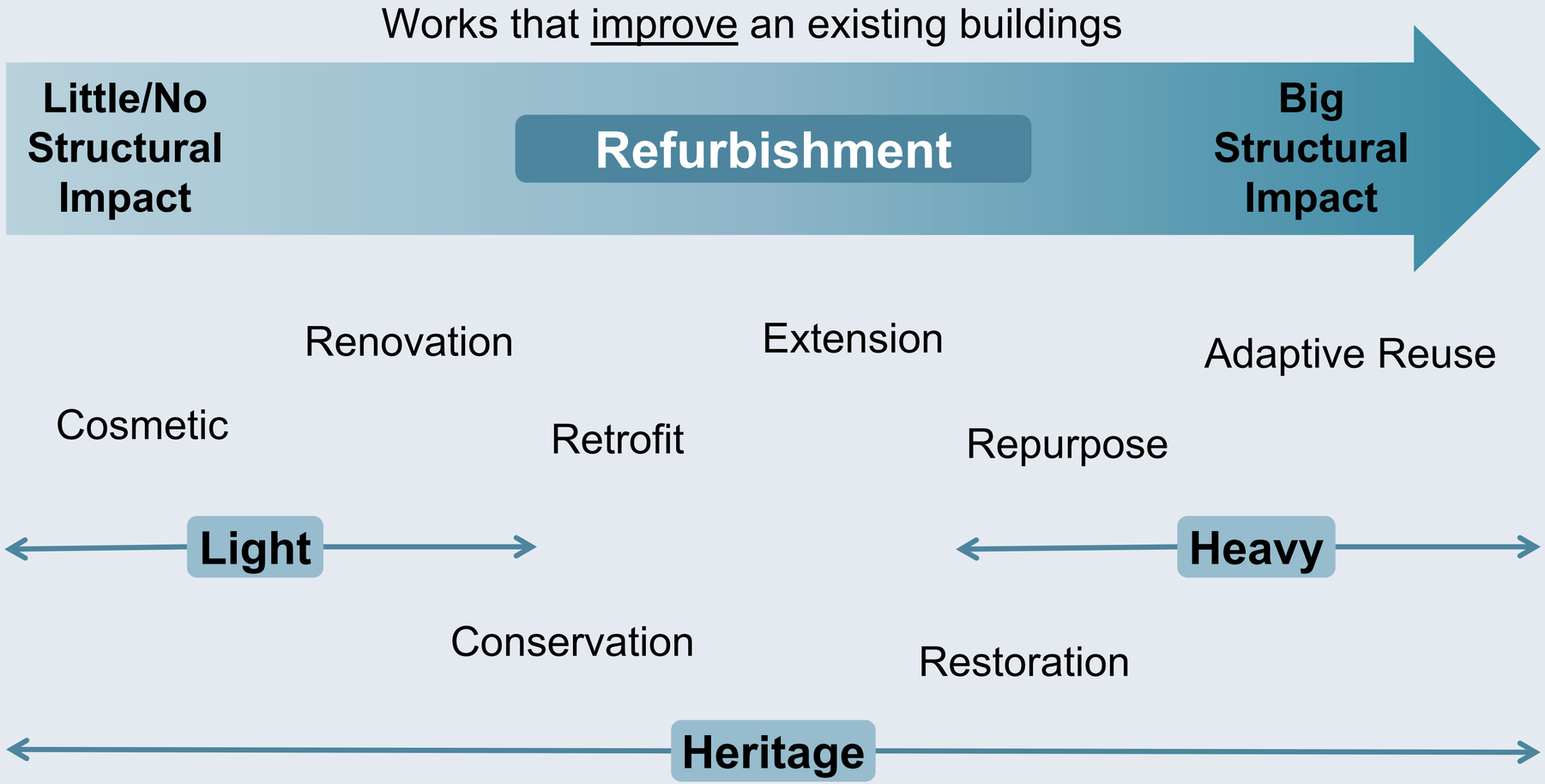
THE FUTURE OF STEEL CONSTRUCTION

Cut & Carve: What? Why? How?

Sally Walsh

WSP

Cut & Carve: What? Why? How?



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Cut & Carve: What? Why? How?

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Cut & Carve is a Construction Technique

Structural alteration involving partial **demolition** and re-engineering of **existing** structures

Highly complex – requires specialist engineering, **temporary** works, and **safety** planning

Add’s **value** by repurposing or extending a building’s life

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Cut & Carve: What? Why? How?

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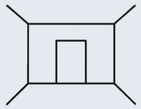
01 Understand Client Aspirations

 More Daylight?

 Better Thermal Performance?

 Open Spaces Required?

 Occupancy to be Increased?

For highest **reductions** in embodied carbon, projects should be designed to **minimise** the scope of **structural** intervention.

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Cut & Carve: What? Why? How?

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01 Understand The Building

- Conduct a **Structural Desk Study** - early feasibility studies and audits are essential.
- Collaborate across teams and **challenge** the need for demolition.
- Do we need to **intervene?** Consider degradation, additional loads, changes to load paths.

How can we achieve our client aspirations?... **Use Cut & Carve**

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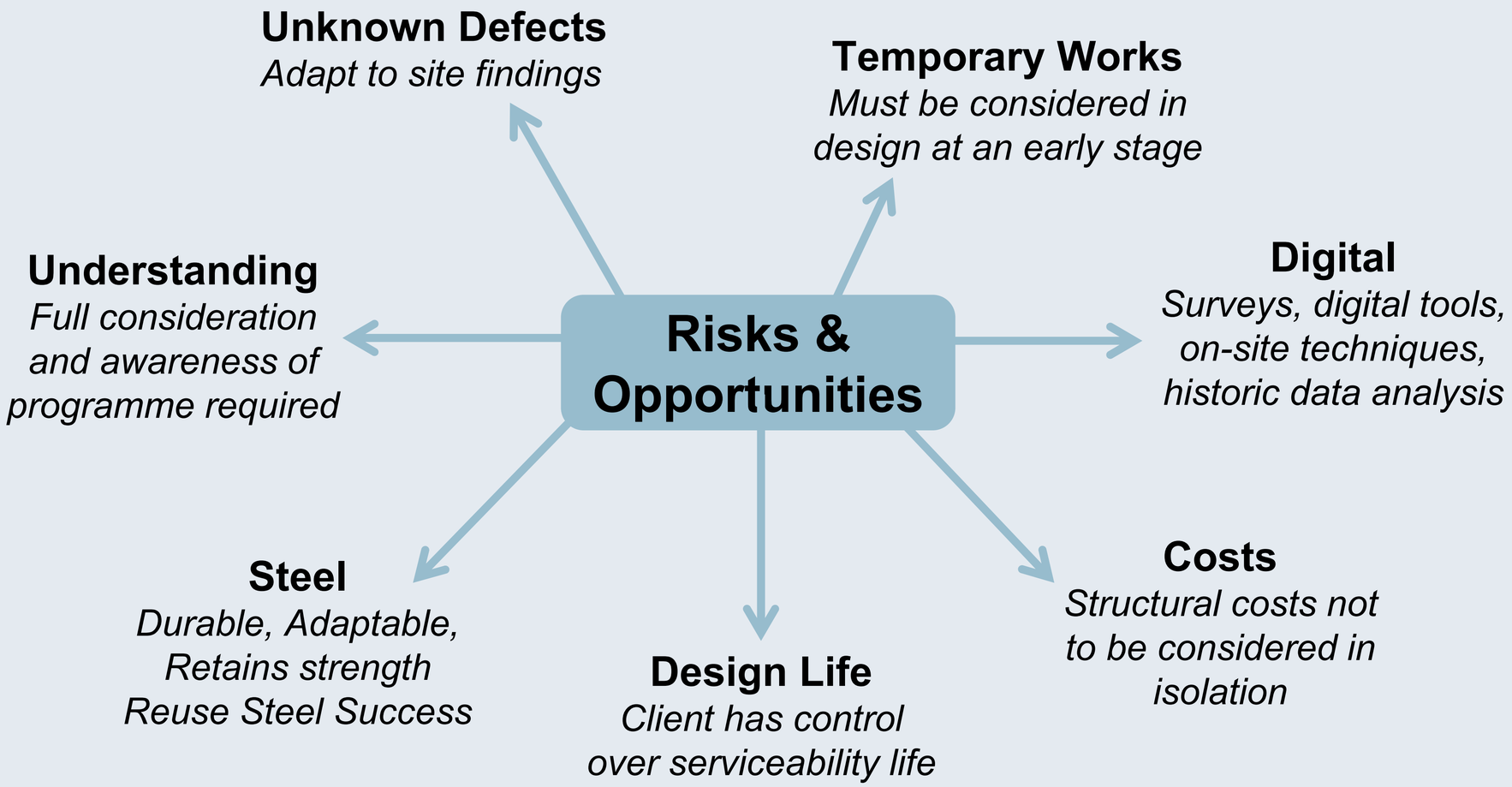
Cut & Carve: What? Why? How?



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Cut & Carve: Closing Thoughts

01 ‘Cut and Carve’ is central to a sustainable, circular future for steel and construction.

02 The steel industry is uniquely placed to lead this transition

03 Project sharing is essential

Next: These principals in action….

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STEEL

CONSTRUCTION

20 Giltspur Street

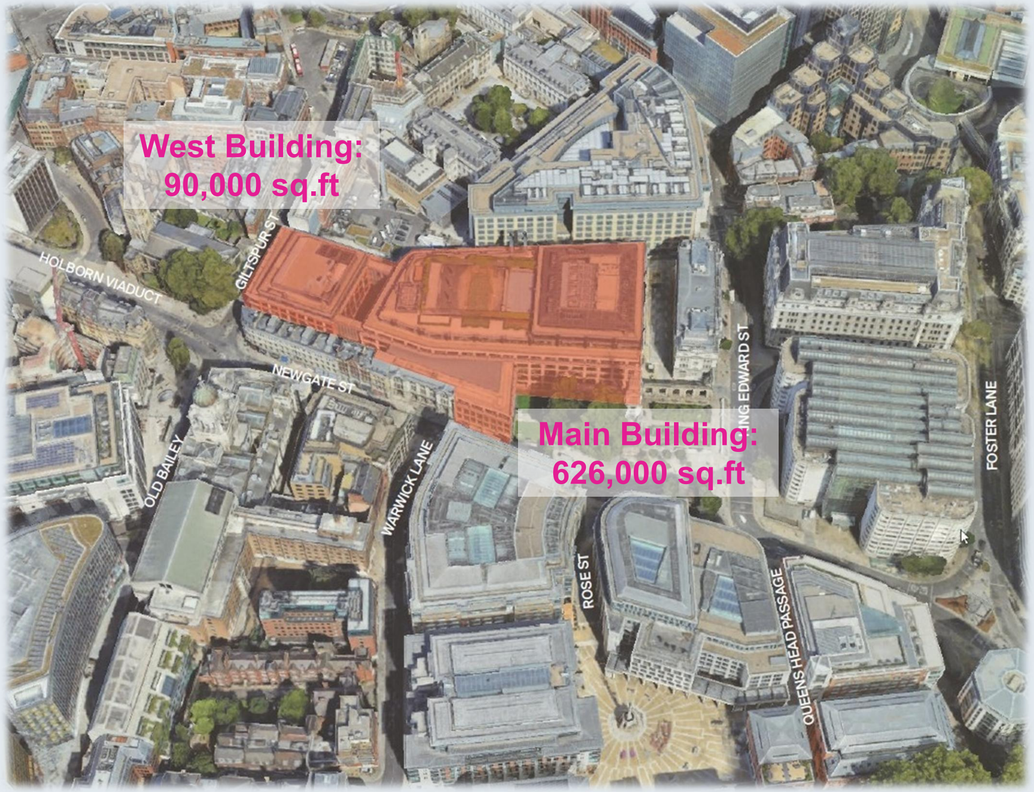
Daniel Bassett

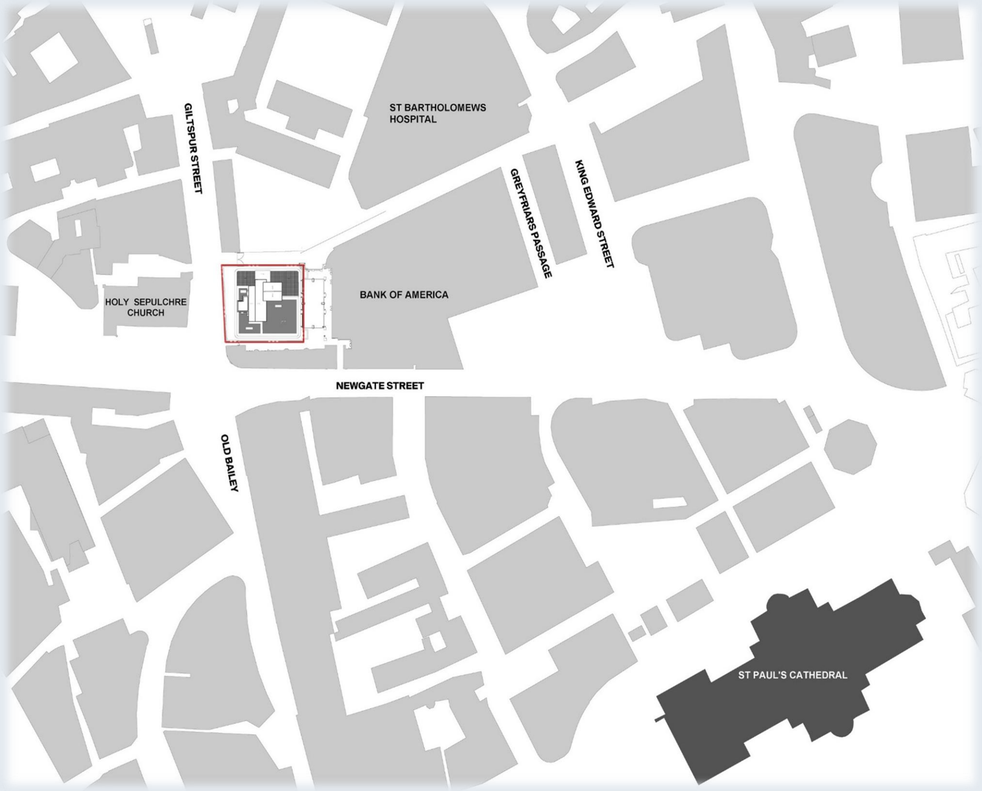
Elliott Wood

Stephen Dorer

Deconstruct UK

20 Giltspur Street
Office block (1999) for Merrill Lynch





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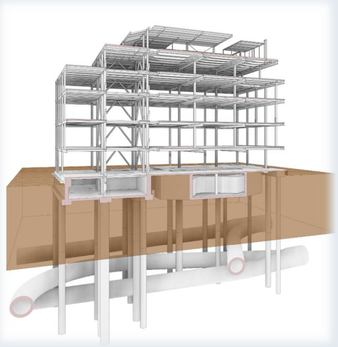
Norges Bank Investment Management · simten DEVELOPMENTS · BGY · ElliottWood · NDY A TETRA TECH COMPANY · stace · exigere · deconstructuk.com

The Journey

		Enabling Tender	Enabling In Contract	
1	2	3	4	5
Sept 2021	2022	Sept 2023	Q4 2023	Jan 2024



- The Brief
- The idea

- Finding what we had
- The Wildcard Option

- Enabling Works Tender
- Two schemes

- Jacking Option Detailed Design
- Incorporating Surveys

- Construction

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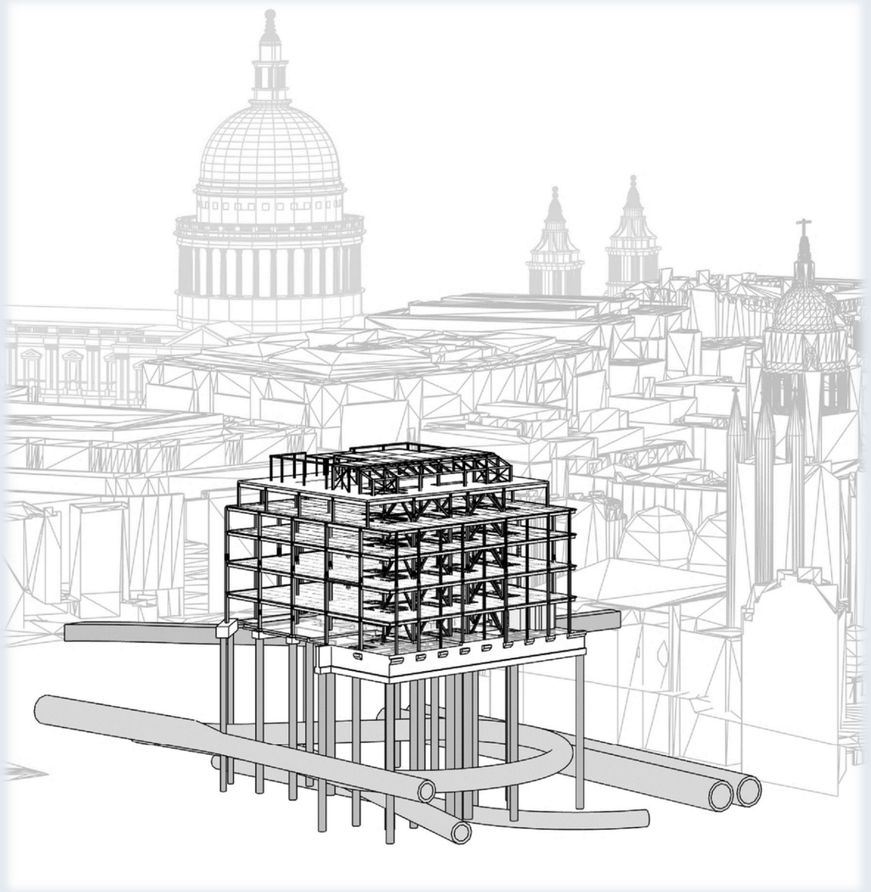
RIBA Stage 1 – Brief
“Maximise the Asset”



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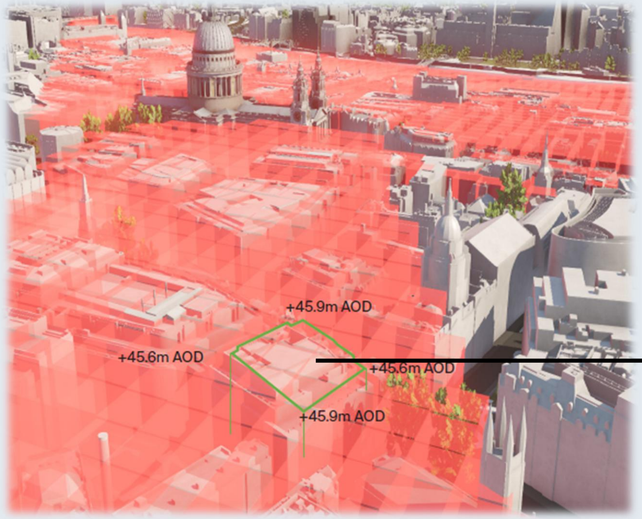
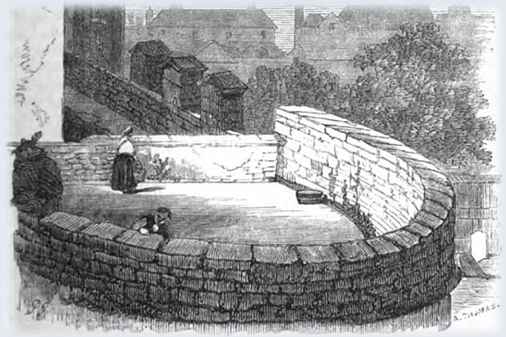
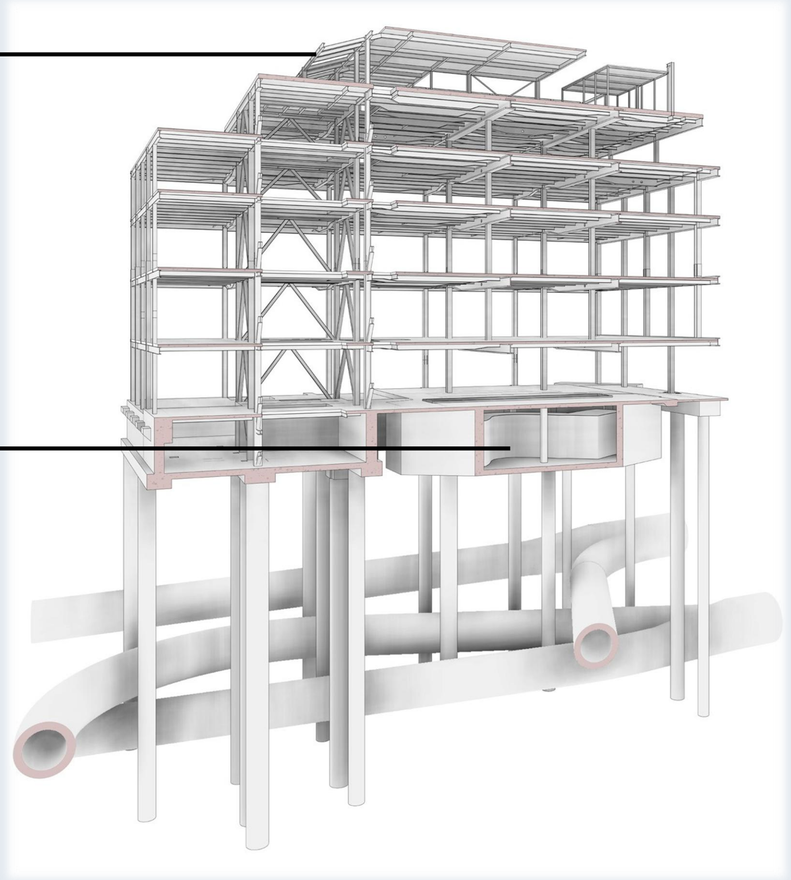
Couldn’t go up or down







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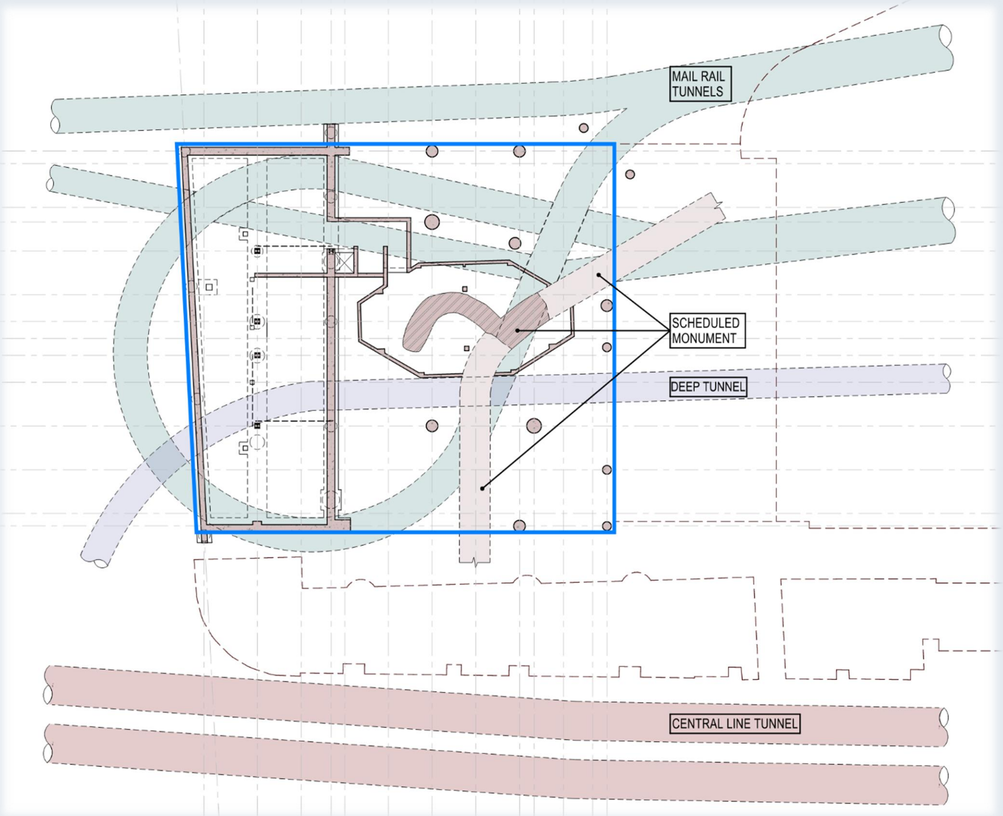
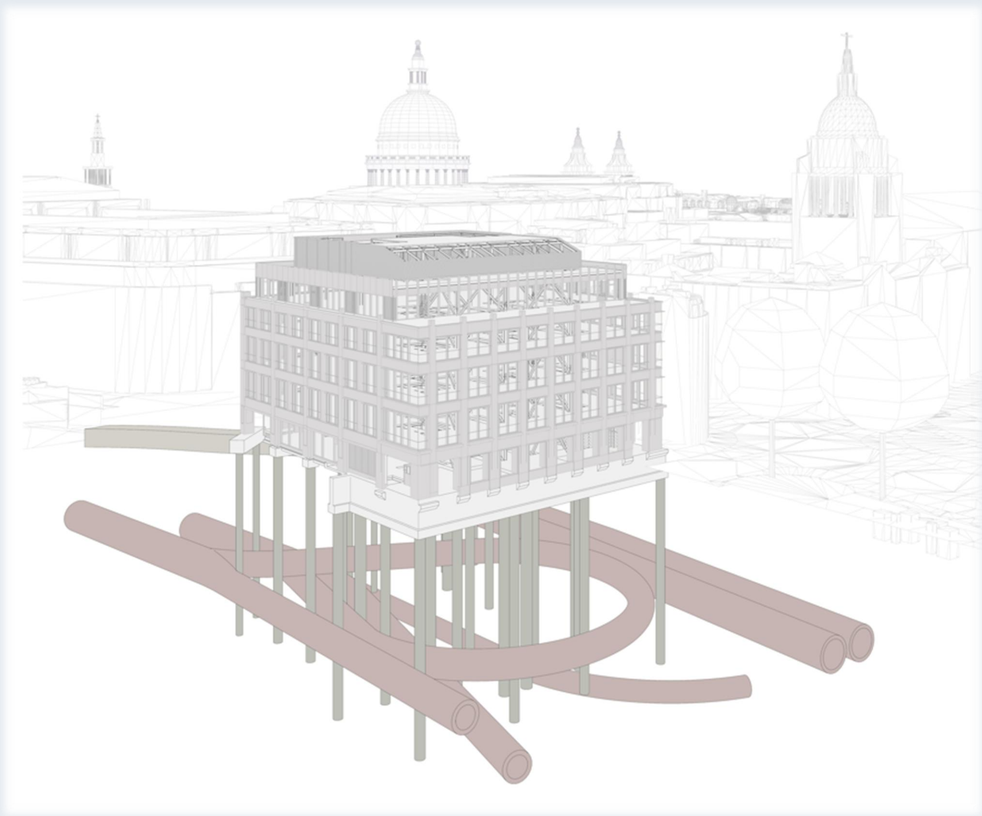
Couldn’t install new foundations





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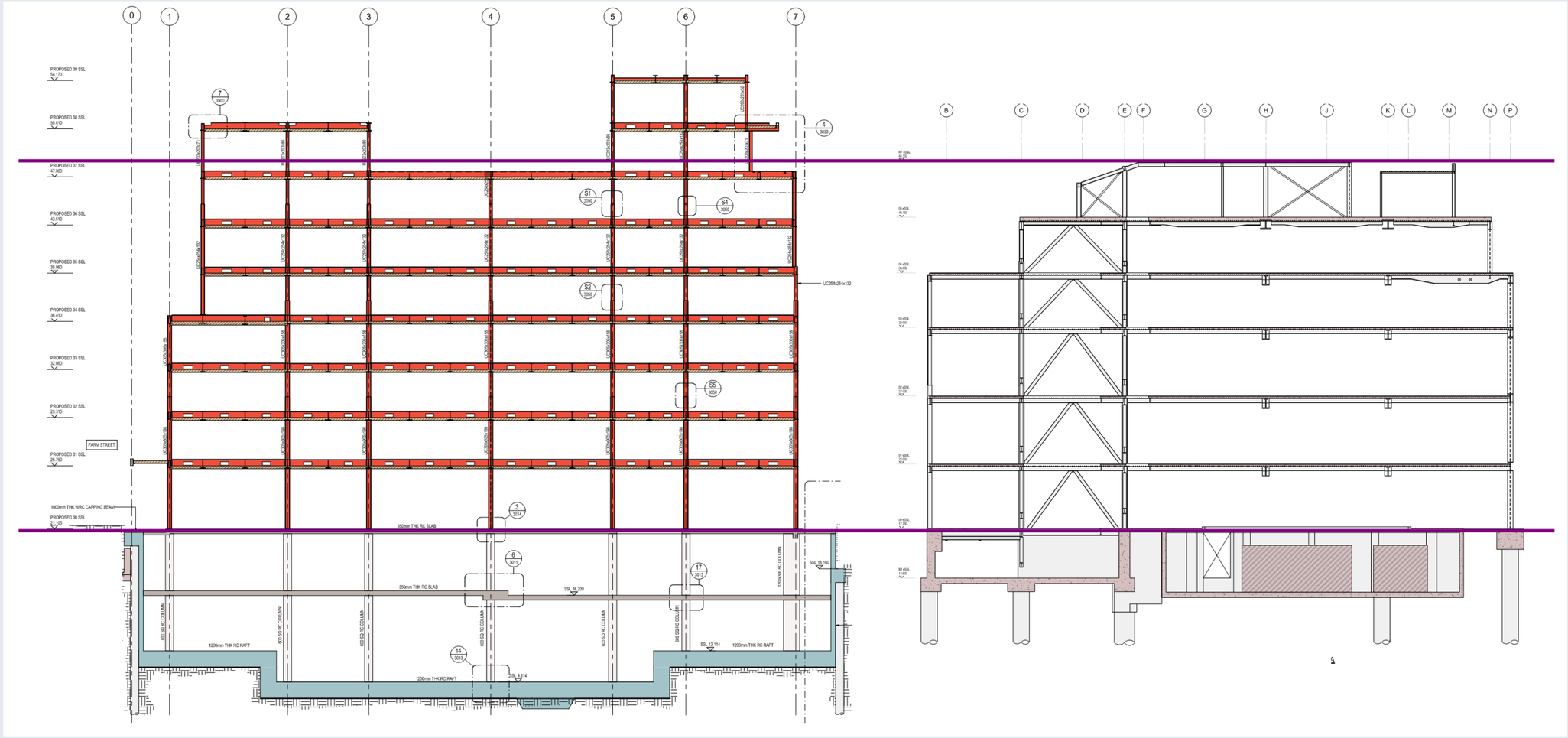
The Idea



36-38 Berkeley Square Proposed Section

20 Giltspur Street Existing Section

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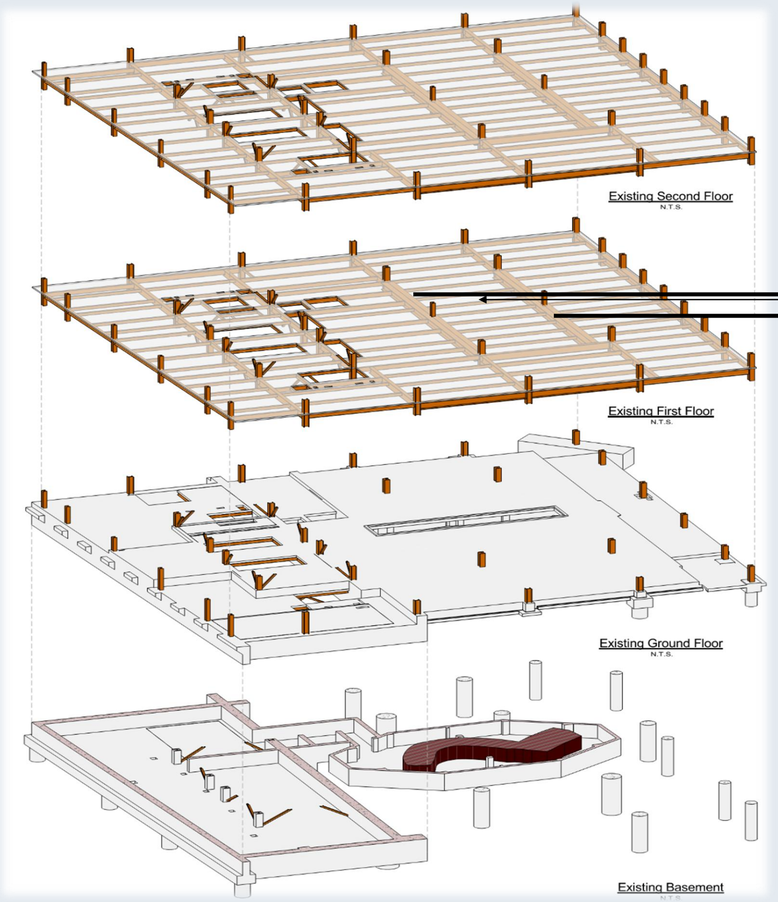
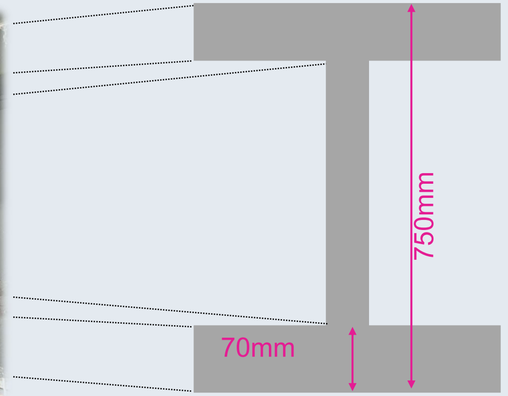
Stage 2 - Good bones

Existing structure was designed for 4+1kN/m^2 imposed load





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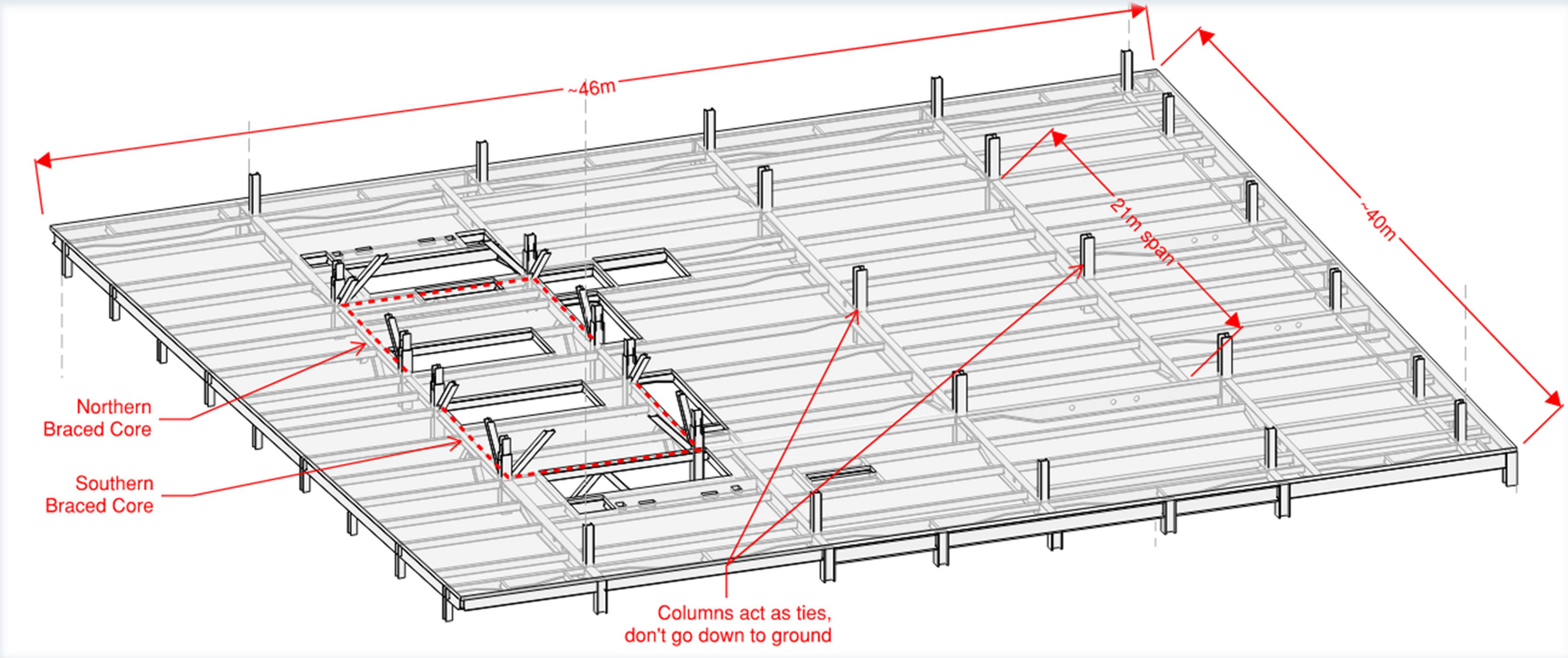
Typical Existing Floor



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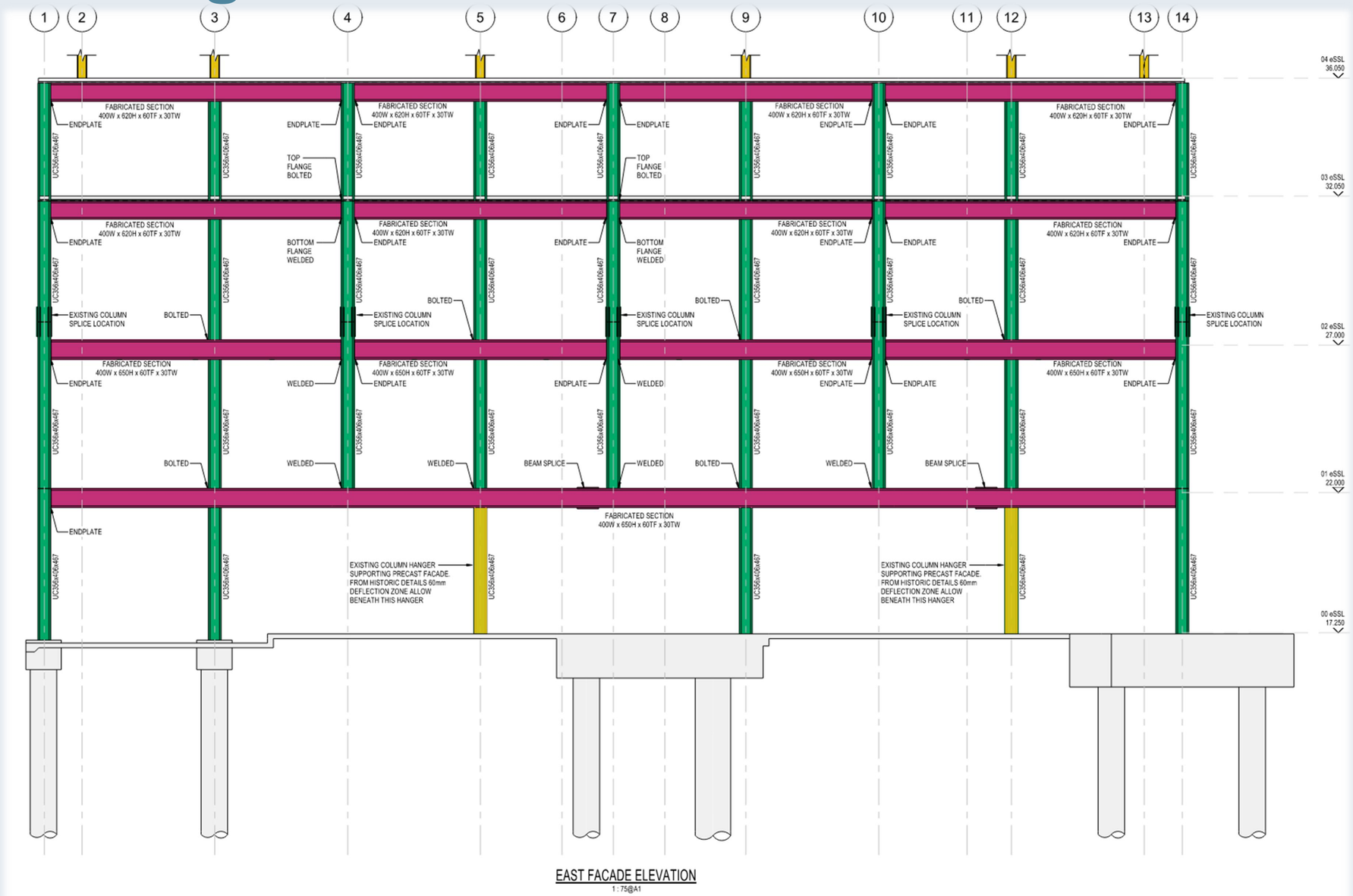
Existing Vierendeel Elevation



EAST FACADE ELEVATION
1 : 75@A1

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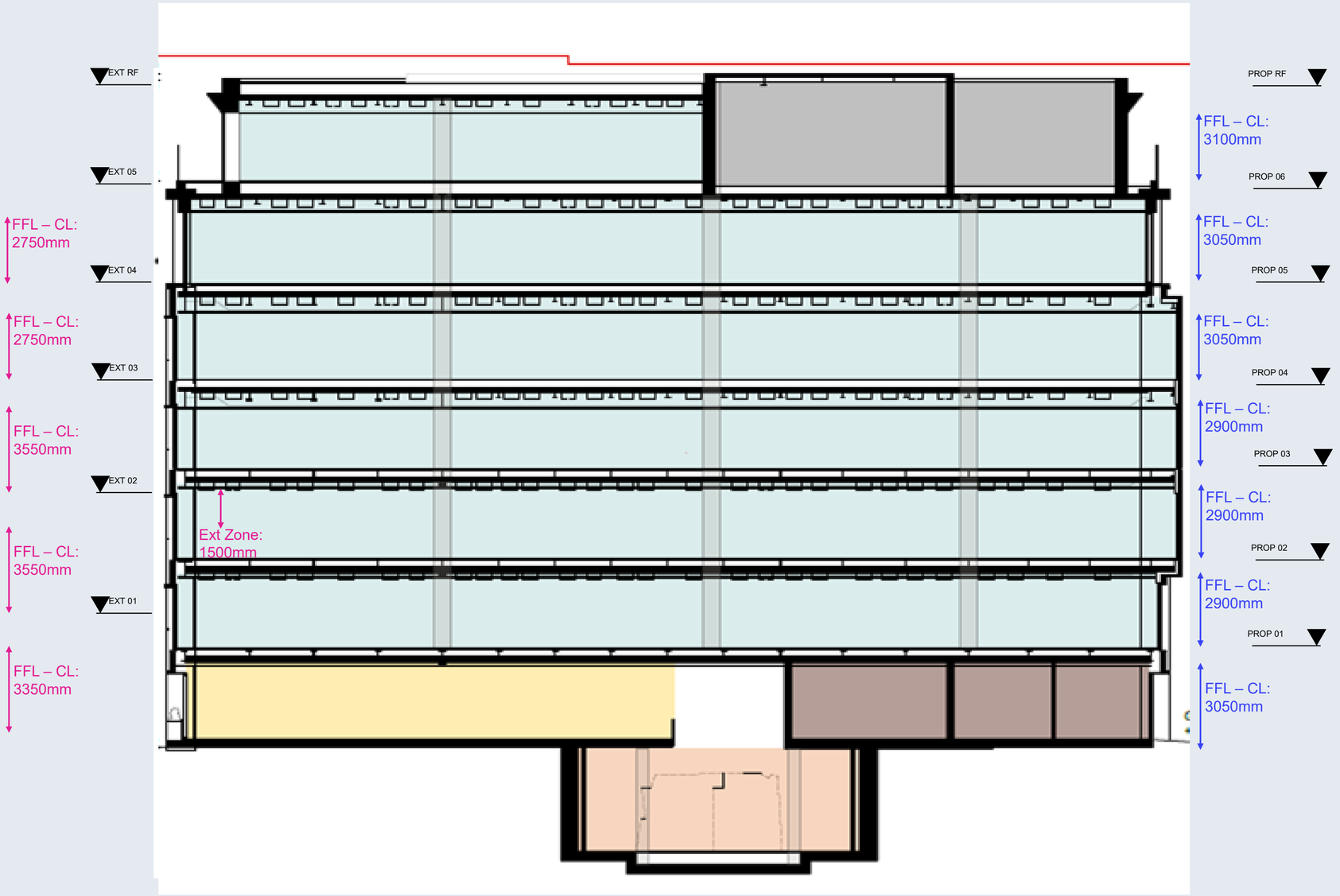
Gain a floor + 1

Initial idea:

Demolish existing first and second floor slabs

Retain what steel we could, build 3 new floors with CLT slabs



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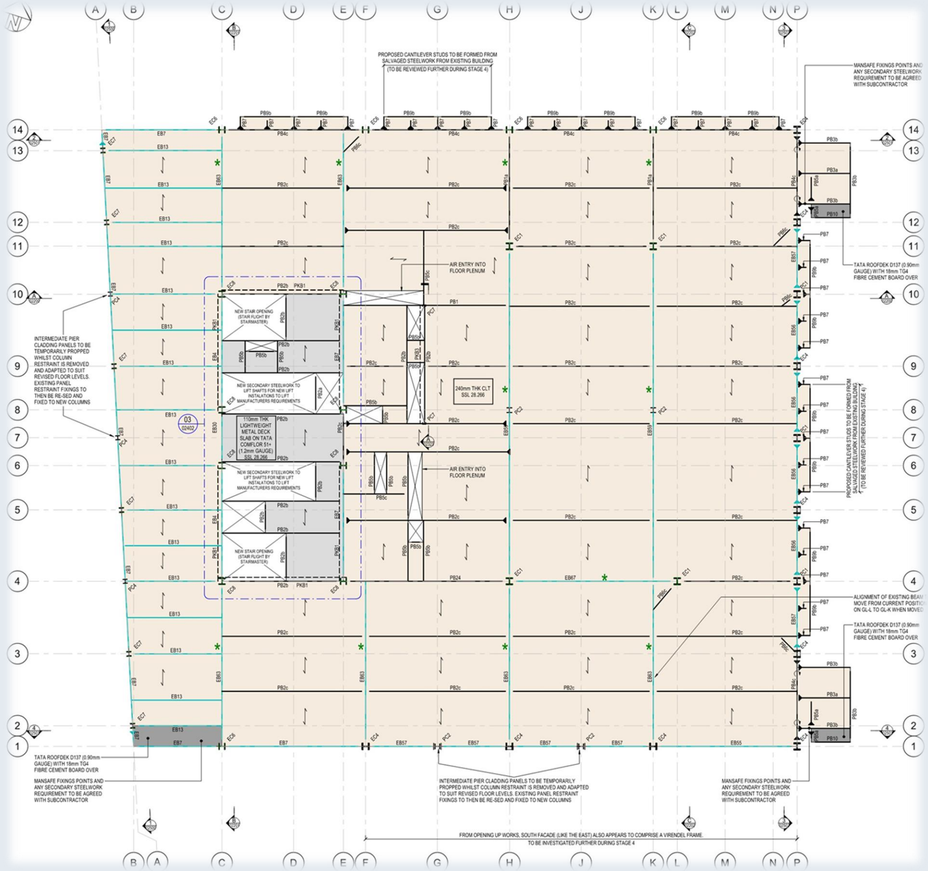
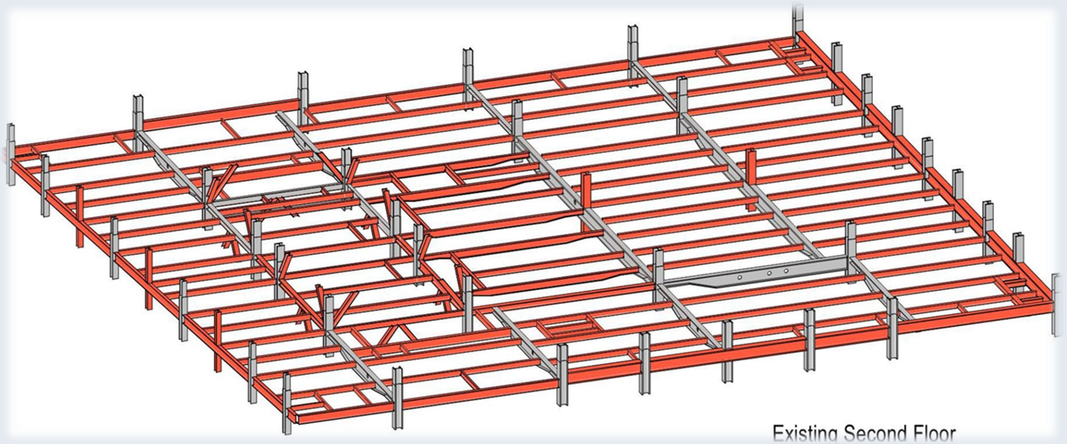
Stage 3 – Enabling Works Tender

Option 1: Compliant Tender Scheme – Demo and Rebuild





0% retention of existing slabs at Levels 01 02

375m^3 of slab demolition required

35% of existing beams reused (by weight)

163T of steelwork not able to be re-used

Volume of New CLT required for New Levels 01, 02 & 03

= ~1075m^3

No blue sky, challenging install of CLT through existing facade apertures

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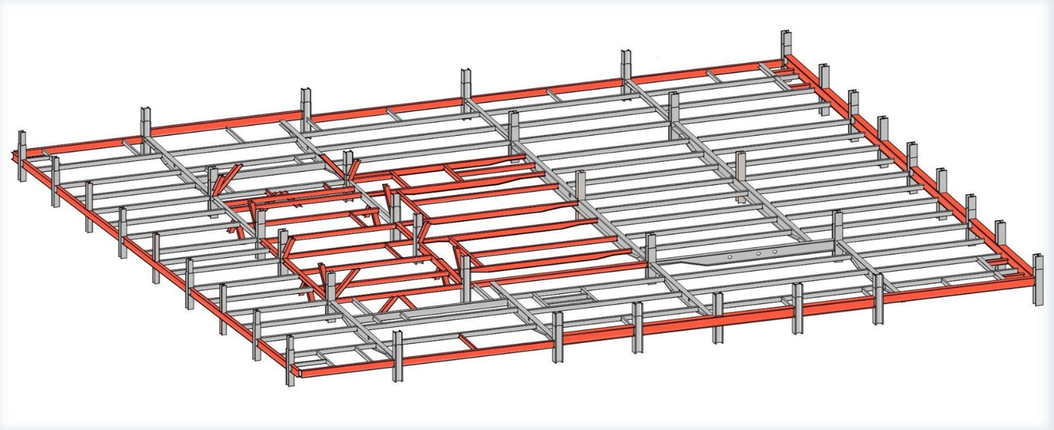
Stage 3 – Enabling Works Tender

Option 2: Contractor proposal – Jacking Scheme



75% retention of existing slabs at Levels 01 & 02
94m^3 of slab demolition required

65% of existing beams reused (by weight)
80T of steelwork not able to be re-used

Volume of New MD infill for New Levels 01, 02 & 03
= ~225m^3

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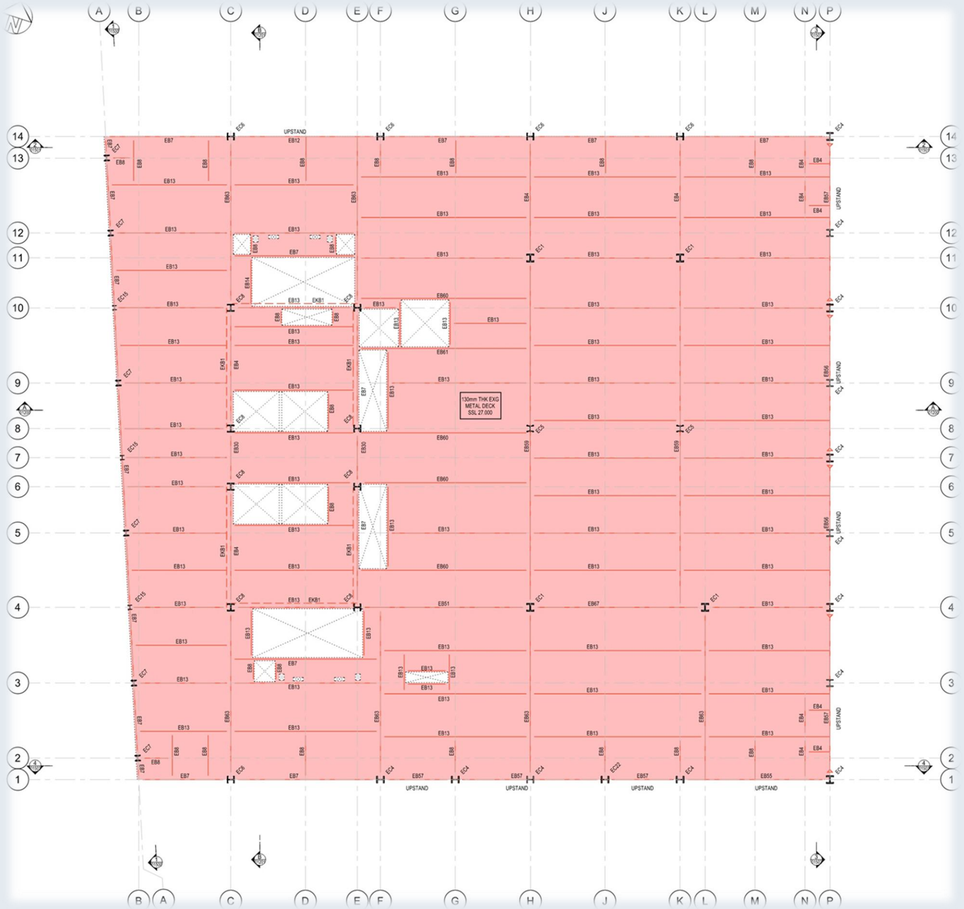
Slab Demolition Comparison



Option 1 – Demo & Rebuild

Option 2 – Jacking Existing Structure

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Stage 4 – Jacking Option taken forward

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Final Vision

- 30% gross area increase
- 41% net area increase
- 80% existing steel reused **+ 70% of existing slabs re-used**
- **EAF for new rolled sections where possible**
- Re-using 2 MD floors saved circa 350m^3 of demo material
- Jacking gave 30% cost saving and reduced programme by 25%
- Would've been more efficient to build on top if that was possible
- A1-A5 127kgCO_2/m^2
  - **251kgCO_2/m^2** Business as usual, demo and rebuild Levels 01/02/03 with new steel and MD slabs (UK Ave EC)
  - **208kgCO_2/m^2** Tendered CLT Option

Scope

- Installation of 607 tonnes of structural steelwork.
- Installation 5350m² of metal decking.
- Formation of 2000 service penetrations.
- Blasting of approximately 7850m² of existing steelwork.
- Application of 8590m² of intumescent.
- Jacking of 2No floor plates. 1No circa 2.20m and another approximately 1.20m and all associated reconnection works. 150t of structural steelwork reused. – Our Alternative
- Removal and Repurposing of Steel at Roof Level
- Steel transfer beams moved 150mm to achieve desired floor to ceiling heights.
- Strengthening of existing splice connections at GF and Second Floor.

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Key Challenges

- The location and key neighbours.
- Cannot go up and cannot go down.
- Blasting – intrusive
- Nearly everything manual.
- Taking steelwork – taken out manually through the floors for repurposing.
- The connections – Locked in stresses and splicing
- Insurances
- Main Contractor

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Moving Material within the building

- The job requires the installation 150 tonnes of fabricated plate girders all of which are installed by hand.

- Only 150 tonnes of steelwork was able to be installed by Tower Crane – which equates to approximately only 24% - the other 76% was by hand

- 2No. 19t, 20 metre plate girders were spliced, bought into the building and erected by hand.

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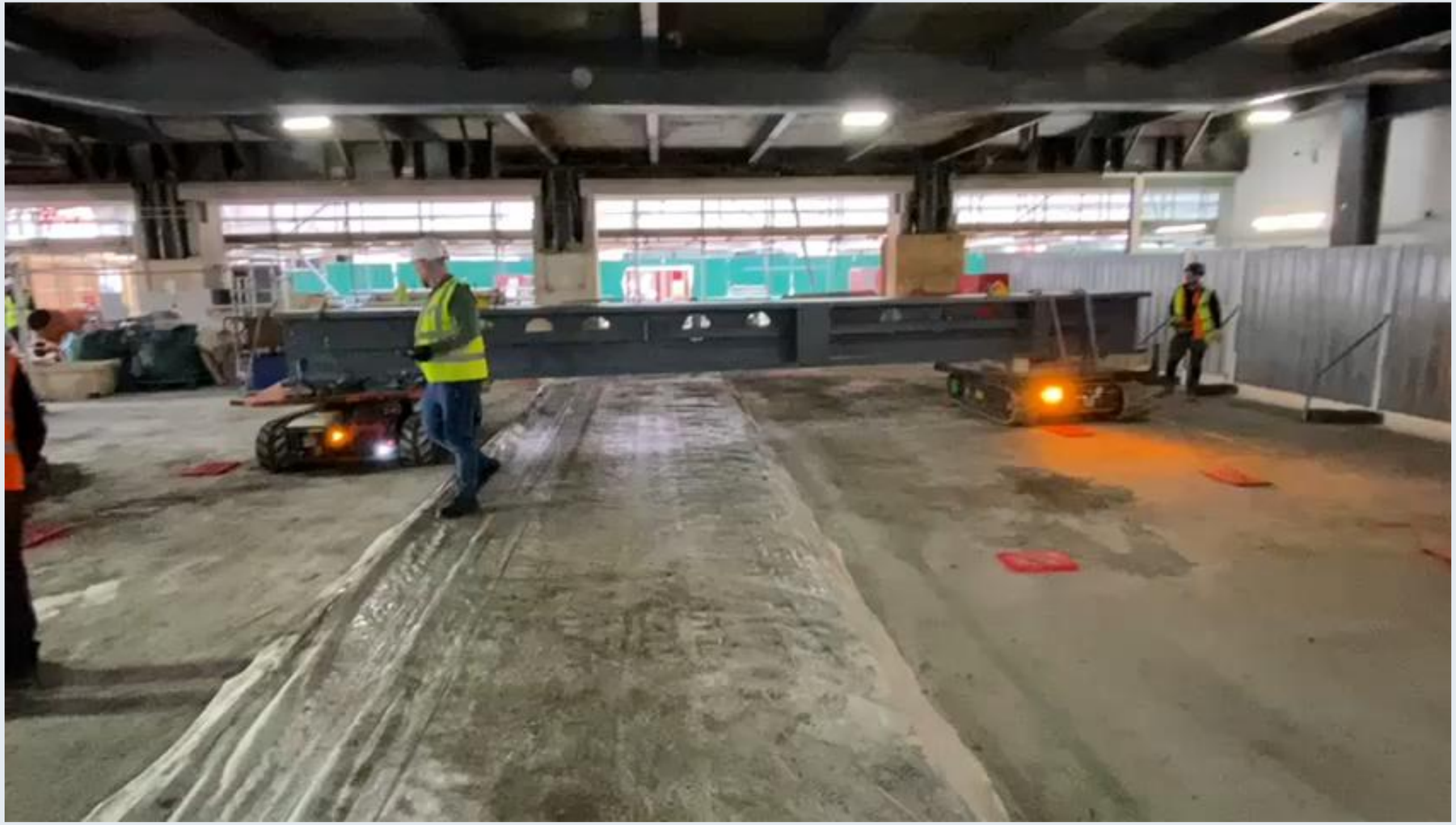
Moving Material within the building



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The Jacking

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