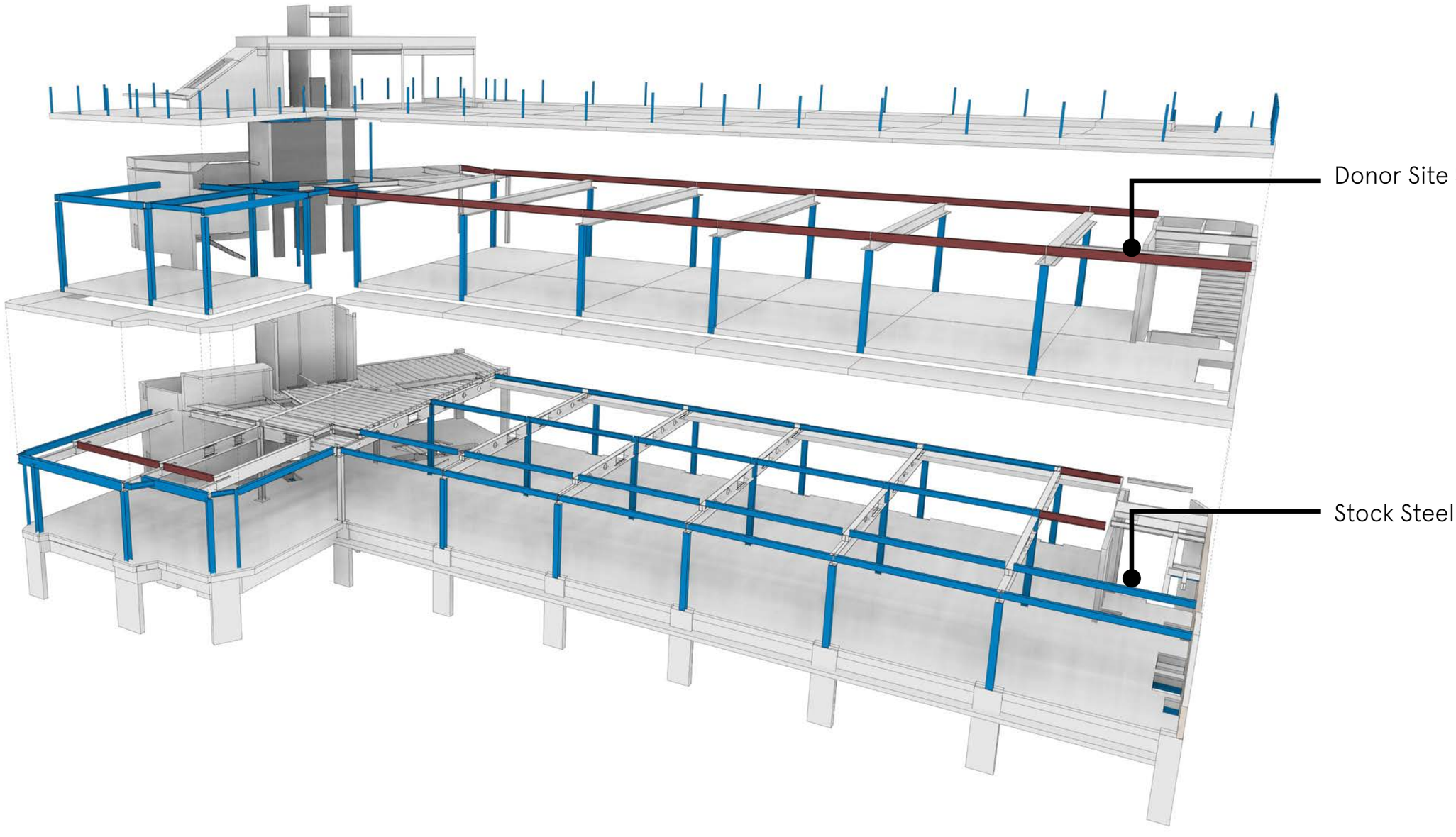
HTS+ Re-Use of Steelwork - Holbein Gardens, October 2022

Steel Reuse at Holbein Gardens

+ Steel reuse accounting for 35% of steelwork



Holbein Gardens Steel Reuse

Selecting Steel for Reuse

Existing Building

+ Mansard roof steels boxed in
+ Columns concrete encased

Current Site

(Incorporated in design RIBA Stage 2 & 3)

Steel for potential reuse at Holbien was identified by HTS.

Measured survey provided approximate lengths, HTS measured steel sizes and undertook visual inspection of steelwork.

↓

Demolition undertaken in a controlled manner for steel reuse.

↓

Transported to Cleveland Steel testing facilities.

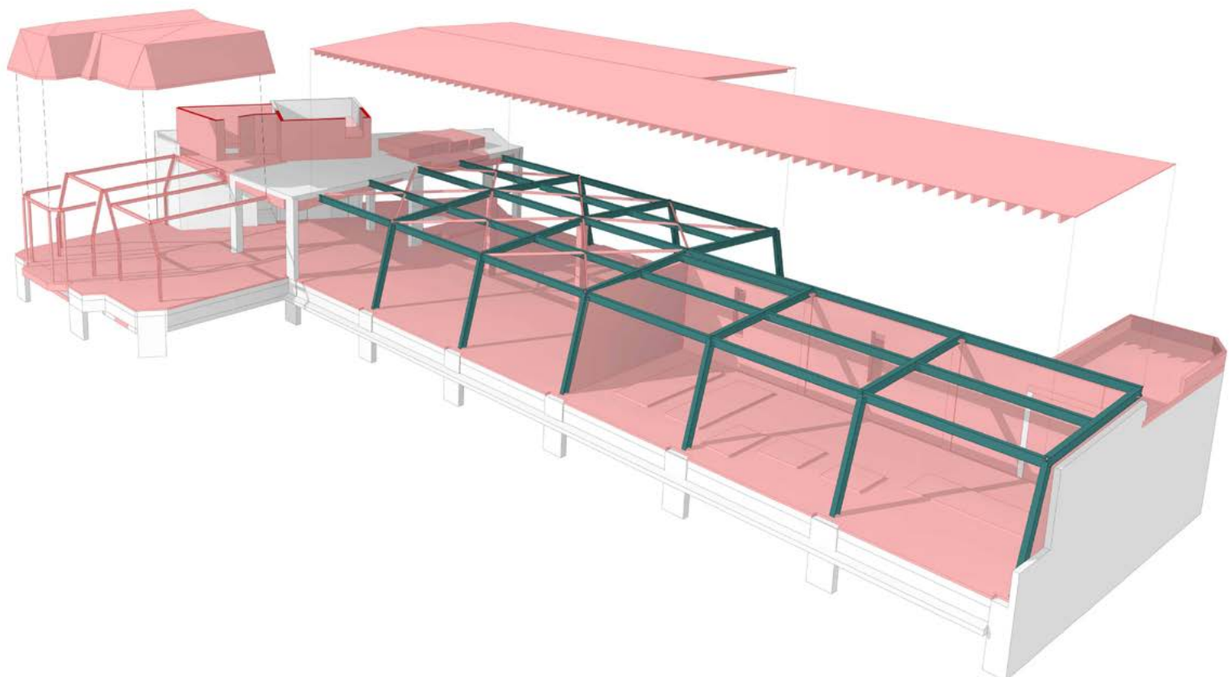
↓

Steel sorted, inspected tested and cleaned. Record of declaration created to allow for distribution into supply chain.

↙ ↘ Not possible to reuse on project due to programme constraints

Steelwork stored for future builds by client. **Or** Sold

Existing Building Steels



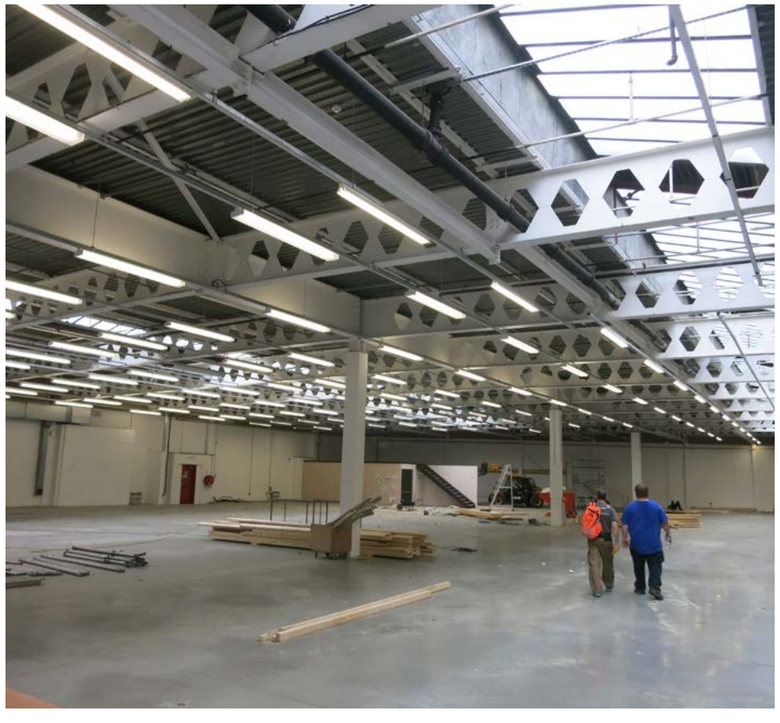
Demo Isometric

Selecting Steel for Reuse

Bermondsey Biscuit Factory Site

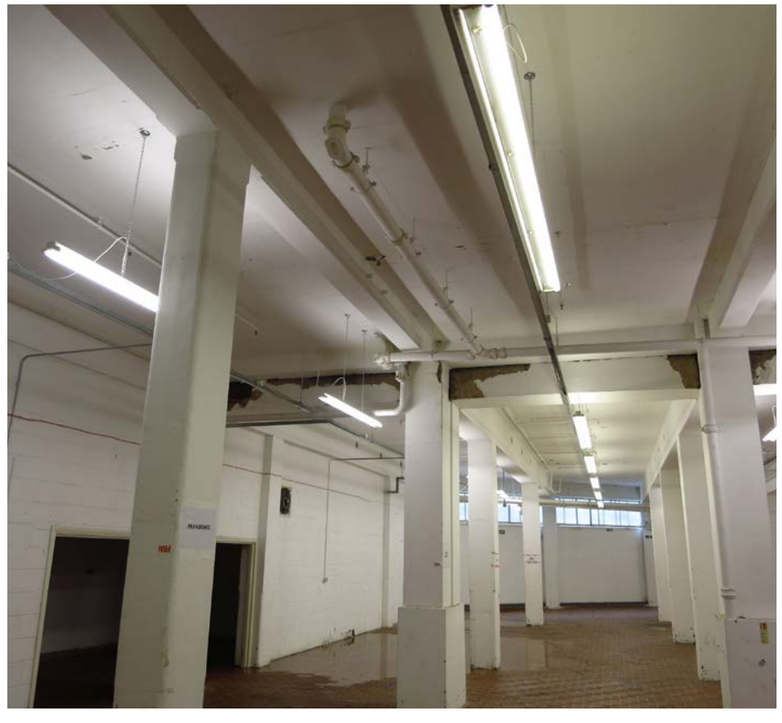
+ Deep beams or castellated beams
+ Steel from existing trusses
+ Concrete encased steelwork
+ Compositely designed steelwork

Compositely designed steelwork



Castellated/deep beams

Steel trusses



Compositely designed steelwork

Selecting Steel for Reuse

Bermondsey Biscuit Factory Site

+ Steels from a small mezzanine
+ Bolted connections
+ Minimal finishes
+ Repetitive sizes

Steel beams and columns forming mezzanine

Selecting Steel for Reuse

Extracting the steel from Bermondsey (9T)

+ Steel removed out of sequence with demolition programme
+ H&S required steels to be supported on scaffold tower prior to being unbolted
+ Added a significant additional cost

Other Sites Owned by Client

(Incorporated in design RIBA Stage 3 & 4)

Steel for potential reuse at Holbien identified at the 'Biscuit Factory' in Bermondsey. HTS measured steel sizes and undertook visual inspection of steelwork.

↓

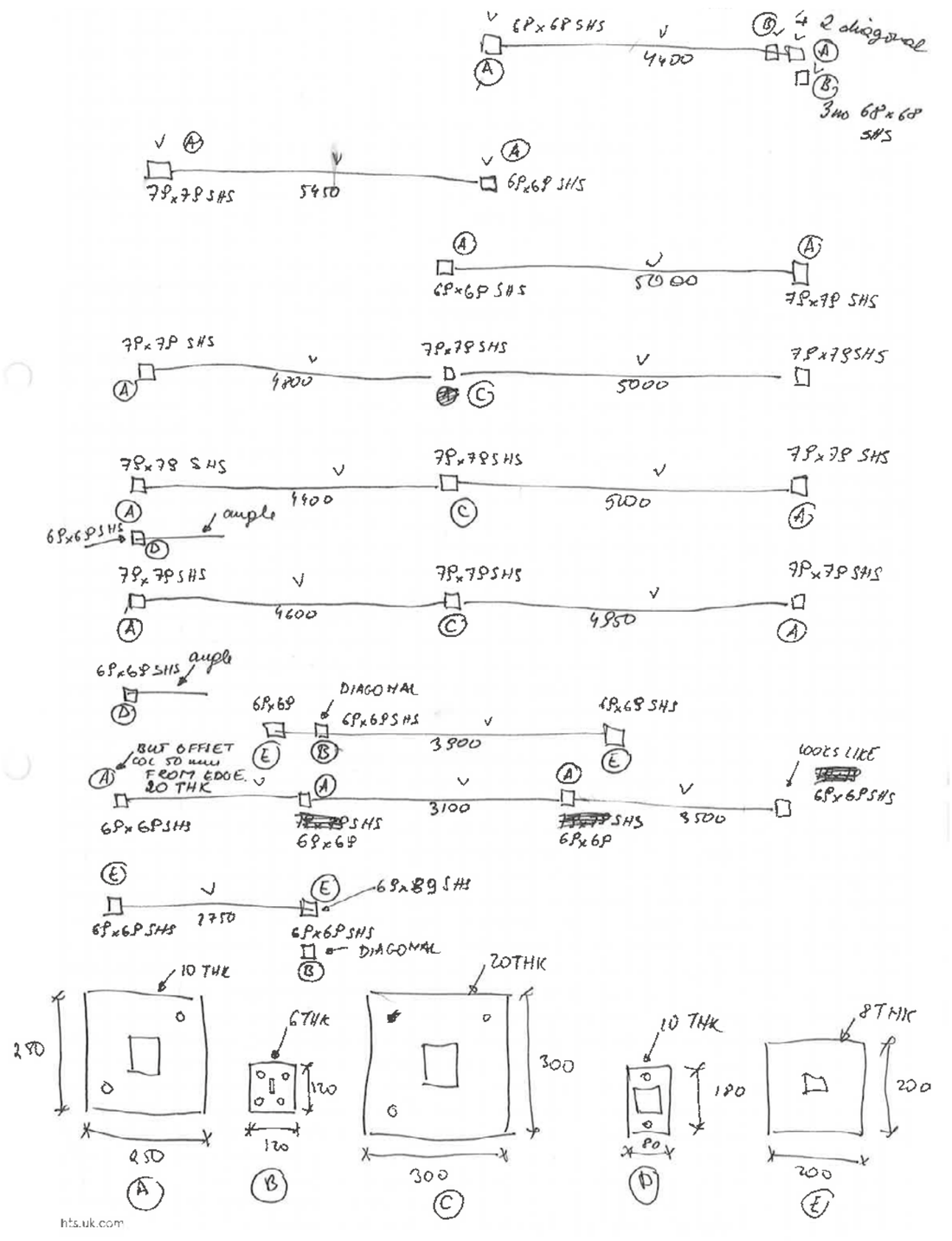
Structure deconstructed, bolted connections.

↓

Transported to Cleveland Steel testing facilities

↓

Steel sorted, inspected tested and cleaned. Record of declaration created to allow for re-use of steel.



Steelwork Survey Notes

Selecting Steel for Reuse

Steelwork from stockist

+ Stock lists confirm available steels
+ Working with Cleveland Steel to confirm steel that could be substituted in

Stocklists

(Incorporated in design RIBA Stage 4 & 5)

Cleveland Steel stock holders provided information to HTS regarding current steel stock.

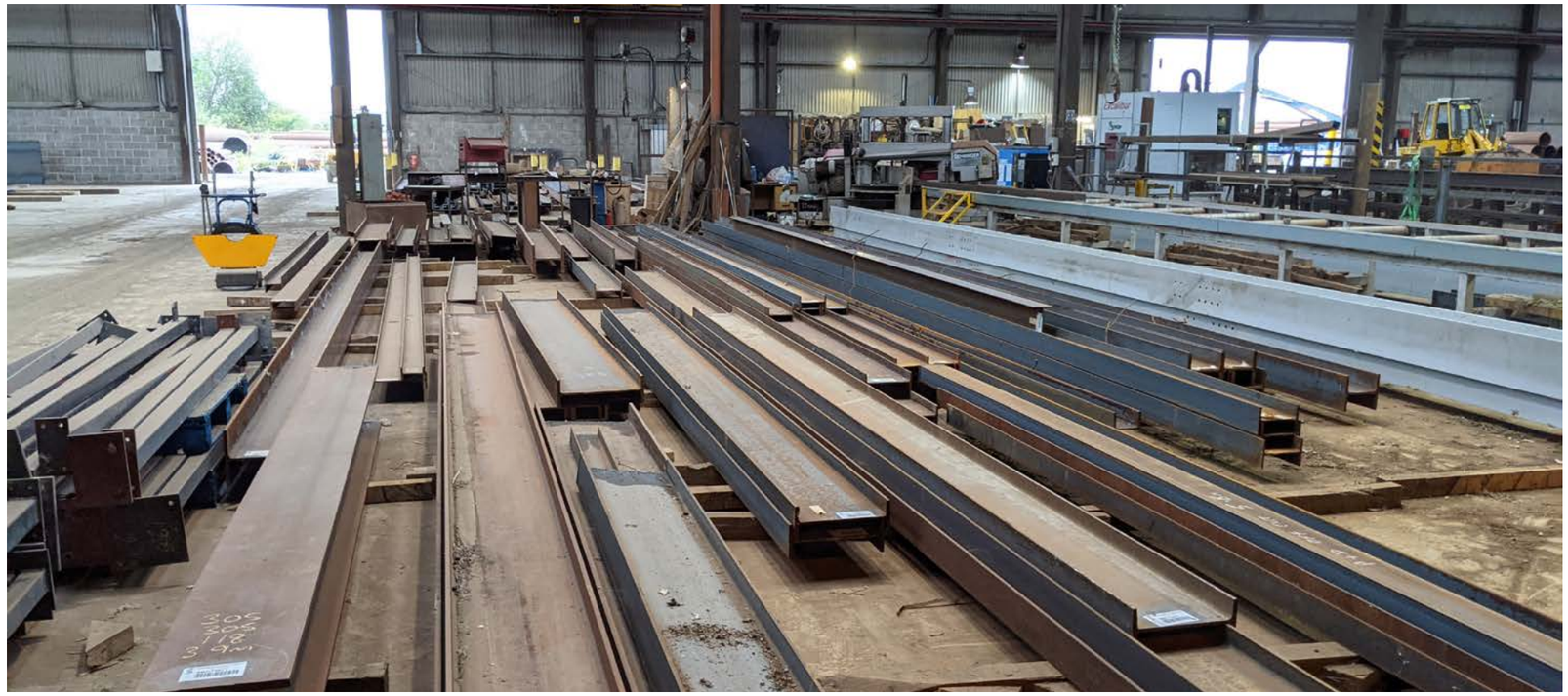
Steel identified for reuse by Cleveland steel including US Embassy Temporary Works

Demolition undertaken in a controlled manner for steel reuse.

Transported to Cleveland Steel testing facilities

Steel sorted, inspected tested and cleaned. Record of declaration to allow for distribution into supply chain.

Steelwork held in storage, and logged on stock list to sell on open market for re-use.



Cleveland Steel Stock

NUM	CDE	PRO	LO1	CHO		ASP		EXT		RVE		DE1	
Beam No.	P.O. No.	Section	Length	Quality		Condition		Ends		Coating		Defect1	
SB00714	502006	UB35617145	6400	4	SECONDHAND	8	PAINT REQUIRES REMOVAL	1	PLAIN	3	PAINTED	6	HOLES
$SB01153	501972	PFC20021060	6400	4	SECONDHAND	7	PAINT REQUIRES REPAIR	0	NO INPUT	3	PAINTED	2	ATTACHME
$SB01277	502026	UB610229101	10100	4	SECONDHAND	7	PAINT REQUIRES REPAIR	6	FLAMECUT	3	PAINTED	1	BENT
157	501973	UB25410228	15500	1	1ST CHOICE WITH CERTS	2	STOCK RUSTY	0	NO INPUT	0	NOINPUT	0	NO DEFECT
71599	501972	UC20320346	9500	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	6	HOLES
71600	501972	UC20320346	7370	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71601	501972	UC20320346	9500	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	6	HOLES
71602	501972	UC20320346	9500	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	6	HOLES
71603	501972	UC20320346	9360	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	6	HOLES
71604	501972	UC20320346	9360	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	6	HOLES
71605	501972	UC20320346	9450	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	6	HOLES
71606	501972	UC20320346	9450	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	6	HOLES
71607	501972	UC15215237	4080	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71608	501972	UC15215237	4080	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71609	501972	UC15215237	3600	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71610	501972	UC15215237	4080	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71611	501972	UC15215237	4070	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71612	501972	UC15215237	3600	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71613	501972	UC15215237	4080	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71614	501972	UC15215237	3600	4	SECONDHAND	6	PAINT IN GOOD ORDER	1	PLAIN	3	PAINTED	0	NO DEFECT
71615	501972	UC20320346	5400	4	SECONDHAND	1	GOOD	1	PLAIN	3	PAINTED	6	HOLES
71616	501972	UC20320346	5400	4	SECONDHAND	1	GOOD	1	PLAIN	3	PAINTED	6	HOLES
71617	501972	UC20320346	7000	4	SECONDHAND	1	GOOD	1	PLAIN	3	PAINTED	6	HOLES

Cleveland Steel Stock List

Selecting Steel for Reuse

Steelwork from stockist

+ Cleveland Steel appointed to carry out both supply and fabrication of steelwork
+ Able to substitute in stock steelwork late on when it became available

Old US embassy temporary works where much of the steel originated

Selecting Steel for Reuse

HEYNE TILLETT STEEL

Cleveland Steel

(Yorkshire)

Cleveland Steel Stock (16T)

Existing steel from Holbein Place (25 steels)

Other Grosvenor projects

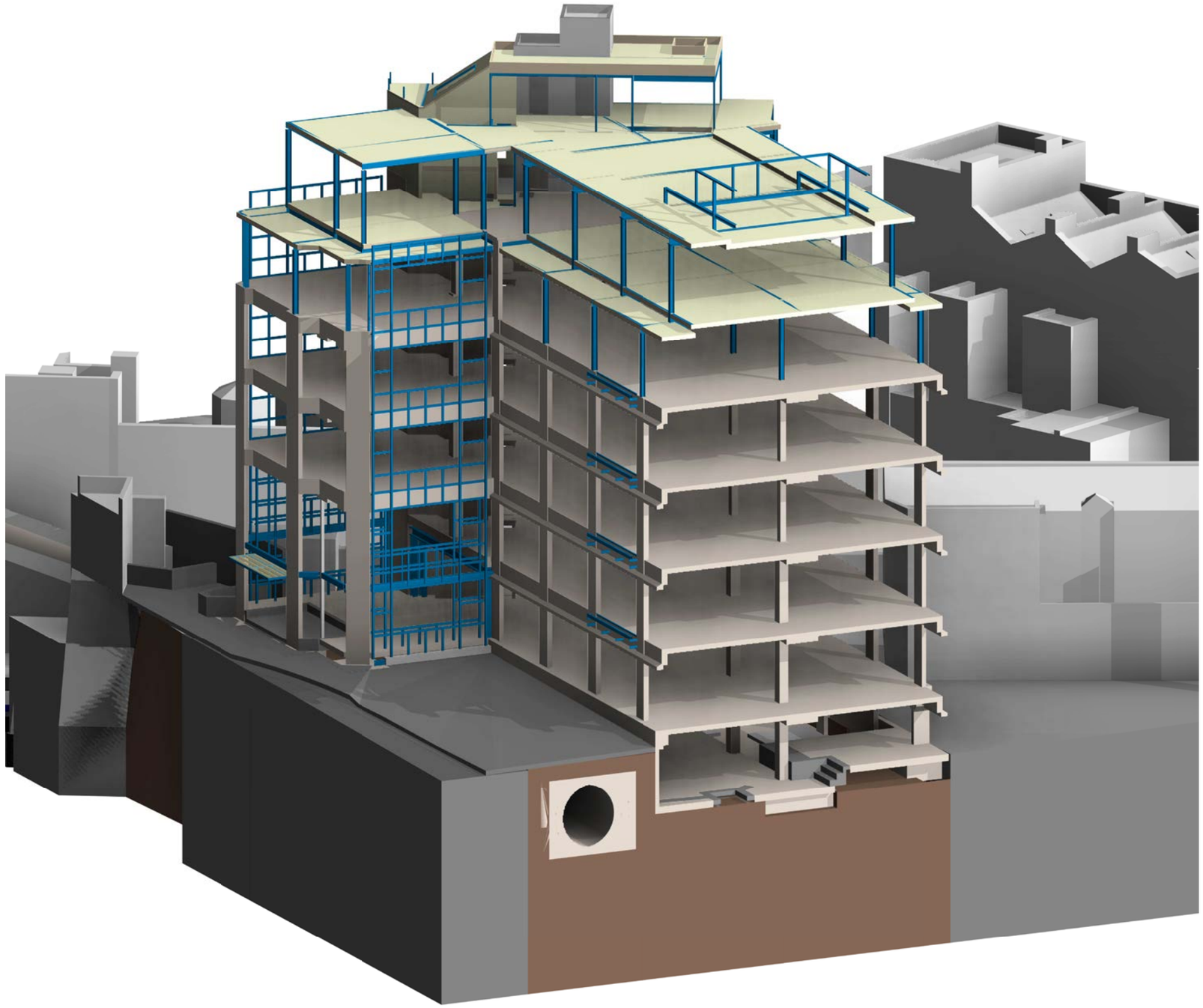
Bermondsey Steel

(22 beams, 6T + columns 3T)

Designing Using Reused Sections

How was the reused steelwork incorporated into the design

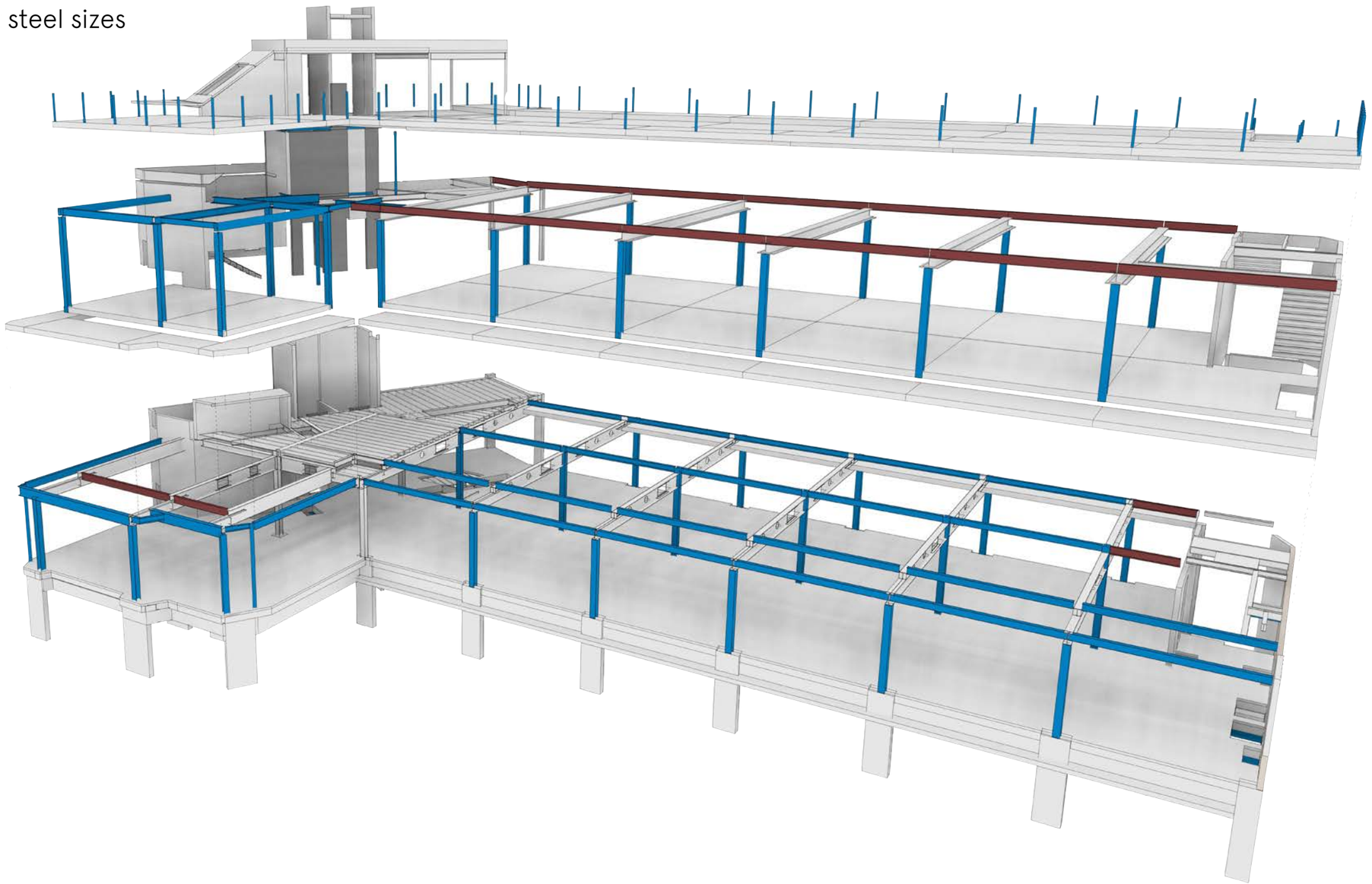
+ Project steelwork split into two packages, enabling and main works, only the main works were considered for reuse



Designing Using Reused Sections

How was the reused steelwork incorporated into the design

+ Design team reactive to what was available
+ Flexibility to change steel sizes until late into the design stages (stage 5)
+ Willingness to incorporate different steel sizes (such as European HE sections)
+ Engaged with Cleveland Steel at stage 4 and continuous dialogue
+ Getting the contractors on board
+ Larger steel sections were not possible to obtain, so focus on tie beams, columns and smaller spans



Designing Using Reused Sections

Implications of reused steel on design

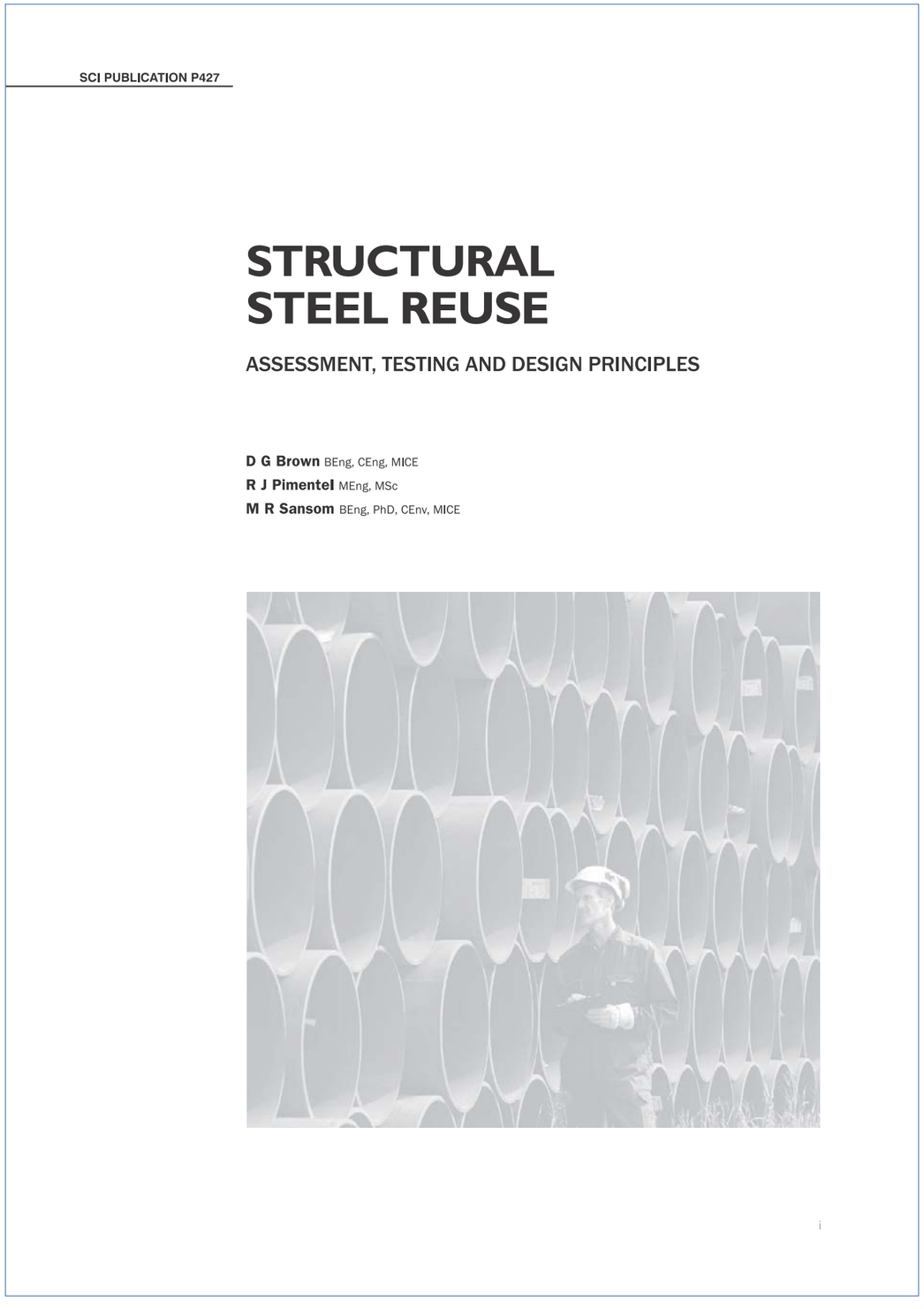
Designing with reused steel is straightforward

Design considerations

+ Design using SCI P427 – Structural Steel Reuse – Assessment, Testing & Design Principles
+ Additional 15% factor applied to buckling checks (columns) but otherwise code safety factors for new steel can apply
+ Early stage design should consider historic grades of steelwork (S275 or before)
+ Ensure to maintain high utilisation of steel section

Practical considerations

+ Consideration of any damage and previous holes in steel
+ If pre-demolition, then account for ends of steels being cut off when demolished
+ Excludes members subject to fatigue, plastic design, extreme loads (fire, impact) and pre-1970



Designing Using Reused Sections

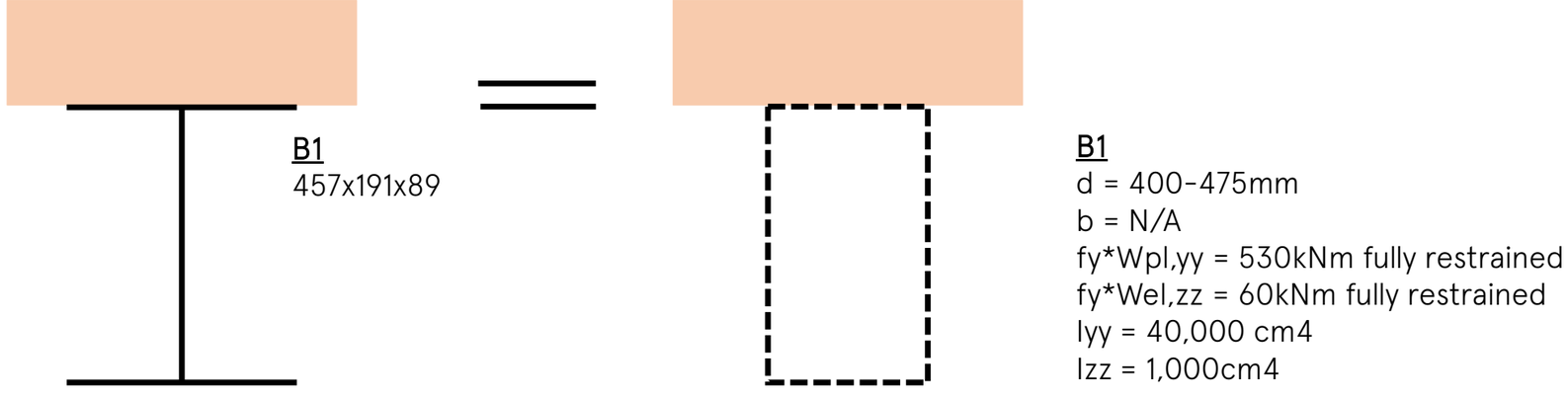
Lessons Learnt for the Design/ Procurement phase

+ Keeping supply chain simple
+ Agree how steel procured and timeframe for considering stockists with client
+ Educate the tendering contractors
+ Educate clients on what the steelwork will look like

Designing Using Reused Sections

Lessons Learnt for the Design/ Procurement phase

+ Loose fit design and flexibility for size. Set out some rules for sizing with architect.
+ Smaller grids = shorter lengths of steelwork required.
+ Don’t count on certain steelwork sizes being available,
+ Avoid specifying steel grades. Specify performance criteria
+ Avoid using a section much heavier than it would be new. Material should be minimised even if it is reused
+ Avoid transfers and fabricated beams
+ Connections will often need to be from new steelwork



Designing Using Reused Sections

Lessons Learnt for the Design/ Procurement phase

- When extracting steel from another building think about quality of steel that is to be extracted.
  - Avoid pre 1970s steelwork
  - Avoid encased steelwork
  - Composite steels can be extracted but may come with a cost uplift
  - Think about lengths
  - Factor in reduced section if damaged
- Time, cost and embodied carbon of extraction should be considered. Doesn't always make sense to reuse

Extracted Steels from One Broadgate (Cantillon)

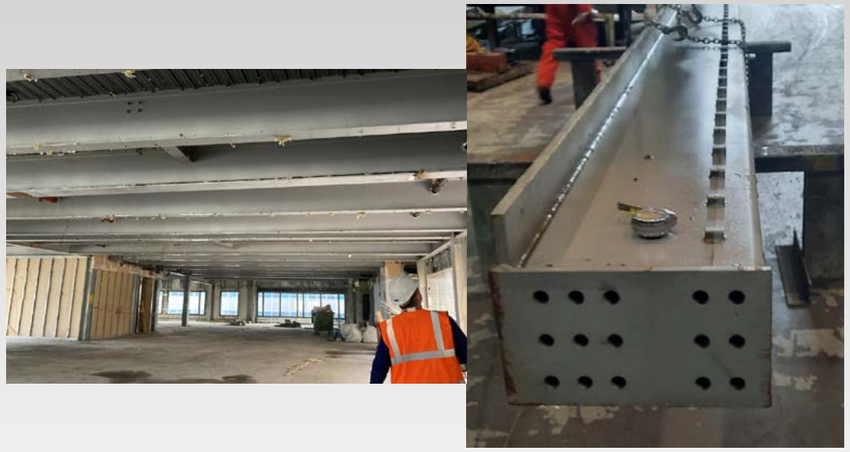
Quantifying the Carbon Savings

Reused steel

+ Research by EMR shows reusable steel EPD for A1-A3 of 0.047kgCO_2e/kg

Product stage (A1-A3)			Construction stage (A4-A5)	
A1	A2	A3	A4	A5
Raw material supply	Transport to factory	Manufacturing	Transport to site	Construction Installation

Cradle-to-gate



REUSABLE STEEL
ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND EN 15804:2012+A2:2019

Programme
The International EPD® System
www.environdec.com

Programme Operator
EPD International AB

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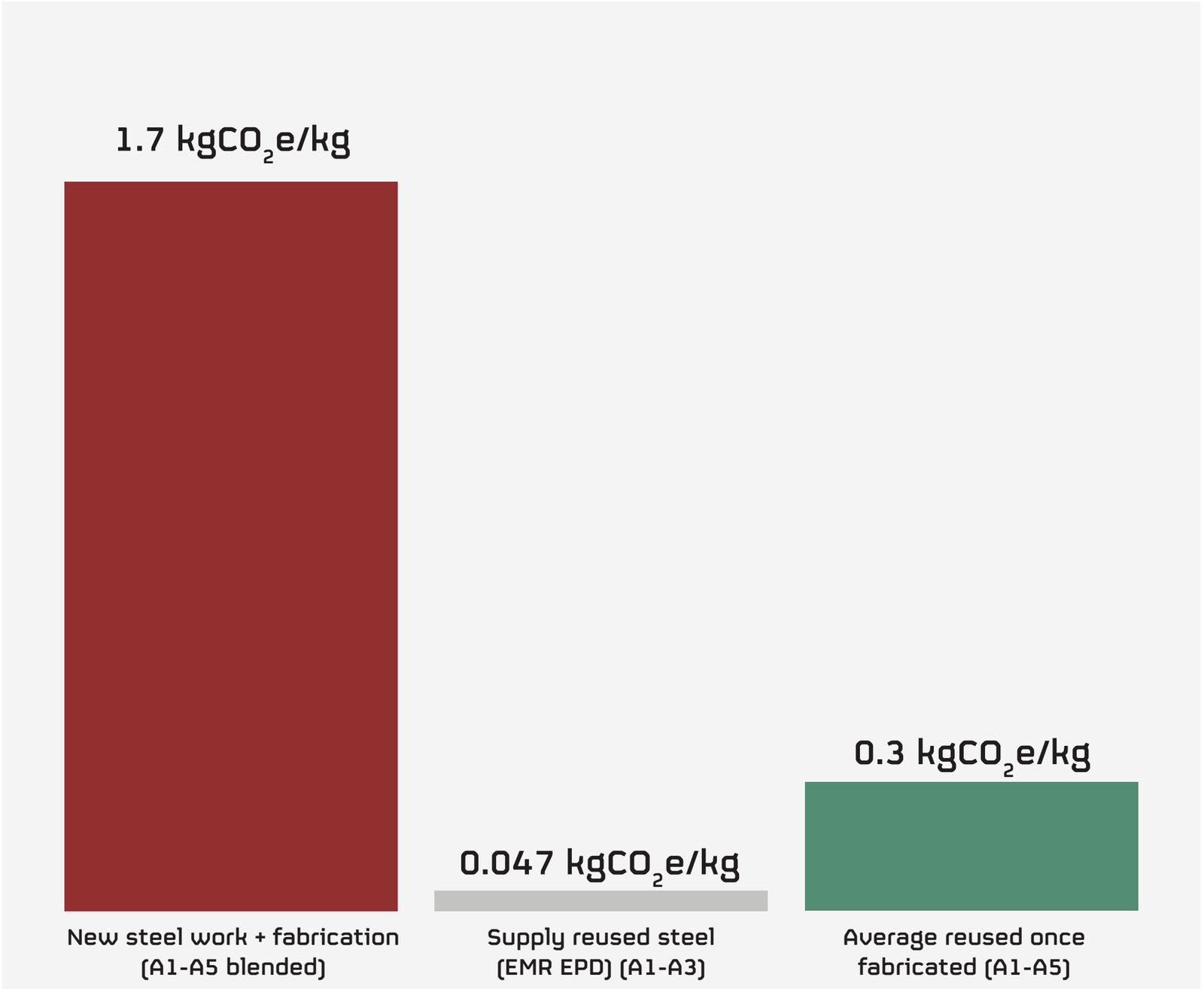
An EPD should provide current information and may be updated if conditions change.
The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Quantifying the Carbon Savings

Embodied carbon of reused steel at Holbein Gardens

+ Average figure taken for Holbein Gardens (once fabricated) of 0.3kgCO_2e/kg
+ HTS report total carbon saving of 35T compared to a total A1-A5 carbon of 975T



Embodied carbon figures for steel at different stages

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