessons Learnt



Co-created

People-centred

Precision-made

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22 January 2024

Any questions?
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