4

Euston Tower

Upcycling Catalogue

4.1 Introduction to Upcycling

4.1.1 General

Upcycling is a strategy for recycling which entails transforming products and materials into higher quality and/or higher value products and materials. The aim is to convert what would typically be waste into new products, by remanufacturing in ways that reduces demand for extracting raw materials from the natural environment.

As noted in Section 2, most of the existing interior fitout, finishes and services have already been stripped out of the existing building. The materials remaining in the building are therefore primarily the "hard-to-handle" material fractions such as concrete, steel, aluminium, and glass.

This Section focuses on the few items remaining in the existing building that have a potential for being reused, either directly or with some remanufacturing. It also presents ideas for developing products that can provide opportunities for storytelling about the circular economy narrative of the proposed development.

It is proposed to explore harnessing the existing materials in products that can create unique stories throughout the different areas of the building, where the user can see, touch, learn, and be inspired by these ideas. This is achieved by weaving existing materials into the narrative of the site, and allowing users to engage directly with these as part of that story.

The ideas presented in this Section are not commitments for the proposed development. Rather they are intended to explore what is possible when it comes to repurposing and upcycling waste. Should any of these ideas be furthered in the proposed development, they will require development and engagement with supply chains, to prove their technical, practical, and economic feasibility.

These are not regarded as standard solutions, but unique, progressive, and industry leading ideas which could put the proposed development at the forefront of building a circular future. In combination with the other strategies described in this document, this positions Euston Tower as a true circular economy pioneer.

> **'Urban Upcycling'** is about creating the **material solutions** of tomorrow, with the **waste of today**

Figure 4.1 (Opposite) Overview of upcycling process and opportunities

How To Upcycle Materials from Existing Buildings

Seek Didactics

See
Sculptural and decorative solutions

Touch
Interact with and touch the materials

Learn
Understand the material journeys and how to reduce environmental footprint

Inspire
Showcase how the "waste" of today can be the resources of tomorrow

Analyse and Reuse

Identify reuse opportunities

Develop upcycle opportunities

Downcycle as a last resort

Development of comprehensive material reuse strategy for disused materials. May include ambitious and innovative project-specific ideas for pioneering reuse scenarios and/or bespoke upcycled design elements.

Implement

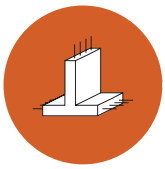
Circular economy tracker

Contractor's WLC and CE clauses

Prototypes & mock-ups

Secure the long-term environmental benefits and delivery, by ensuring the material reuse and circular economy ideas are specified in contract. Prototypes and mock-ups used to ensure quality of bespoke designs.

Upcycling Opportunities

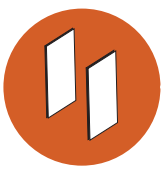


Concrete Slabs

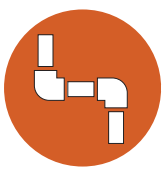
External Glass

Internal Glass

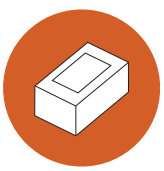
Wind Canopies



Podium Tiles



Sprinkler Pipes



Waste Brick

Terrazzo

Timber Studs and Panels

Timber Furniture

4.1.2 Upcycling opportunities overview

An overview of the upcycling opportunities presented in this Section are shown in Figure 4.2.

While some of the opportunities suggest a direct reuse of the items, others require some remanufacturing. This Section goes into detail of each of the opportunities, and provides initial considerations on the upcycling processes.

It should be noted that these are early ideas, intended to test the possibilities of what to do with the existing materials. They are not resolved design ideas and should not be considered as such. Where renders are included, they are shown as illustrative sketches. Where there is appetite for exploration, these ideas will be developed as the design of the proposed development develops.

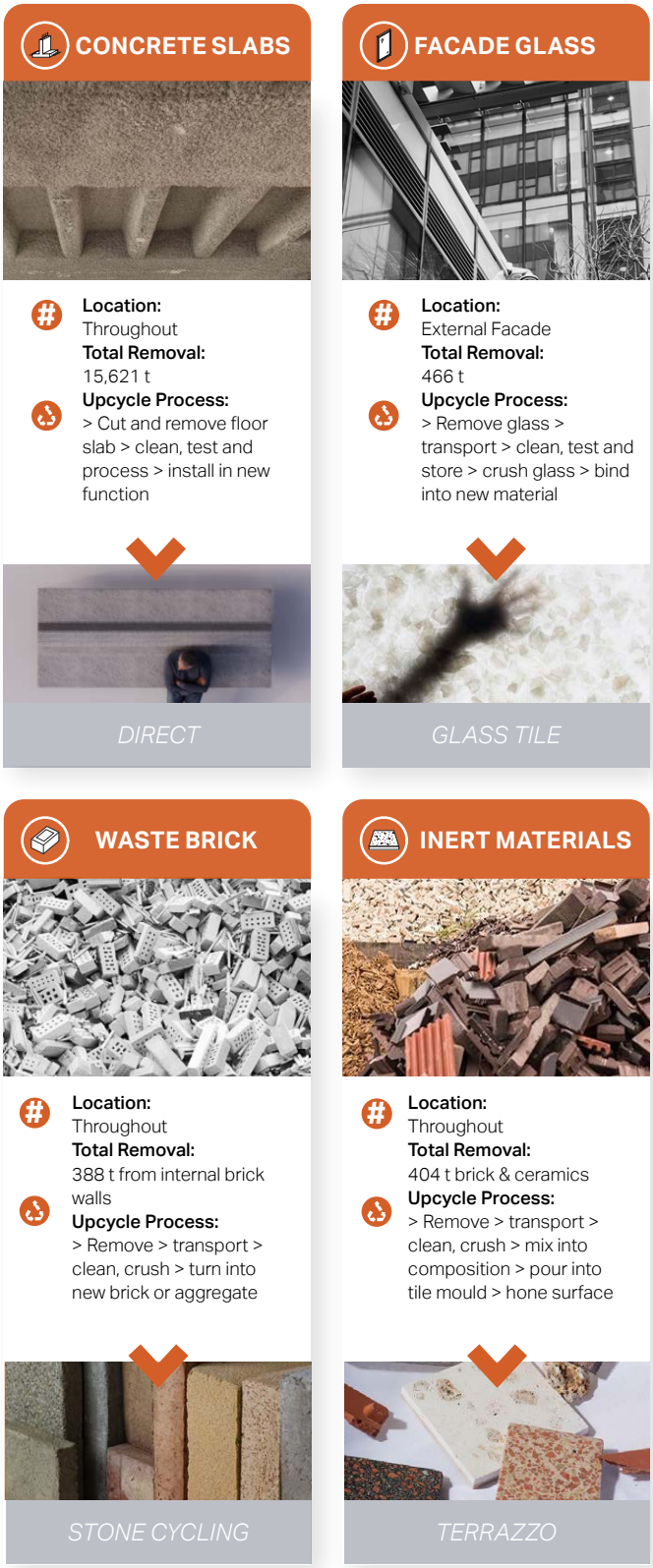


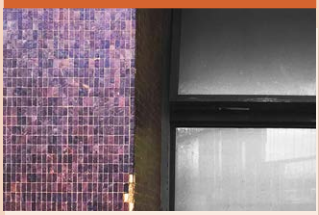
Figure 4.2 Overview of unique upcycling opportunities

INTERNAL GLASS

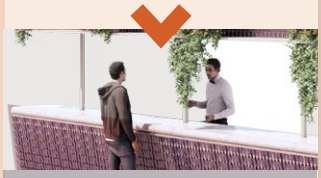
Location:
Ground Floor Level
Total Removal:
831 m²
Upcycle Process:
> Remove glass > clean, test and store > sell to external buyer or re-install as glass partitions

GLASS PARTITIONS

PODIUM TILES



Location:
Podium Exterior Columns
Total Removal:
131 m²
Upcycle Process:
> Remove from columns > clean, test and process > install in new function



REPURPOSED TILE

WIND CANOPIES

Location:
Wind Canopy
Total Removal:
16 t
Upcycle Process:
> Cut and remove canopy > clean and cut into fins > install in new function

CLADDING

SPRINKLER PIPES

Location:
Levels 1 and 2
Total Removal:
TBC
Upcycle Process:
> Cut and pipes > clean, test and bend > bend and fix into bike racks

BIKE RACKS

TIMBER STRUTS

Location:
Levels 3 - 34
Total Removal:
26 t
Upcycle Process:
> Remove > clean, cut, layout in tiles > fix and sand > install

END GRAIN TIMBER

TIMBER DOORS

Location:
Throughout
Total Removal:
4 t
Upcycle Process:
Direct reuse with reuse partner

TIMBER DOORS

SOFTWOOD

Location:
Timber joinery & doors
Total Removal:
4 t
Upcycle Process:
> Remove and clean > reform into furniture > deliver to user

TIMBER FURNITURE

4.2 Concrete Slabs

4.2.1 General

Concrete is the largest Key Demolition Product (KDP) identified in the existing building, estimated to be approximately 34,237 tonnes equivalent to 3,534 tCO_2e. This is from a number of sources, most of which is from the concrete floor slabs (16,922 tonnes).

As described Section 3, tests are being carried out to evaluate the feasibility of reusing cut out sections of the slabs in a structural application.

Alternative upcycling opportunities are suggested in this Section. These may employed if the slabs are not suited for a structural use, or indeed in combination.

Figure 4.3 Ribbed concrete slabs at Euston Tower

Concrete

	Volume	Weight	Impact		Volume	Weight	Impact
• Floorslabs	5,064 m^3	12,153 t	1,252 tCO_2	• Staircase	477 m^3	1,146 t	118 tCO_2
• Columns	1,815 m^3	4,355 t	449 tCO_2	• Roof deck	345 m^3	691 t	71 tCO_2
• Beams	1,681 m^3	4,034 t	416 tCO_2	• Blockwork	169 m^3	237 t	22 tCO_2
• Walls*	2,810 m^3	6,744 t	695 tCO_2	• Mortar	53 m^3	101 t	20 tCO_2
• Ribbed slab	1,987 m^3	4,769 t	491 tCO_2	• Paving slabs	3 m^3	7 t	1 tCO_2

**Quantity differs from what is recorded in the Pre-demolition Audit as this document accounts for retention of the existing central core in the proposed development.*

Figure 4.4 Concrete component quantities in the existing building

Diagram for Removal of Concrete Slabs

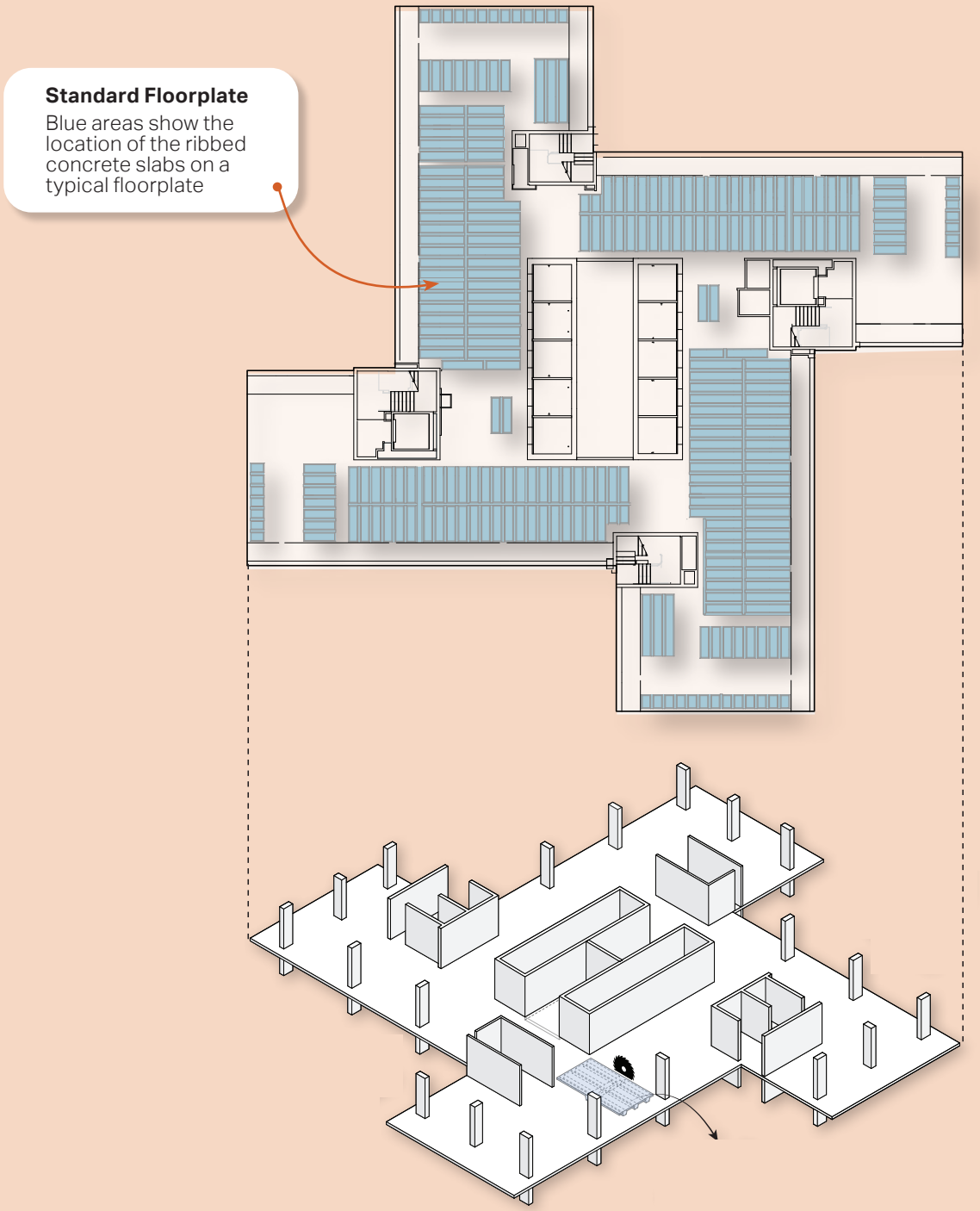


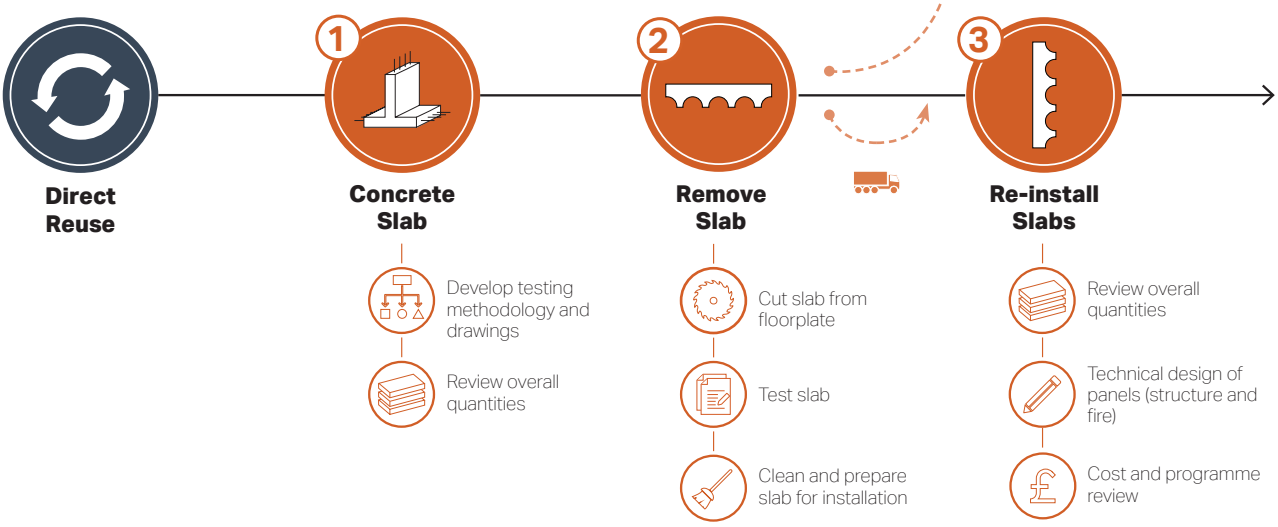
Figure 4.5 Location of ribbed slabs and principles of removal

4.2.2 Upcycled concrete products

The ribbed slab elements could provide use in several non-structural applications: internal elements, street furniture, or as landscape items. Ideas are shown in the sketches in Figure 4.6 and Figure 4.7.

These could be used at the proposed development or elsewhere.

The Upcycling Process



Street Furniture

Cut slabs and modify to form street joinery or furniture

Figure 4.6 Upcycling process of ribbed slabs (above) and examples of transformation for use as street furniture (below)

Sketch Ideas for Reuse of Ribbed Concrete Slabs

Ribbed Wall Detail

The slabs can be directly reused as unique wall cladding elements

Joinery Detail

Cut and stack slabs to create a unique reception desk or bar joinery

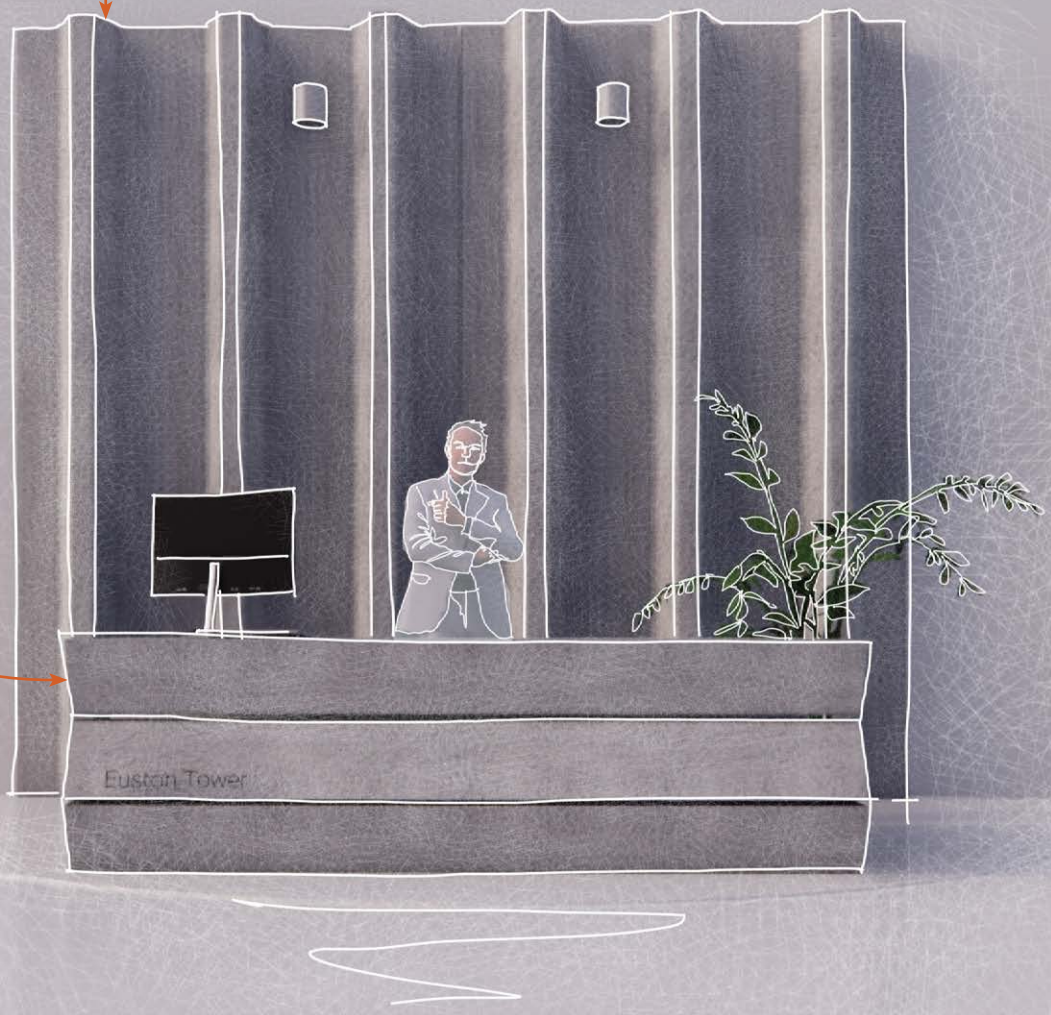


Figure 4.7 Example sketches of slabs as both a wall cladding and cut into pieces stacked as a furniture item (reception desk)

4.3 Facade Glass

4.3.1 General

With 378 tonnes of glass available from the deconstruction, the intention is to maximise the reuse potential of this valuable resource.

As described Section 3, tests are being carried out to evaluate the feasibility of recycling the predominant glass fractions back into high quality flat glass.

Alternative upcycling opportunities are suggested in this Section. These may employed if the glass recycling trials prove unsuitable, or indeed in combination.

Figure 4.8 Existing facade glass at Euston Tower

Overview of Existing Facade Glass

Roll Pattern Glazing

Rolled glass (plant room floors only)
Monolithic, 6mm thickness
(assumed Stippolyte)

No. glass panes per floor	75
Total glass mass (tonnes)	1

Secondary Glazing

Secondary glazing
Monolithic, 6 mm thickness
(assumed toughened with solar film)

No. glass panes per floor	150
Total glass mass (tonnes)	97

Vision Glazing

External vision glazing monolithic,
12 mm thickness (assumed
toughened with solar film)

No. glass panes per floor	200
Total glass mass (tonnes)	279

Spandrel Glazing

Spandrel glazing
Monolithic, 6mm thickness
(assumed ceramic frit)

No. glass panes per floor	150
Total glass mass (tonnes)	89

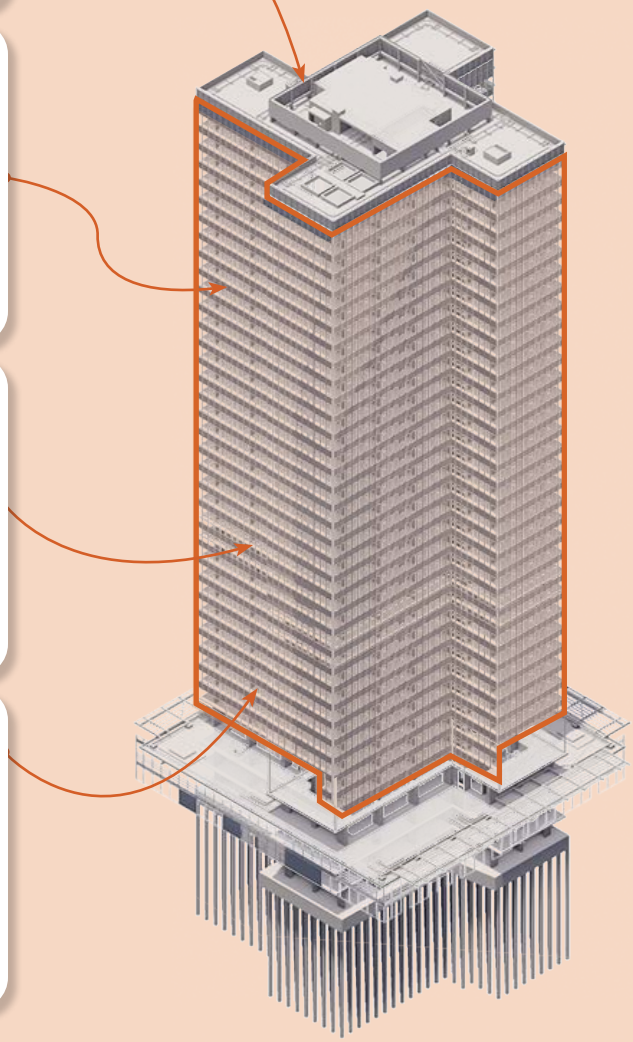


Figure 4.9 Primary glass quantities and qualities in the existing building

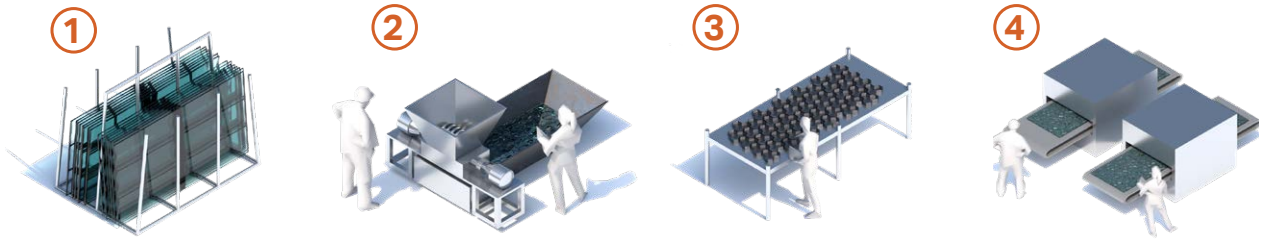
4.3.2 Upcycled Glass Tiles

The glass elements could be upcycled into bespoke glass tiles used in a variety of applications, from wall finishes to joinery cladding. Ideas are shown in the sketches in Figure 4.11.

The upcycling process begins with the selective crushing of the reclaimed glass, to create glass cullet. This crushed glass is then arranged within custom tile moulds, and remelted to form bespoke glass tiles.

This process also holds the potential to create larger glass panels. These could be used at the proposed development or elsewhere.

The Upcycling Process to Create Custom Glass Tiles



Glass stacked, transported, and stored

Sorted and crushed to cullet

Shaped into various tile shapes in moulds

Processed and remelted

Examples of Upcycled Glass Tiles

Material reference:
Pernille Bülow

Material reference:
Dr. Tyra Oseng-Rees

Material reference:
Magna Glaskeramik

Material reference:
Glass Brick

Figure 4.10 Upcycling process of glass tile (above) and material references (below)

Sketch Ideas for Using Upcycled Glass Tiles

Figure 4.11 Sketch ideas for upcycled glass tiles used internally (above) and externally (below)

4.4 Internal Glass

4.4.1 General

The internal glazing should be directly reusable, where possible and where demand exists. Options for doing so include:

- **Option 1** Reuse internal glass directly within proposed development, for example for reception, offices, back of house, or WC areas
- **Option 2** Advertise the internal glass on distribution platforms for sale or donation.

For glass to be reused it needs to be dismantled carefully to avoid damage, collected on specialist steel A frame stillages, and handled and stored carefully. Should a reuse option be considered for the internal glazing, a more detailed audit of the panels should be undertaken. Additionally, a limited removal of some of the internal panels, by an appropriate contractor, will provide useful information on the ease of disassembly.

Figure 4.12 Existing internal partition glass at Euston Tower

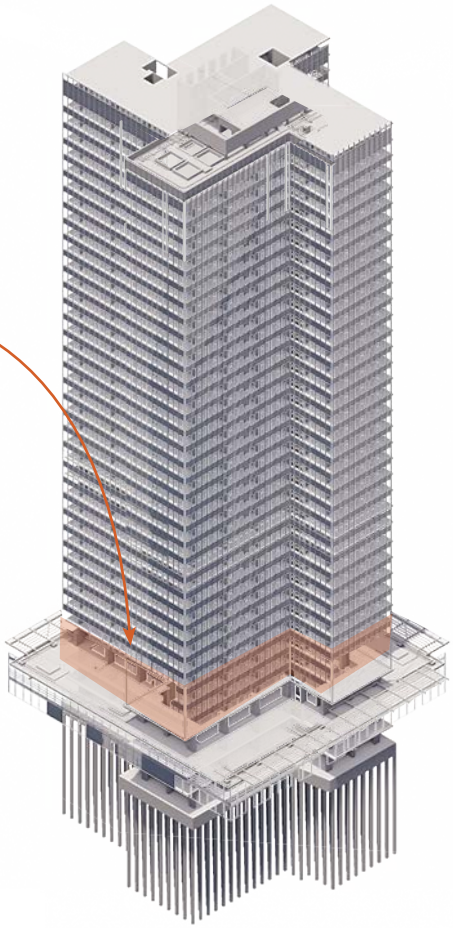
Overview of Internal Glass

Internal Glazing

Location
Levels 01 and 02

Quantity Area (m^2)	Thickness	Total
93	TBC	6.7 t

Reuse potential
High (either on site or elsewhere)



The Reuse Process

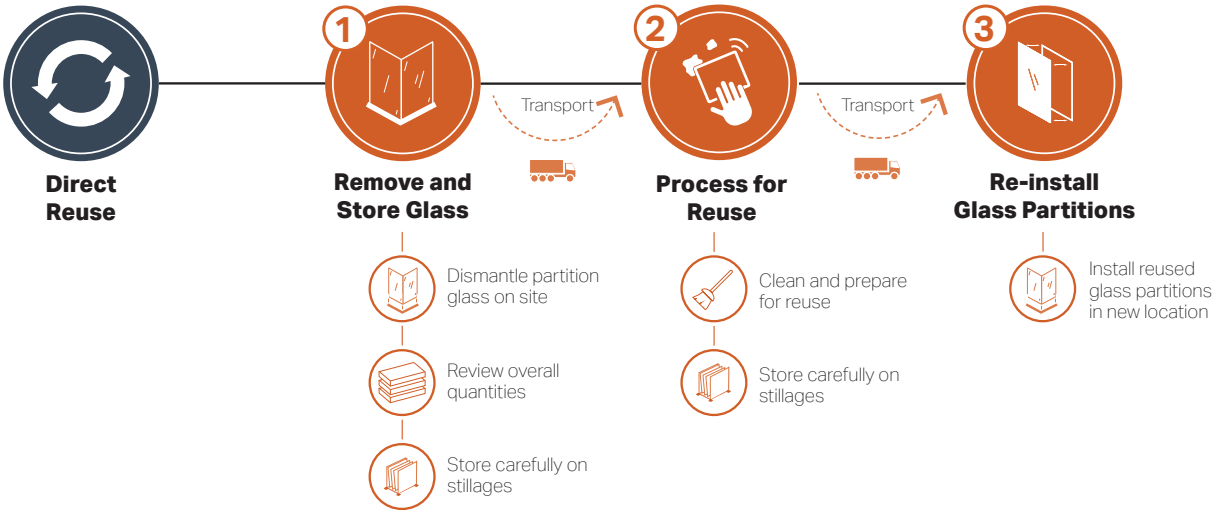


Figure 4.13 Location of internal partition glass (above) and reuse process (below)

4.4.2 Direct reuse applications

The glass partitions of high quality are directly reusable. For example, they could be used for creating new glass partitions for offices and meeting rooms, or as shower screens for use in the end of trip facilities. Sketch ideas are shown in Figure 4.14.

Reusing interior partition glass necessitates maintaining its original dimensions, as resizing is not typically a practical option, especially where glazing is used with its existing hardware. Consequently, applications should be sought where the glass can be installed in its existing state and size.

Sketch Ideas for Reusing for Existing Glass Partitions

Figure 4.14 Sketch idea for reused glass partitions for meeting rooms (above), shower screens (bottom left) and laboratories (bottom right)

4.5 Podium Tiles

4.5.1 General

Among the 6.6 m^3 of tiles available in the existing building, the red tiles from the external columns at the Level 02 podium, are suited to direct reuse in various applications.

These tiles could be effectively repurposed for cladding walls or flooring, using in terrazzo mixes, or incorporating into joinery.

The existing tile mortar is old and the individual tiles are lightweight, meaning the tiles are easy to remove by hand. Being lightweight also means the tiles are convenient to transport and store, resulting in reuse potential that is logistically straightforward.

Thickness: 5 mm

Volume: Approx. 131 m^2

Disassembly: Easy

Location: Level 02 Podium

Reuse Potential: High

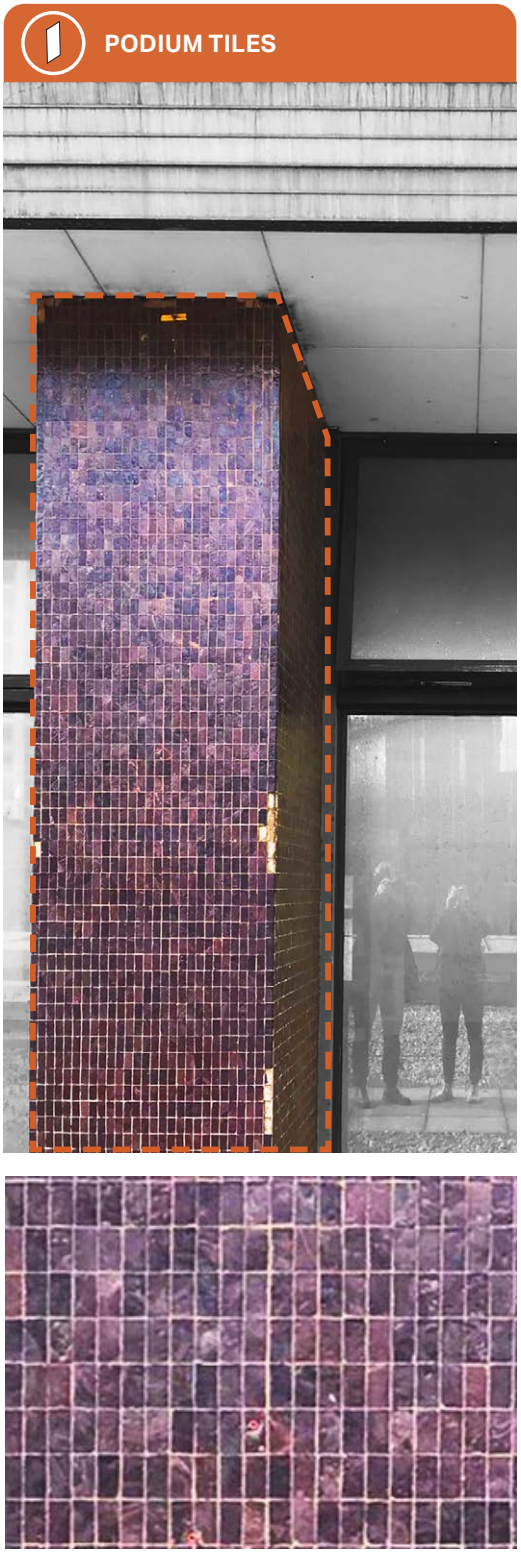
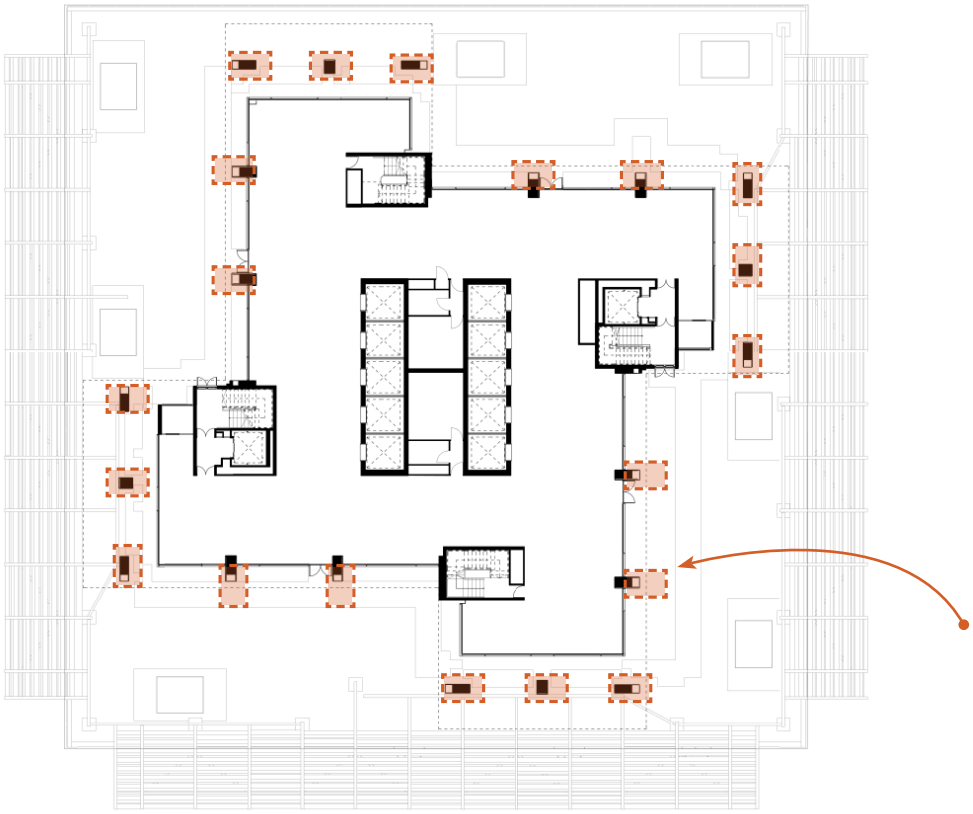


Figure 4.15 Existing red tiles on external podium at Euston Tower

Overview of Location of Podium Tiles



Tile Location
Level 02 Podium external columns covering an area of approx. 131 m²

The Reuse Process

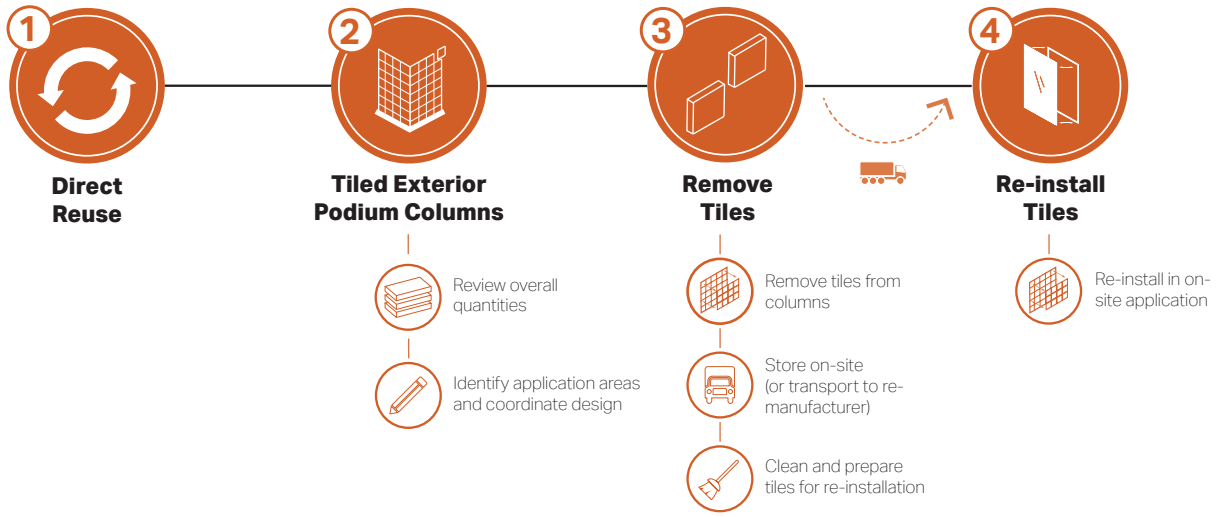
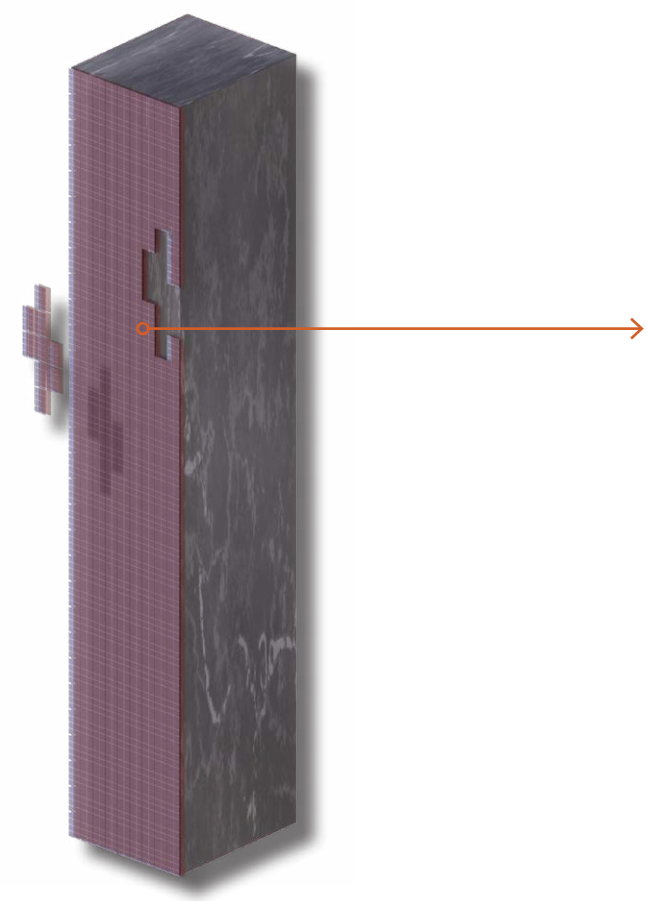
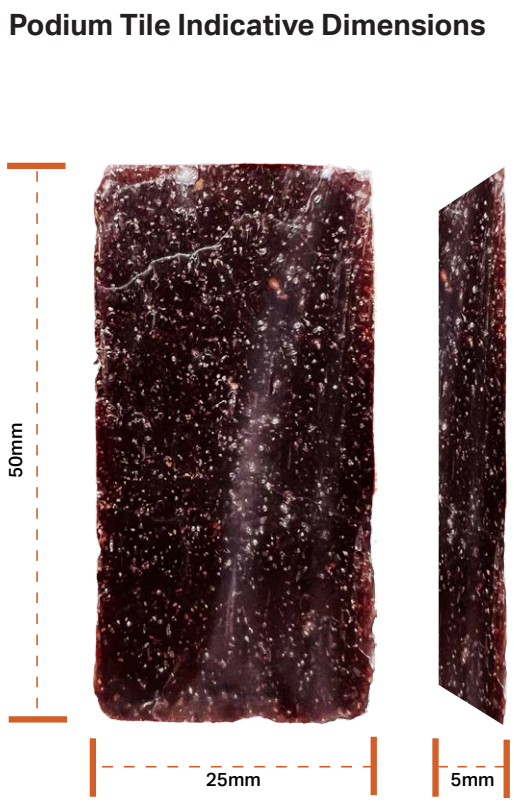


Figure 4.16 Location of the existing tiles on Level 02 podium (above) and the process for reusing the tiles (below)





4.5.2 Direct reuse applications

The tiles present an opportunity for versatile reuse. Their durability and adaptability make them ideal for repurposing in various aspects of the proposed development. These tiles could be effectively reused in an application similar to their in-situ condition — to clad walls or columns.

They could be similarly be integrated into joinery, serving as accents or features that showcase the resilience of these tiles and contribute to the ongoing circular economy narrative of the proposed development. This may be a better option for reuse as it avoids any weathering considerations.

These could be used at the proposed development or elsewhere.

Figure 4.17 (Opposite) Sketch idea for reused podium tiles in joinery

Sketch Reuse Idea for the Podium Tiles

4.6 Wind Canopies

4.6.1 General

The existing tower's wind canopies, made from aluminium fins, could find a new lease on life beyond their original purpose.

These robust, weather-resistant materials could be repurposed into furniture, innovative cladding features, or art installations. Any application would seek to harness the strength, durability, and quality of the existing materials.

Composition: Aluminium

Volume: 5.86 m^3

Disassembly: Medium

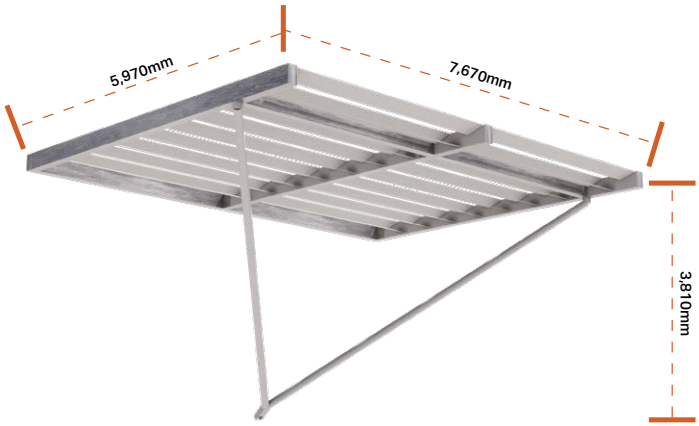
Location: Level 02 Podium

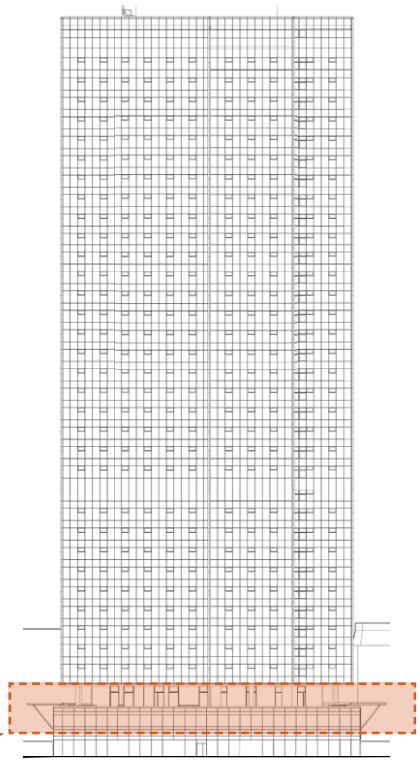
Reuse potential : High

Embodied CO_2: 105 tCO_2

Figure 4.18 Existing podium wind canopy at Euston Tower

Location of Existing Wind Canopies





Wind Canopy Location

The wind canopies are located on exterior of second floor podium

The Upcycling Process

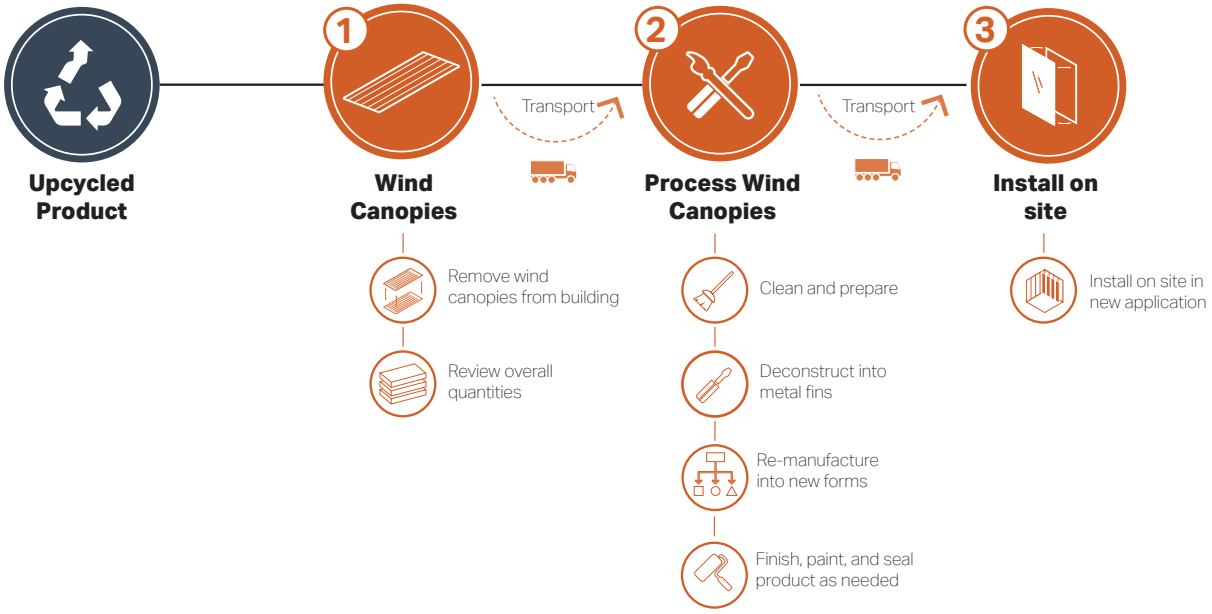


Figure 4.19 Location of the wind canopy on tower elevation (above) and the process for removing and remanufacturing the canopies (below)

4.6.2 Upcycling applications

The wind canopies could be re-purposed in a variety of ways, such as into joinery elements, wall cladding, or art pieces. See sketch ideas in Figure 4.20 and Figure 4.21.

These could be incorporated into the design of the proposed development or used elsewhere.

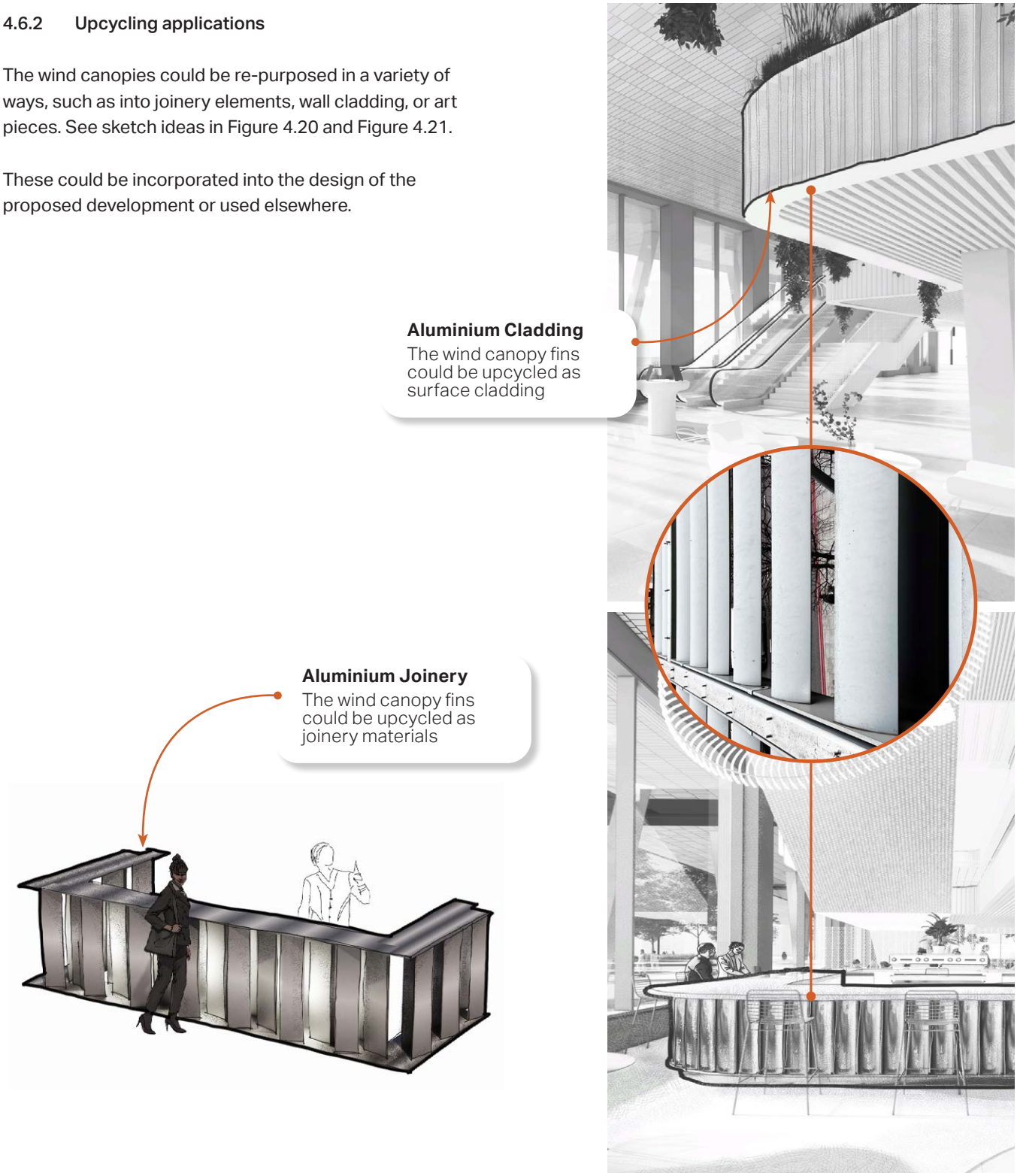


Figure 4.20 Sketch ideas for upcycled wind canopies in joinery or as cladding

Sketch Reuse Ideas for Wind Canopy

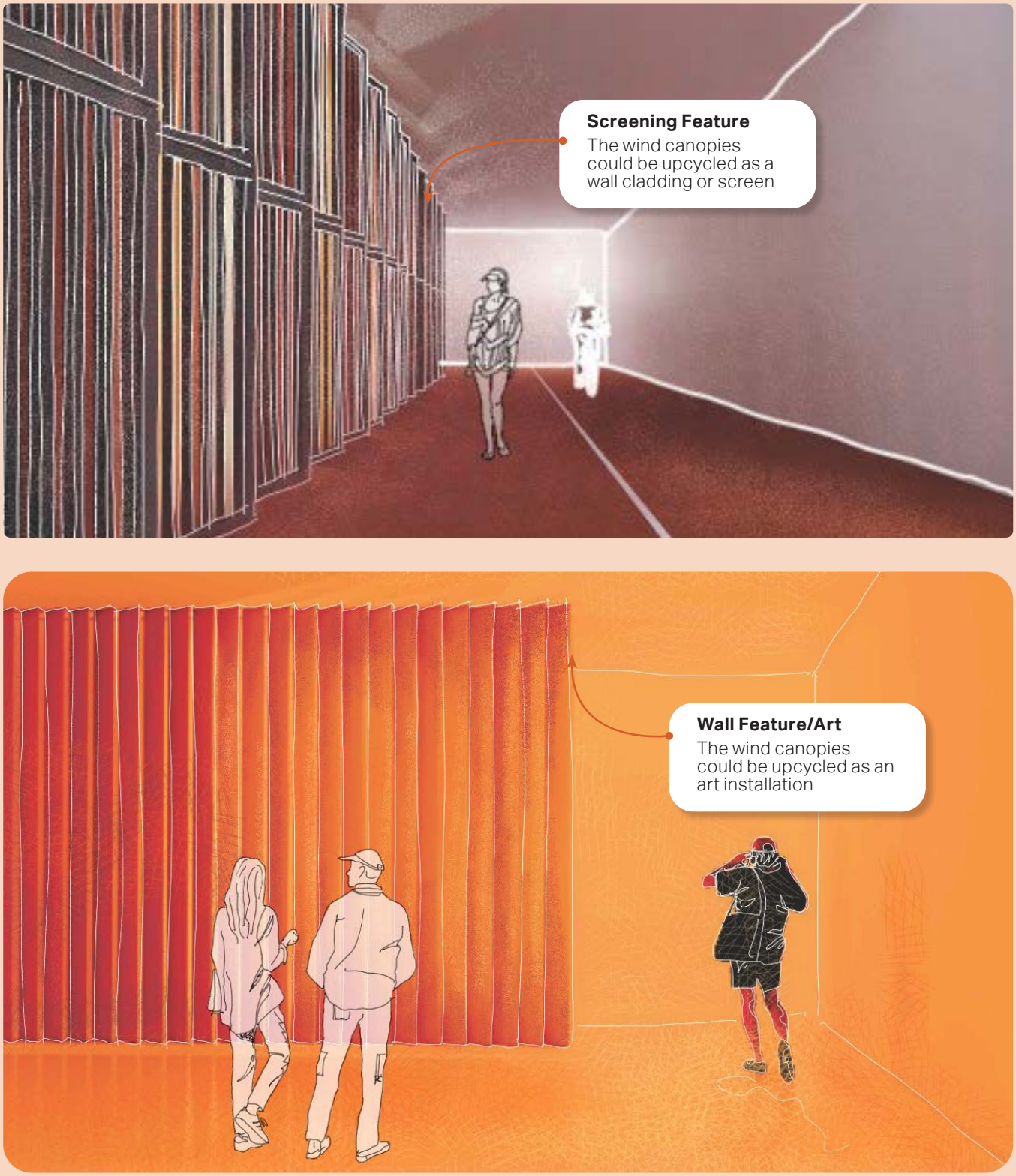


Figure 4.21 Sketch ideas for upcycled wind canopy as wall cladding (above) or art installation (below)

4.7 Fire Sprinkler Pipes

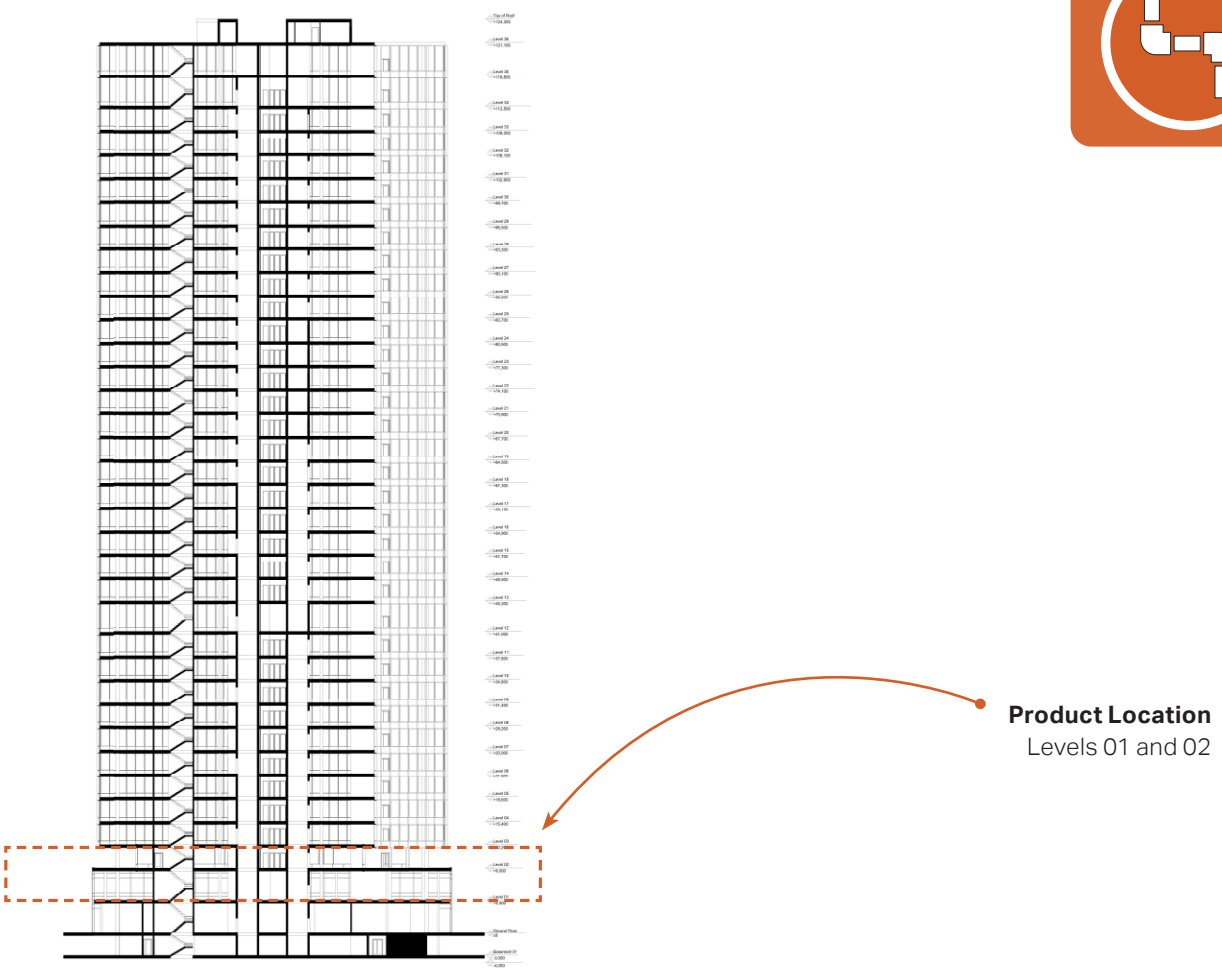
4.7.1 General

There are existing fire sprinkler pipes on Levels 01 and 02 of the building.

Sprinkler pipes are generally made from carbon steel, and there is a potential for remanufacturing the pipes for other uses.

Further surveys would be needed to evaluate the quantity and condition of the pipes, considering factors such as corrosion, integrity, and suitability for upcycling. Should they be used in an upcycling application, the pipes would need a degree of processing to clean them, remove coatings, paint, and other contaminants both internally and externally.

Figure 4.22 Levels 01 and 02 fire sprinkler pipes at Euston Tower



The Upcycling Process

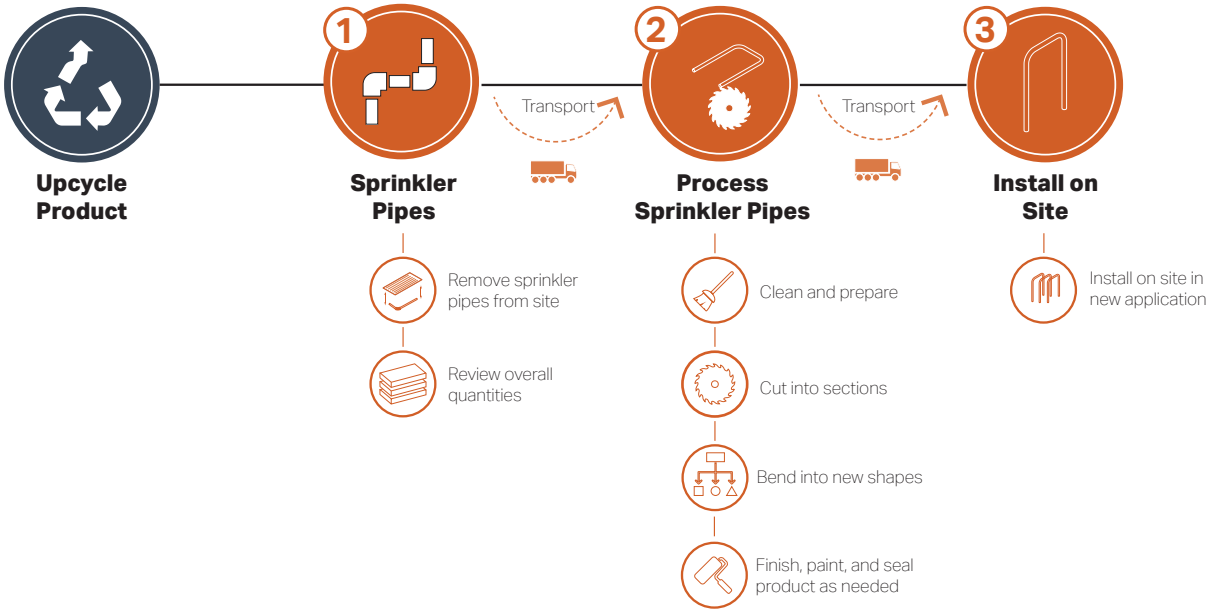


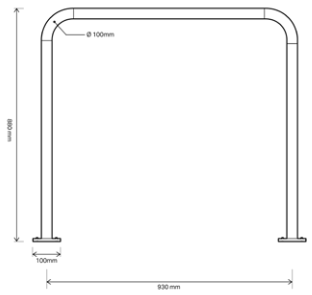
Figure 4.23 Location of sprinkler pipes in existing tower (above) and roadmap for the remanufacturing of sprinkler pipes (below)

4.7.2 Upcycled bicycle racks

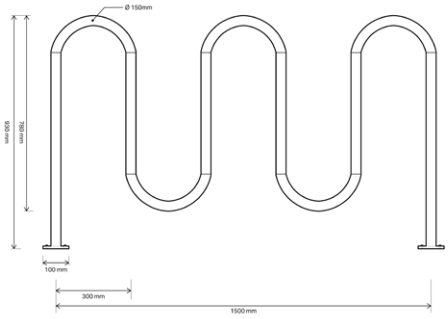
The sprinkler pipes could be remanufactured into bicycle racks. This would require close engagement with a manufacturer to clean and bend the pipes into shape for the bike racks.

Testing would also be required to ensure they are secure enough for use as bicycle racks.

This is an ideal opportunity to use in the proposed development, given the number of bicycle racks required by planning policy, especially for the short-stay spaces in the public realm, where the upcycled products can be on display. Of course, application could be found elsewhere.



Single Bicycle Rack



Multiple Bicycle Rack

Total Length: **2.5m**

Total Length: **5.6m**

Figure 4.24 Sketch ideas for potential resulting bicycle racks, shorter lengths are likely to be preferable

Figure 4.25 Render of the cycle facilities entrance in the proposed development

4.8 Waste-based Brick

Existing brickwork, glass, and mortar from Euston Tower could be repurposed using the innovative waste brick method pioneered by Stonecycling in the Netherlands.

Through strategic deconstruction and processing, these materials can be transformed into high quality upcycled bricks. This sustainable approach enables the salvage and reuse of the original materials, minimising waste and preserving virgin resources, and contributing to more sustainable and circular construction process.

Stonecycling's WasteBasedBricks comprised at least 60% waste, and upcycling approximately 90kg of waste per square meter.

WASTE BRICK

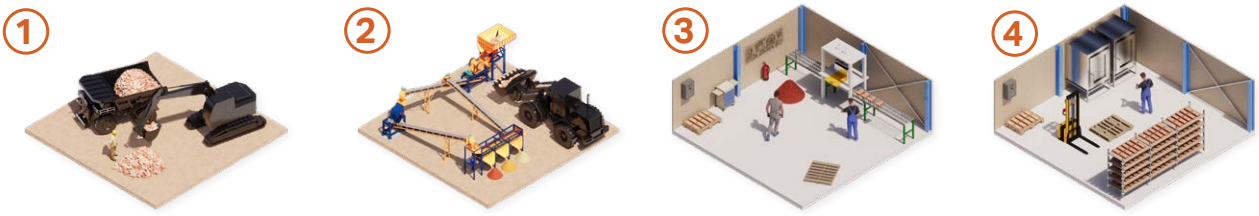
Figure 4.26 Inert waste reference image from Stonecycling

Existing Brick Location

Brickwork used within existing cores at Euston Tower

Figure 4.27 Brickwork used within existing cores at Euston Tower

The Upcycling Process



Move Building Waste

Crush Building Waste

Mix and Form New Brick/Tile

Dry Heat to Finish

Figure 4.28 Process for manufacturing waste-based bricks from inert materials (above) and reference images of upcycled brick products (below)

4.9 Wasted-based Terrazzo

Creating terrazzo from waste brick, crushed concrete, and crushed glass is a sustainable and environmentally friendly construction material or design choice.

Terrazzo is a composite material made by embedding small pieces of various materials, like glass, stone, or metal, in a binder, typically cement or epoxy resin. Waste brick and concrete can be cleaned, crushed, and used as aggregate. Crushed glass should be crushed into small, consistent pieces which can be incorporated into the aggregate to give the recognisable colourful flecks that make up the iconic terrazzo look.

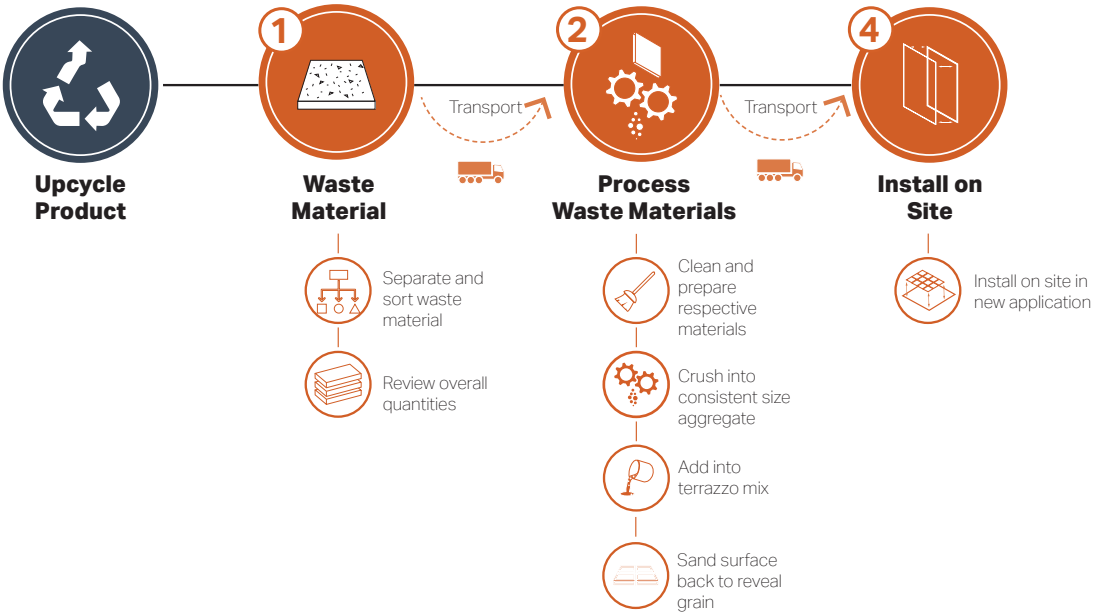
The design team has already engaged in trials for making basic terrazzo tiles using some inert materials from the existing Euston Tower. These will be developed as the design is progressed.

Terrazzo slabs and tiles are a versatile and durable material, and can be used as floor or wall cladding, in joinery, and in furniture design.

Figure 4.30 Terrazzo reference image from Lendager (Wasteland)

Figure 4.29 Trial terrazzo made using inert material from Euston Tower

The Upcycling Process



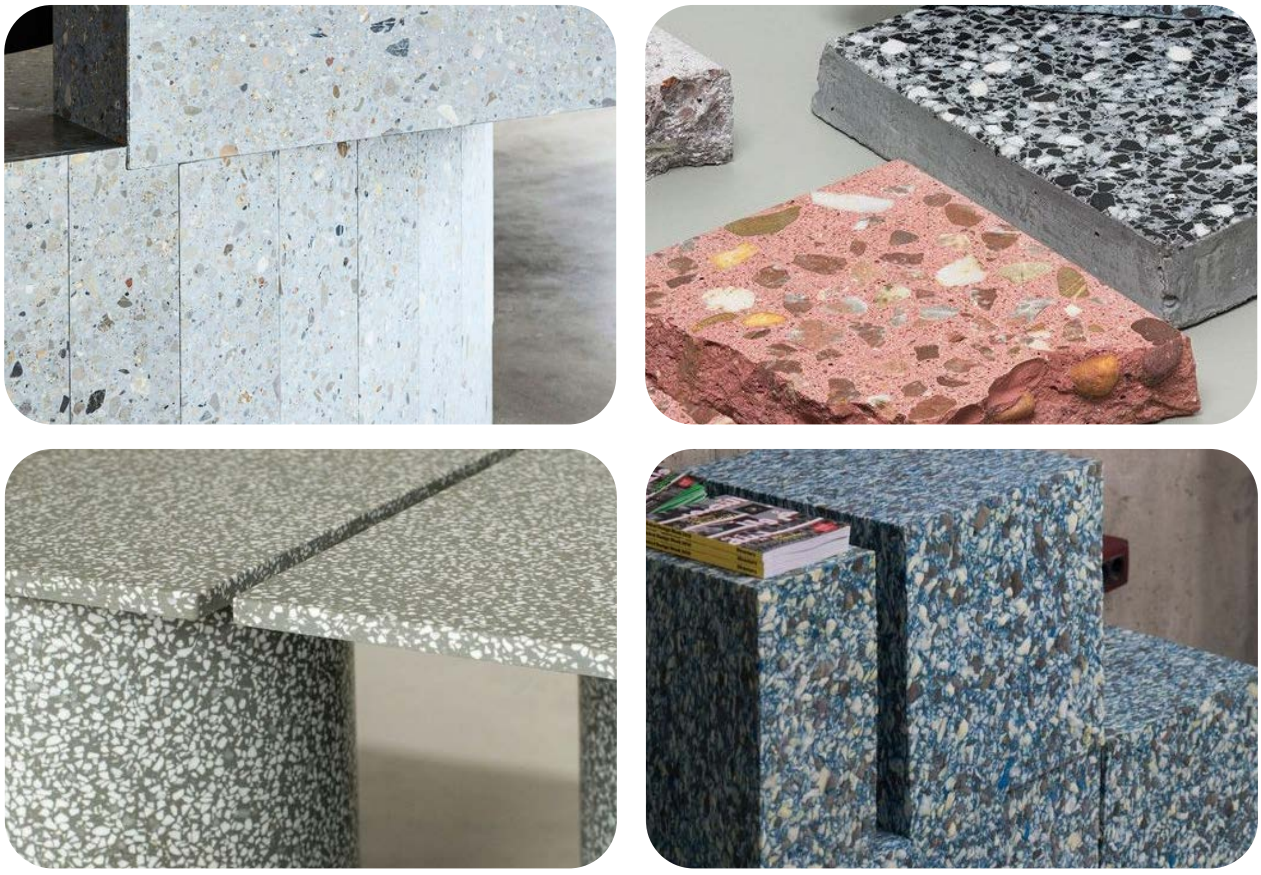


Figure 4.31 Process for manufacturing waste-based terrazzo from inert materials (above) and reference images of terrazzo products (below)

4.10 Timber

4.10.1 General

Timber is thought to be mainly present in the large number of doors throughout the existing building, as well as in the substructure for the secondary facade system. There is also a relatively small quantity of timber finishes which could be reused.

Theoretically, most of this timber is reusable. The recovery options are:

- Reuse in new development for good lengths of timber
- Advertise on distribution platforms to sell or donate
- Engage with a suitable third-party reclamation company, such as Community Wood Recycling
- Most of the solid timber can be recycled, usually into chipboard.

For any significant amounts of timber that seem to be coated or treated prior to 2007, it is recommended to test for preservatives containing hazardous substances.

Should a reuse option be further considered for the doors, a more detailed audit of the sizes available (and original suppliers, if possible) should be undertaken. They should also be classified in terms of whether they are fire doors or not, noting however that reuse would likely be in a non-fire door application.

A limited removal of some of the doors and frames will provide useful information on ease of disassembly and condition upon removal.

Figure 4.33 Existing timber doors at Euston Tower

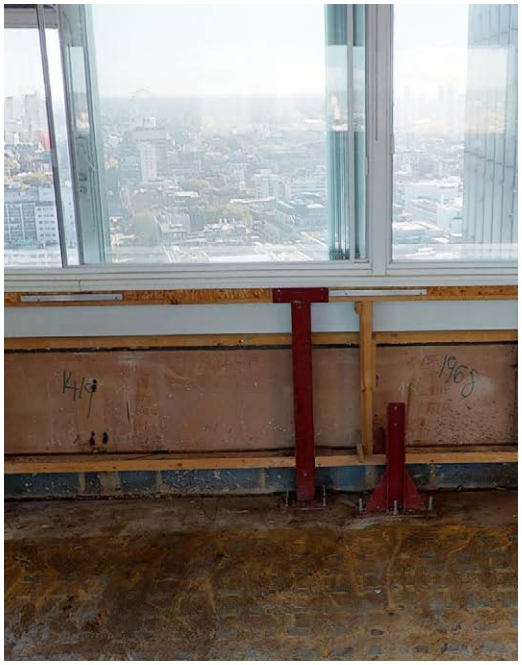


Figure 4.32 Timber in facade substructure at Euston Tower

Sketch Ideas for Timber Reuse or Recycling

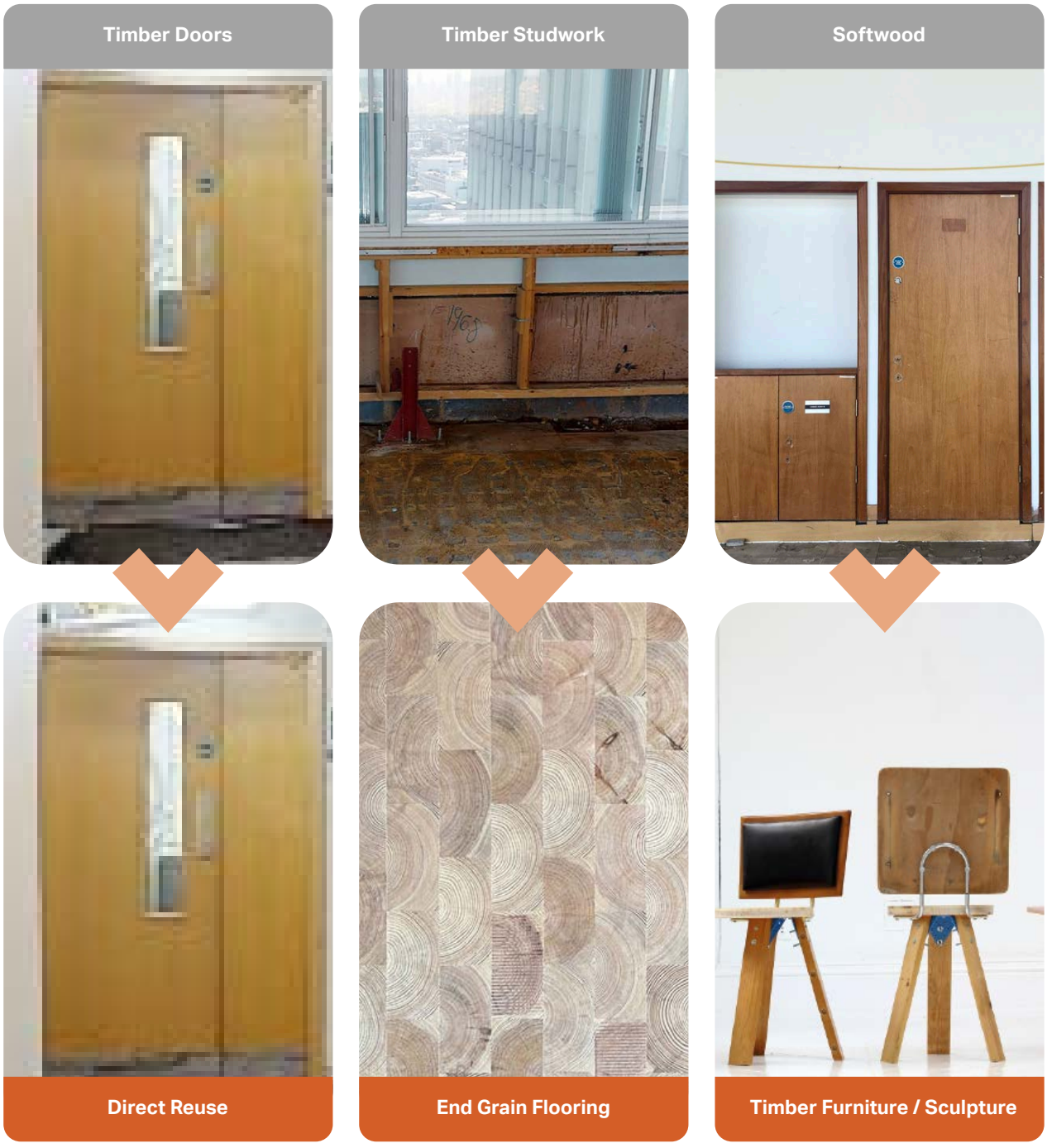


Figure 4.34 Sketch ideas for either direct reuse or remanufacturing of existing timber elements

4.10.2 End grain timber flooring

End grain timber flooring could be made from repurposing timber from the existing building, as a sustainable and creative way to give extended life to these materials.

End grain is made by continuously cross-cutting or slicing timber into blocks or rounds, with the annual growth rings exposed on every piece.

Once installed, the end grain has a unique non-repeating appearance, is acoustically absorbent, and is a durable and resilient flooring finish. End grain timber flooring was used extensively across Europe and America in manufacturing factories, as it provided a hard-wearing and forgiving surface for dropped metal components.

The Upcycling Process

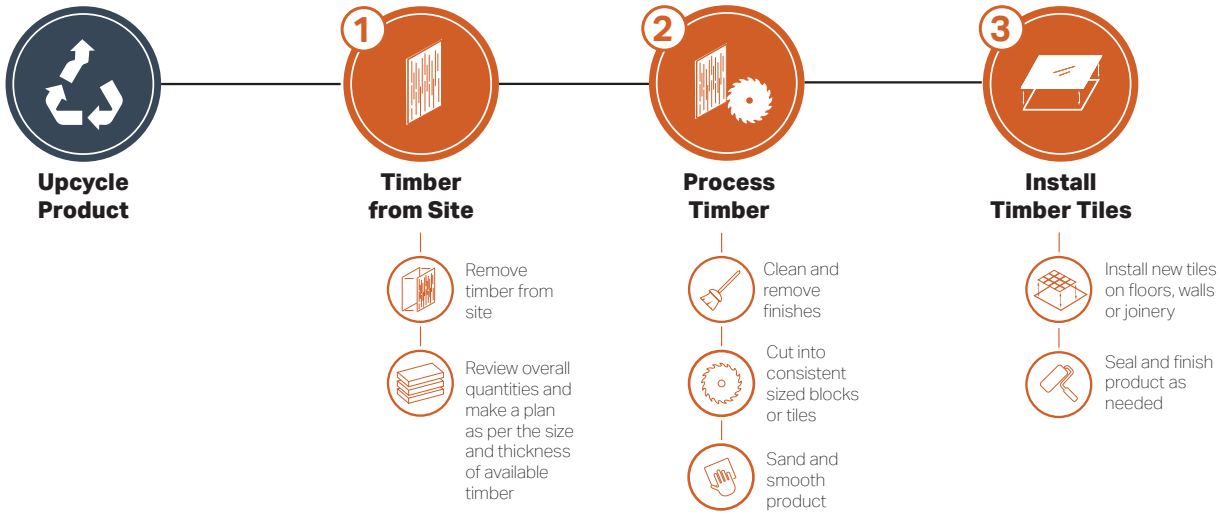


Figure 4.35 Process for remanufacturing timer into flooring (above) and reference images of end grain timber products (below)

4.10.3 Timber furniture

Where the quality of the existing timber is sufficient, it could be repurposed as bespoke furniture pieces, as a sustainable and creative way to give new life to these materials.

Like many of the more artistic ideas, this process could be given an informative function, and run as a series of upcycling workshops with the local community (e.g. as an upcycle cafe).

The resulting pieces could be used within select spaces in the proposed development, giving ownership and a sense of pride to members of the local community. Of course, the resulting furniture could be used elsewhere.

Upcycled Timber Furniture

Figure 4.36 Sketch ideas and reference images for upcycled timber furniture

4.11 Next steps

The early, sketch ideas described in this Section are intended to test the possibilities of what can be done with the existing materials. They are not resolved design ideas and should not be considered as such. Where renders are included, they are shown as illustrative sketches only.

Where there is appetite for exploration, these upcycling ideas would have to be further developed and evaluated.

Figure 4.37 illustrates a roadmap for the evaluation and mock-up process as the next step for developing these ideas.

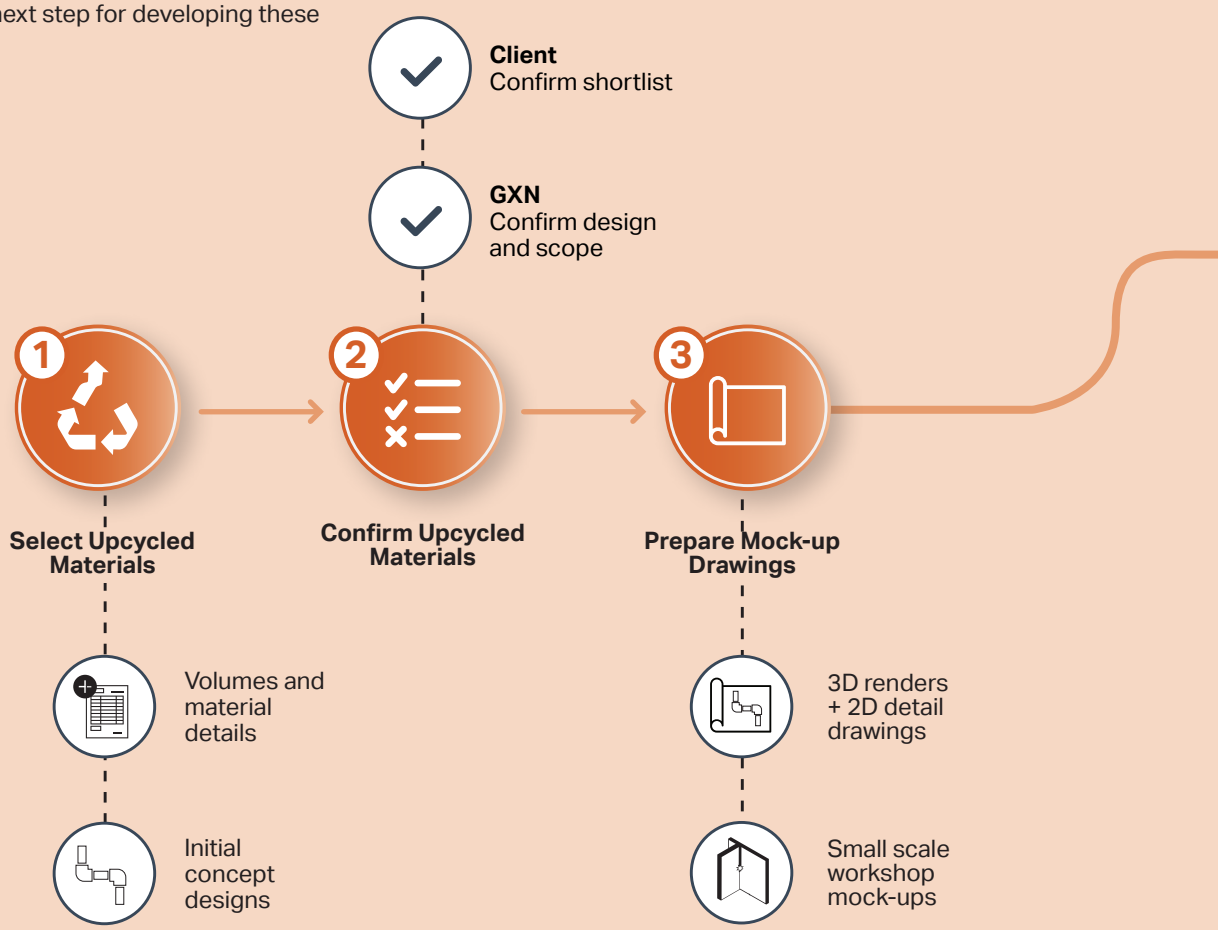
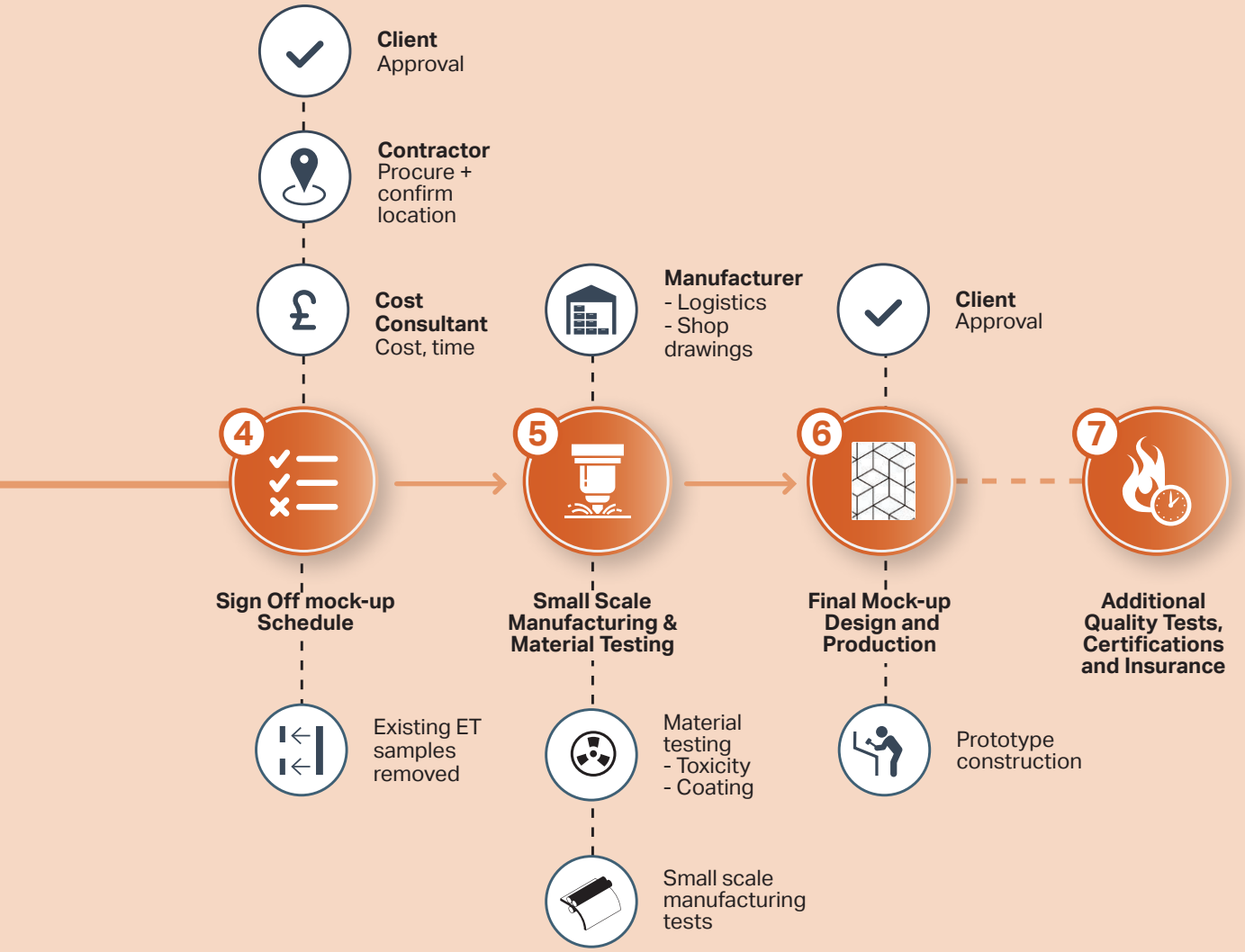


Figure 4.37 Roadmap for next steps in the upcycling process


Client
Approval
Contractor
Procure +
confirm
location
Cost
Consultant
Cost, time
Manufacturer
- Logistics
- Shop
drawings
Client
Approval
4
5
6
7
Sign Off mock-up
Schedule
Small Scale
Manufacturing &
Material Testing
Final Mock-up
Design and
Production
Additional
Quality Tests,
Certifications
and Insurance
Existing ET
samples
removed
Material
testing
- Toxicity
- Coating
Prototype
construction
Small scale
manufacturing
tests

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