

The Scottish Government's Net Zero Public Sector Buildings Standard

Applying the Standard to Existing Buildings

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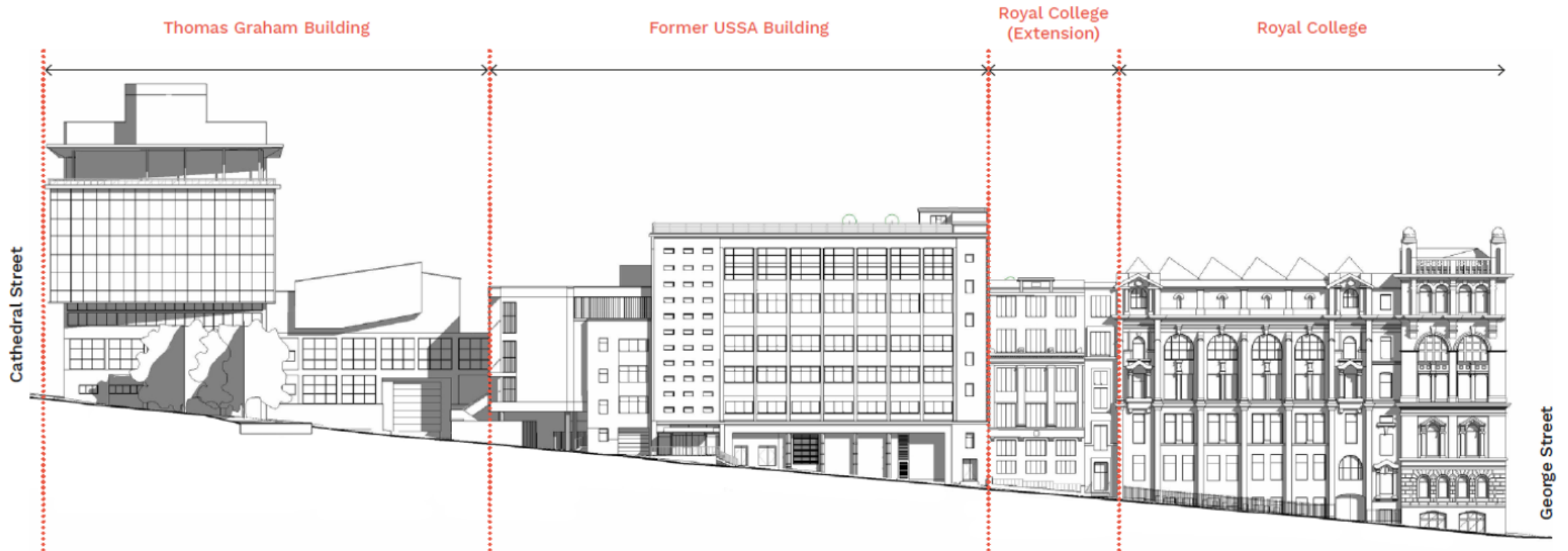
NZPSB Standard Major Refurbishment Meet the Standard Event

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www.strath.ac.uk

CHATIC

Refurbishment of the former University of Strathclyde Student Association Building



The elevation above shows the eastern edge of John Street and the immediate context to which the CHATIC building must respond to. CHATIC neighbours the category B Italianate Royal College building (1903), which was later extended. It is this 4-bay extension that CHATIC directly adjoins. The Thomas Graham building was completed in 1964 and was later extended and refurbished, with a renewed facade in 2005. The diagrams on the following pages analyse the vertical and horizontal modelling of the Royal College further.



“To establish a **world-leading** focal point for technology-led and market changing innovation within Glasgow City Innovation District, that **attracts new R&D** co-location investments from the **public and private** sectors and becomes **a hub for nurturing** new start-ups and established businesses that generate **inclusive growth** for Glasgow and Scotland”.

University of Strathclyde Project Vision



Source: HLM Architects

The refurbishment of the old Student Union building on John Street, is an opportunity to **reimagine a once iconic building** within the University of Strathclyde's campus, expand upon a thriving technology and innovation zone within the wider Glasgow City Innovation District (GCID), **create a lasting legacy for the building** and reactivate the western edge of the campus.

CAMPUS MAP

Campus Guide

1. Royal College Building
2. Technology and Innovation Centre
3. Learning and Teaching Building
4. Students' Union
5. Strathclyde Institute of Pharmacy and Biomedical Sciences
6. Strathclyde Business School
7. Strathclyde Sport
8. Andersonian Library
9. Lord Hope Building
10. James Weir Building
11. Campus Village



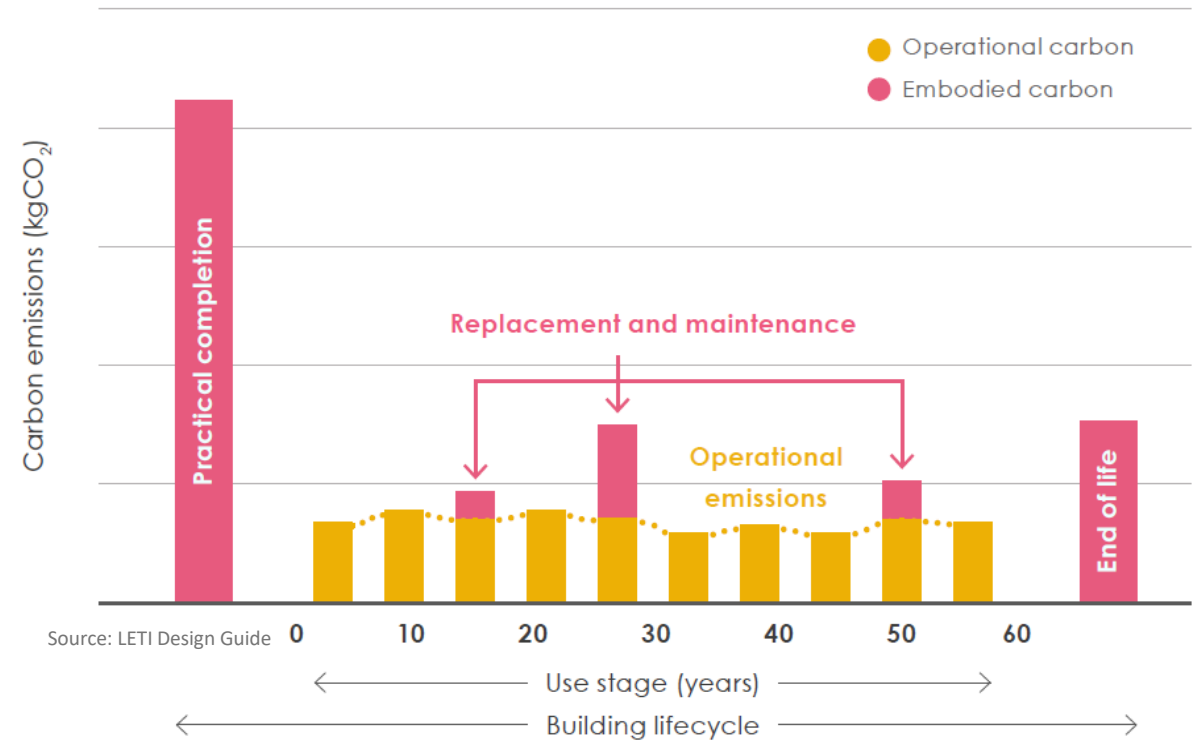
USSA Building Key Facts

- GIFA 5,545 m²
- Opened 1959. Extensions 1970s to rear and fire stair to side.
- 11 storeys – floors 5,7,9,10 are housed within the rear building and floors 1-4, 6, 8A & B, and 11 are within the main building.
- The main building and rear extension are constructed of steel with concrete encasement and pre-cast concrete floor slabs.
- Building closed 20 August 2021.



Case for reuse: mitigation whole life carbon

- Embodied carbon impacts can account for as much as **70%** of whole life carbon in a new building.
- Most design decisions and product choices made during the early feasibility and design stages of a project will influence the carbon impact at every stage of the building life cycle and beyond.
- Reuse of a building can save millions of kilograms of 'upfront' embodied carbon emissions.
- This approach addresses **Objective 2** - Construction Embodied Carbon of the Standard.



Progress to date

- Project Registered for the NZPSB Standard – Existing Building *now* a Major Refurbishment project
- A Pre-Redevelopment Audit has been prepared to maximise reuse where possible. No demolition.
- Soft Landings programme commissioned
- Full condition & structure surveys – very poor to dilapidated state.
- Heat from campus heat network, which will be decarbonised by 2040 and grid electricity emissions offset.



Source: HLM Architects

Sustainability Consultant – **ARMILA**
Sustainability Services
Architect – **HLM Architects**
Soft Landings Champions – **Max Fordham**
MEP – **Harley Haddow**
Project Management and Cost consultancy – **Gardiner and Theobald**
Contractor (Stage 1) – **Heron Bros.**

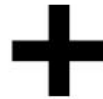
Objective 1 Inclusive Net Zero Economy Outcomes

CHATIC will:

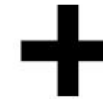
- Drive public sector, community and individual engagement in innovation activities from ideas to prototype testing
- Provide new spaces for learning & engagement by students and staff
- Offer colocation rental opportunities for partners
- Host **Strathclyde Inspire** entrepreneurship hub for start-ups and spin ins, and **Social Innovation Hub**, with **Living Lab**
- Provide a café and events space, plus a range of meeting and collaborative working spaces.



workspace



gathering space



2 hubs

Source: HLM Architects

Pre-refurbishment Audit

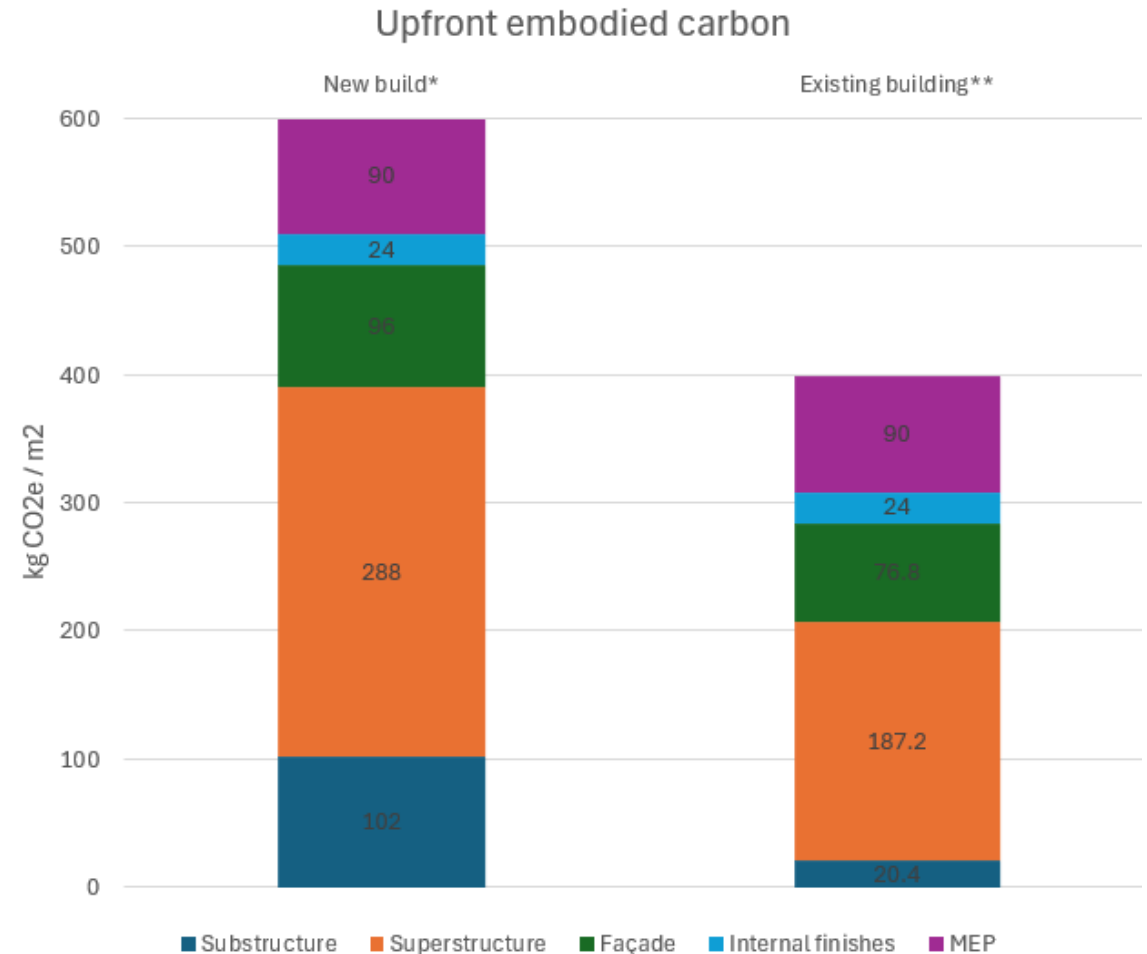
- A pre-refurbishment audit was prepared during early design development stages.
- Supported **Objective 2** requirements by **mitigating ‘upfront’ embodied carbon.**
- A total of **443 tonnes of material** is predicted, est. volume of 532 m³.
- The report recommended a targets:
 - **93% diversion of waste from landfill**
 - **15% target for reuse (by weight)**
- It has also helped to address the requirements of **Objective 4 – Other Whole Life** by considering the opportunity for **reuse of existing materials, FF&E** and mitigating whole life embodied impacts.

Material	Weight (tonnes)	Volume (m ³)
Concrete	87.3	56.1
Brick	81.5	48.0
Gypsum	79.7	106.1
Timber	58.1	97.0
Metals	53.4	11.9
Insulation	16.3	174.1
Plastics	14.7	10.6
WEEE	14.5	10.6
Stone	13.1	5.3
Carpet	10.8	6.4
Glass	7.0	2.8
Ceramic	6.9	2.9
Grand Total	443.2	531.8

Source: Reusefully report - Pre-Refurbishment Audit of the USSA Building, Glasgow

Upfront Embodied Carbon Target

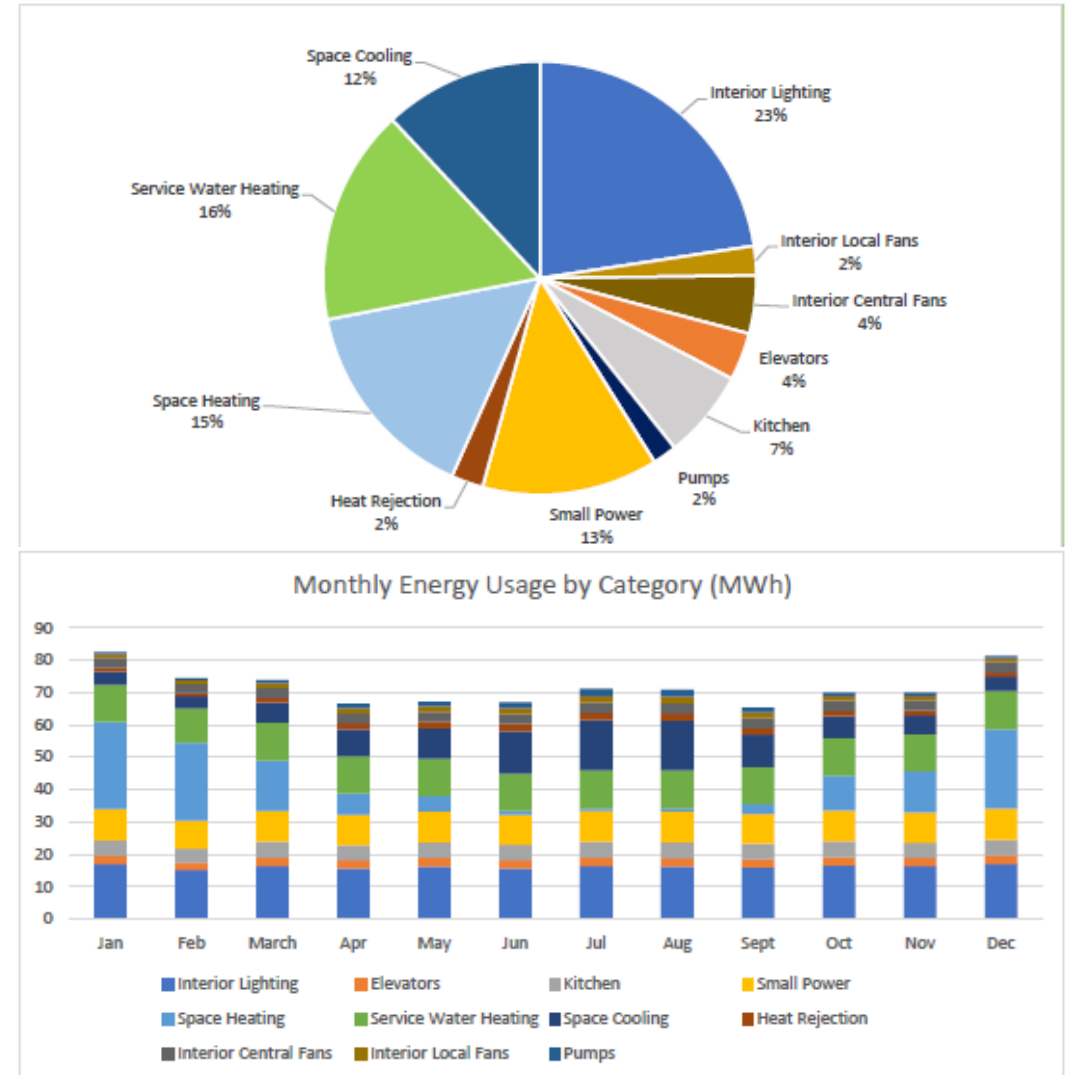
- <math><400\text{kgCO}_2\text{e}/\text{m}^2</math> was identified as an ‘upfront’ embodied carbon target. The design has been and continues to be reviewed against this target.
- The LETI elemental breakdown for upfront embodied carbon for offices has been referenced as a comparator.
- Est. embodied carbon **savings** is around **1,140,000 kgCO₂e**, when compared against the new build scenario.
- This approach has supported the project in addressing **Objective 2** requirements by measuring and mitigating ‘upfront’ embodied carbon.



Source: ARMILA Sustainability Services initial LCA summary
 *Elemental breakdown based on LETI breakdown for offices
 **Based on scope of works – informed by project team

Operational Energy

- The baseline **Energy Use Intensity (EUI)** was measured as **297kWh/m²/year**, reflecting the 1950s-70s building with gas heating and poor fabric performance.
- Detailed operational energy modelling confirmed that **lighting** and **ventilation upgrades** alone would **increase** the EUI to **315kWh/m²/year**, due to added fan and cooling loads.
- An early options appraisal exercise identified that fabric improvements and air tightness improvements could **reduce** the EUI closer to **160kWh/m²/year**.
- Further modelling suggested that by integrating the use of **ASHPs**, this could further **lower** the EUI and bring this closer to **120kWh/m²/year**.
- **Air permeability testing** confirmed that the existing building, as it stands, measured at more than 25m³/m².hr @50Pa.
- A range of **fabric** performance enhancements and efficient services and system design was agreed with the architects and design team.
- As such an **aspirational EUI of 120-150kWh/m²/year** was identified at application stage under **Objective 3 – Operational Energy**.
- This figures continues to be reviewed as occupancy and small power profiles evolve.



Source: Harley Haddow TM54 report – developing design, options appraisals

Internal Environmental Quality

Objective 5 of the Standard requires a project to inform an Indoor Environmental Quality strategy and confirm targets that aim to enhance user wellbeing and comfort.

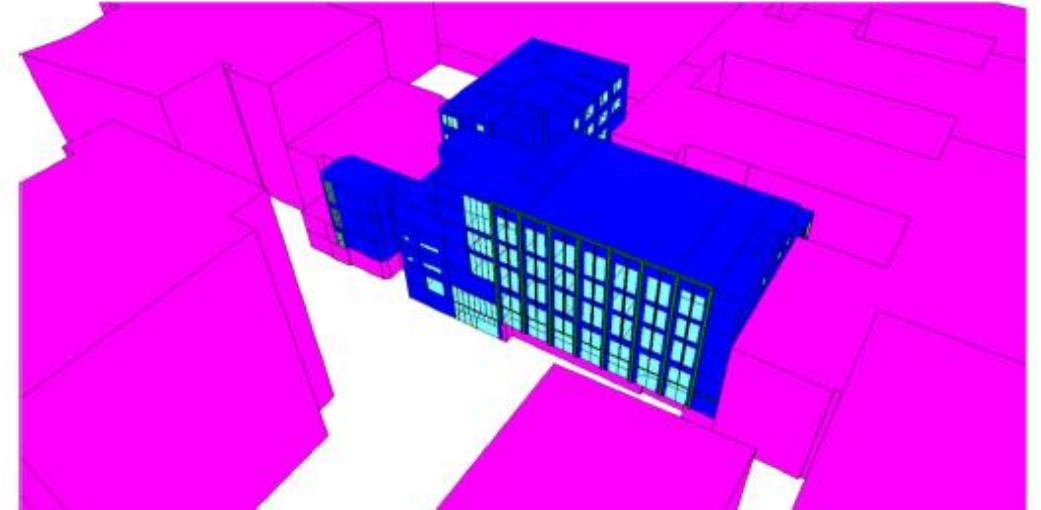
An **IEQ strategy** was agreed with the designers and University:

- Indoor air quality has been measured, ensuring CO₂ concentrations stay below 1000ppm
- Sensors will capture and record data for Use Stage analysis.

Climate Based **Daylight Modelling** has been used to consider the quality and provision of natural light as the design develops. Targeting Average Daylight Factor (ADF) of >2%.

83% of spaces meet both ADF and average illuminance criteria simultaneously.

Acoustic consultant is engaged and performance standards agreed, with Stage reviews and reporting taking place.



Metric	% of Occupied Spaces Meeting Target	Observations
Average Daylight Factor > 2%	87%	Highest near western façade, slightly lower in deep floorplate areas
Average Illuminance 100-3000 lux	90%	Peak near glazed facades, overall low glare risk
Both ADF & Illuminance	83%	Majority of spaces compliant

Source: Harley Haddow IES model from CBDM report

Comments

CHATIC

Has all the issues typically encountered on a major refurbishment project:

- Layout / floorplan
- Legacy building challenges
- Hidden defect risks
- Interdependence with current heating systems.

Refurbishments are costly, complex and uncertain; require upfront investment to assess / stabilize.

Significant embodied carbon savings, however operational energy & emissions for the estate will increase.

The Standard

Warming up **all** stakeholders on the “nuts and bolts” of the Standard is essential.

Expand document suite to be relevant & accessible for all user groups.

EOI process could be introduced.

Documents’ terminology aligned to construction processes & language.

Interactive on-line project tracker tool.

INZ Champion role within an organisation is key; needs support.

Objective 6 Environmental Aspects could be a key point of difference.

Individual from Standard team to be assigned to each project.





Concept Sketch Section view
Concept sketch showing project
ambition for CHATIC



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