7.0 Sustainability

7.1 Sustainability Strategy

Summary

Sustainability

The proposed development will follow a hierarchical design approach that is in line with industry best practice and the key targets of the London Plan 2021, in order to minimise Camden's contribution to Climate Change and on-site carbon dioxide emissions.

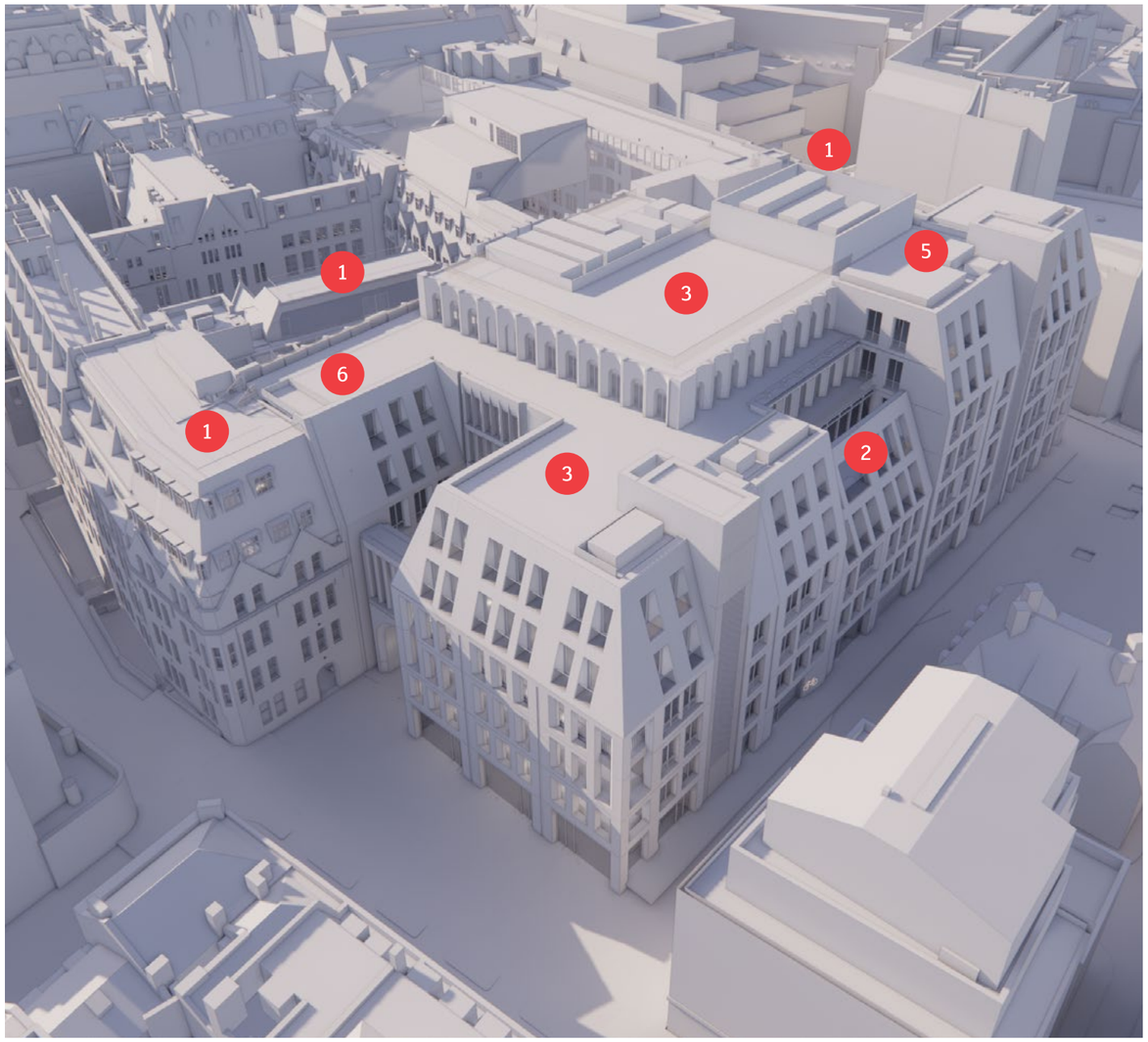
These will be achieved by using less energy through the adoption of sustainable design principles, including re-use of the existing structure, removing gas infrastructure in favour of an all-electric services solution, and on-site renewable energy generation. Further to this, the sustainability of the development is enhanced through the inclusion of other features relating to biodiversity and pollution.

The team are aiming for BREEAM Excellent, WELL Core Gold, and to achieve all targets of the London Plan 2021. The team will also strive to engage with the emerging circular economy, seeking out as many opportunities as possible to reuse existing materials.

Further information can be found in the Energy and Sustainability Statement.

Key Points:

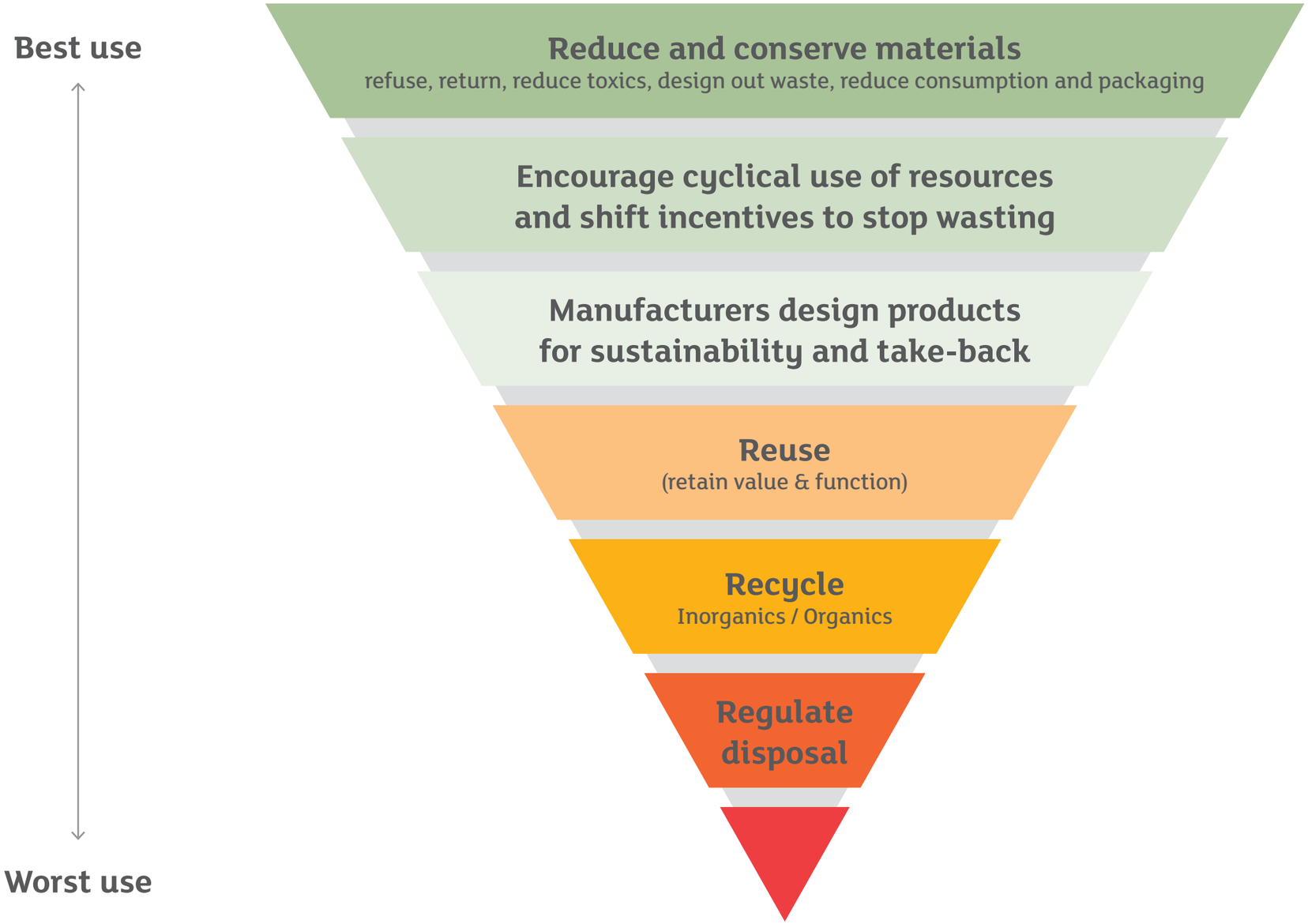
1. Retain and re-use (with improvement) the existing Grade II* heritage elements of the building.
2. Retain and re-use the existing 1990's building steel frame and foundations as primary structure for development on the site.
3. Creation of an external roof terrace with planting
4. High performance facades used for all buildings (other than heritage blocks).
5. Building footprint maximised & site re-used in more efficient building.
6. Reduce surface water runoff, where possible via Sustainable Urban Drainage systems (SUDs). Incorporate biodiverse roofs and blue roofs where appropriate.



7 .2 Reuse Strategy

Waste hierarchy

The development will seek to follow the waste hierarchy diagram opposite. The design team's philosophy will be to keep materials at their highest level of value wherever possible.



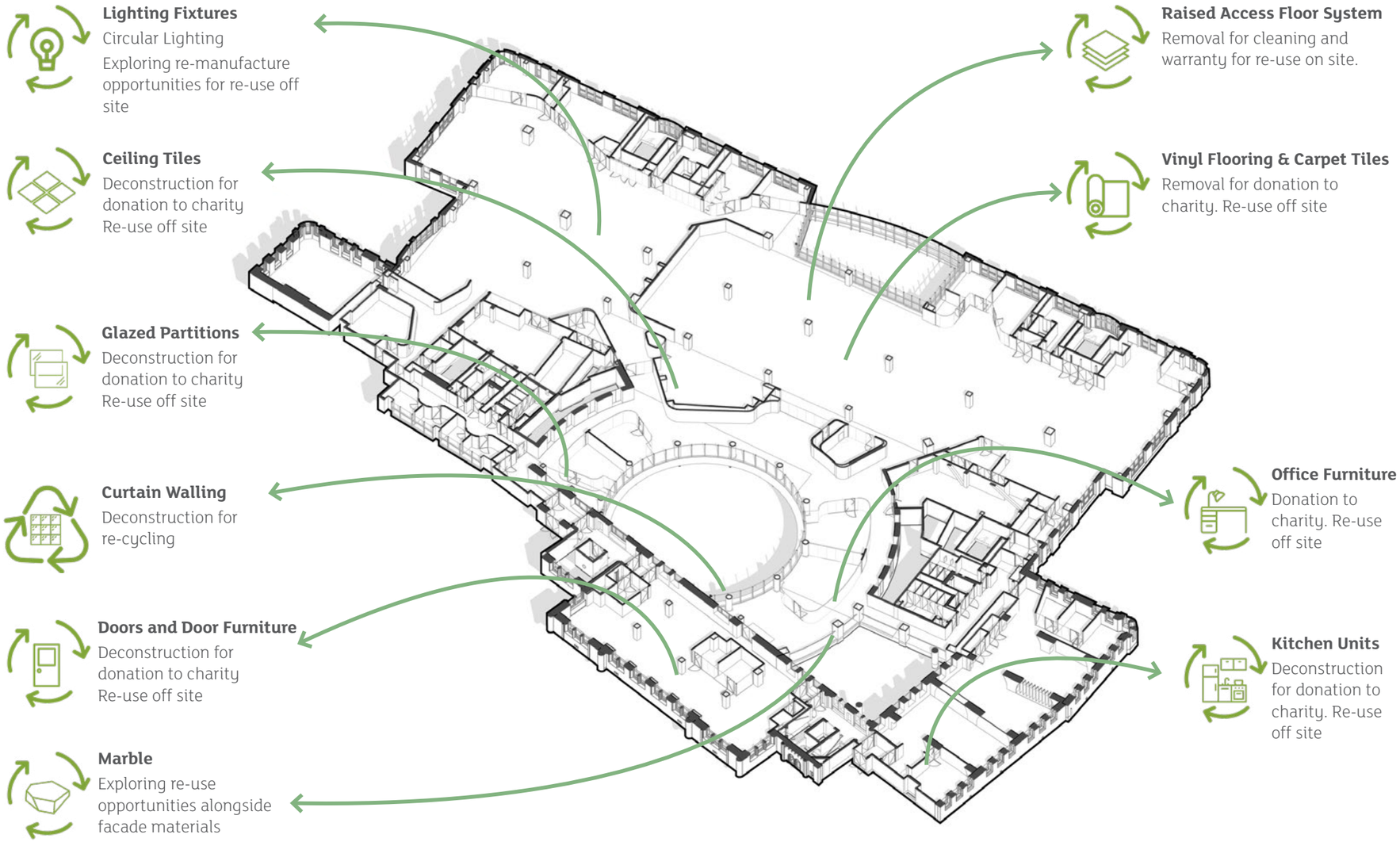
7.2 Reuse Strategy

Reuse opportunities during strip out

The design team has liaised with The Recycled Assets Co (TRACO UK) to identify opportunities for reuse of items removed during the strip out phase. The items intended for reuse include:

- Carpet tiles
- Ceiling tiles and grid system supporting the tiles.
- Glass partitioning + framing
- Kitchens and joinery
- Doors + door furniture
- Decorative wall finishes
- Vinyl flooring
- Lighting
- Operable walls

A study of further opportunities to reuse items removed during the demolition phase is currently underway.



7.3 Facade Replacement

Upgrade or Replace?

The design team has carefully considered the 1990's facade and wether this could be retained and upgraded or needs to be replaced.

This has involved undertaking detailed studies to assess the make-up and likely performance of the existing facade as well as its current condition. We have also sought to identify any areas that could be problematic for the future longevity of the building if the now 30 year old facade were to be retained. We have worked with specialist facade contractors and material researchers to evaluate the best solutions for the building.

We have also considered the areas of facade that would be practical to retain and how they would work with any new facade that is required as part of th eworks to upgrade and extend the building. In order to facilitate the proposed plans for the redevelopment, much of the facade would need to be removed and replaced to allow for the following:

- Providing larger openings at ground floor to increase activiation
- Enable plant replacement strategy at roof level
- Enable additional proposed mass to upper floors and stair cores
- Increased floor zone for services solution

The above improvements would leave relatively little existing facade remaining as can be seen from the diagrams on the next page.

7.3 Facade Replacement

Upgrade or replace?

Step 1:

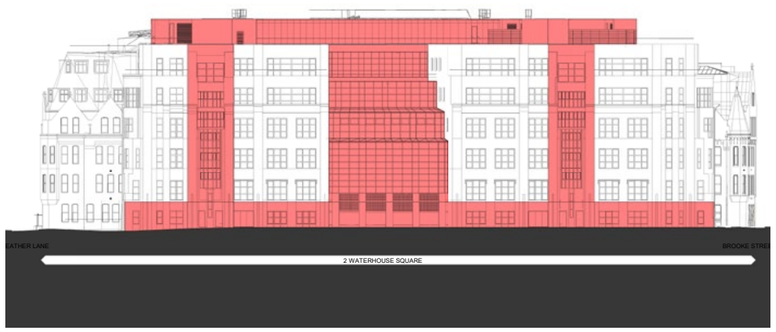
Remove ground floor facade to create new openings & activate ground floor plane

Step 2:

Remove 6th floor plant screen to add a new floor of offices

Step 3:

Remove facade of stair cores so they can be extended up to new 6th floor office



Step 4:

Remove ROL facade to facilitate infill

Step 5:

Remove corbel to access and upgrade inadequate weatherproofing

Step 6:

Move windows up to accommodate raised FFLs, due to installation of more efficient air-handling system

7.3 Facade Replacement

Improved Daylight to Office Floorplate

Floorplate considerations

The structure of the existing building is good with excellent floor to floor heights and the key existing dimensions are:

Floor to floor: 4100 mm generally, 4400 mm at first floor.

Raised floor zone: 250mm

FFL to suspended ceiling: 2700mm

Ceiling / lighting zone: 150 mm

Ceiling void and Structure: 1150 mm

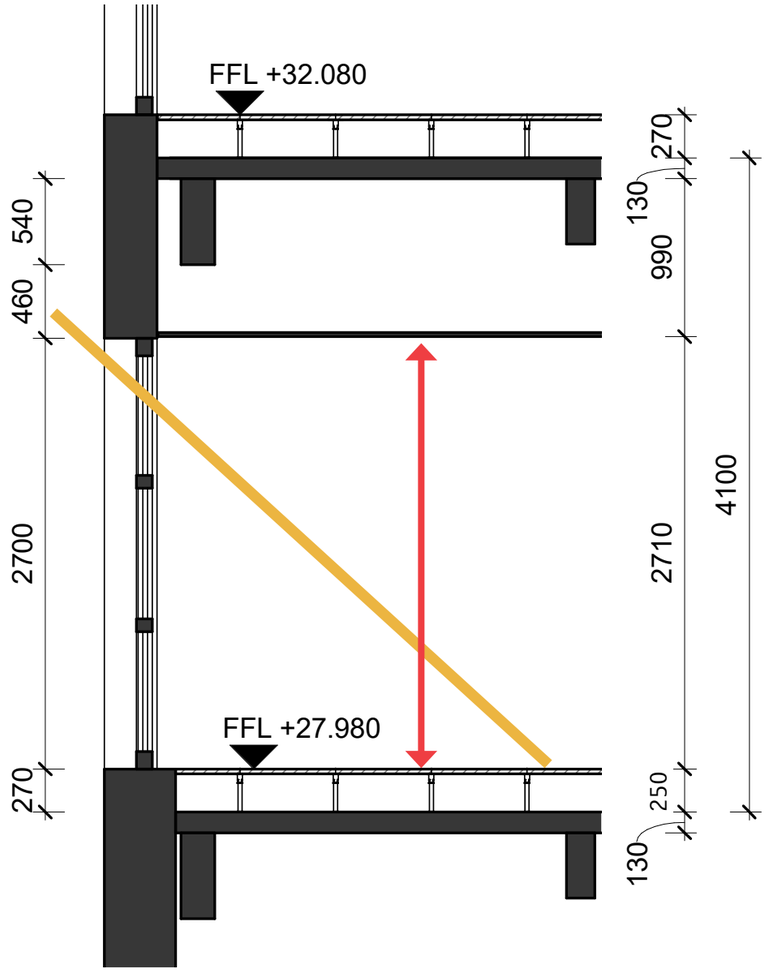
There are opportunities to maximise the floor to ceiling heights, which rely on the following changes to the building:

Air in floor with only sprinklers, fire detection and lighting at soffit level, meaning full ceilings can be omitted, saving vast quantities of embodied carbon

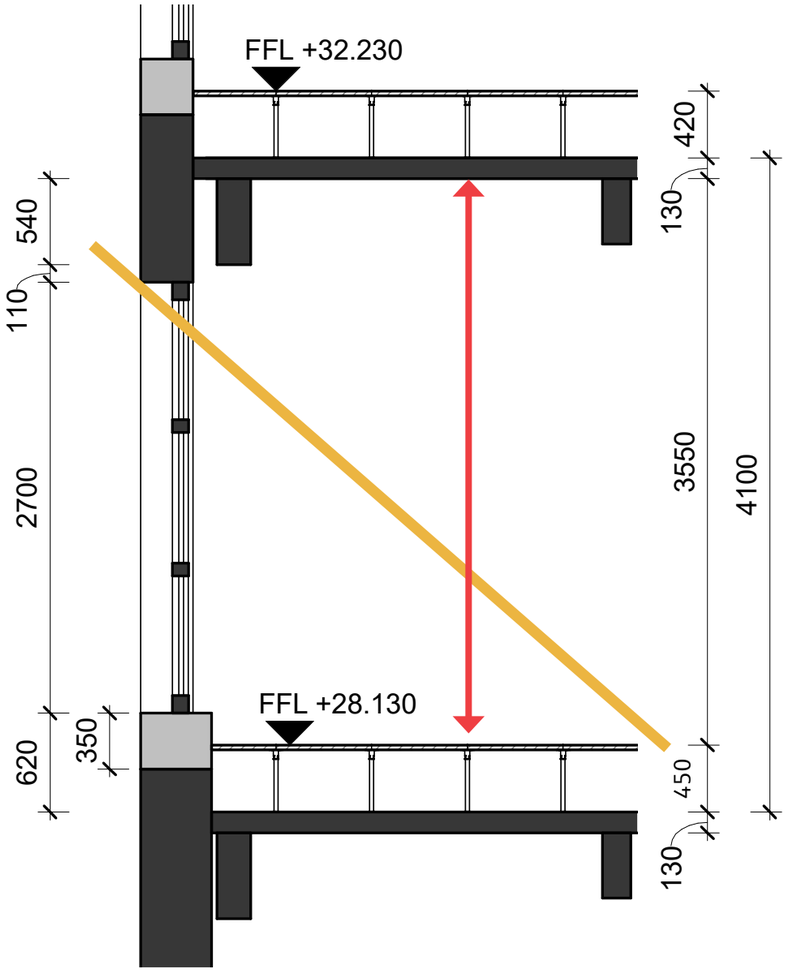
This raises the raised access floor level, meaning the windows and facade would need to be modified / replaced

This allows an increased floor to ceiling height of approx 3650mm to u/s of slab & 3150mm to u/s of steel

Builders work to steel required for new services distribution



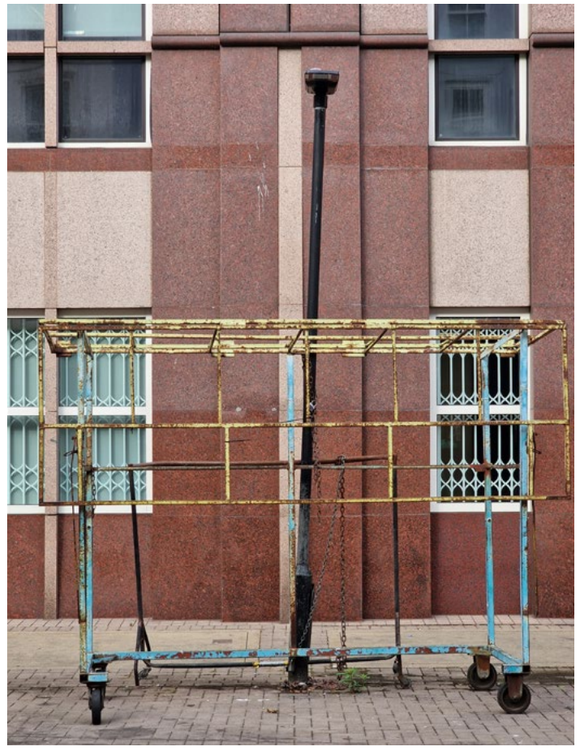
Existing

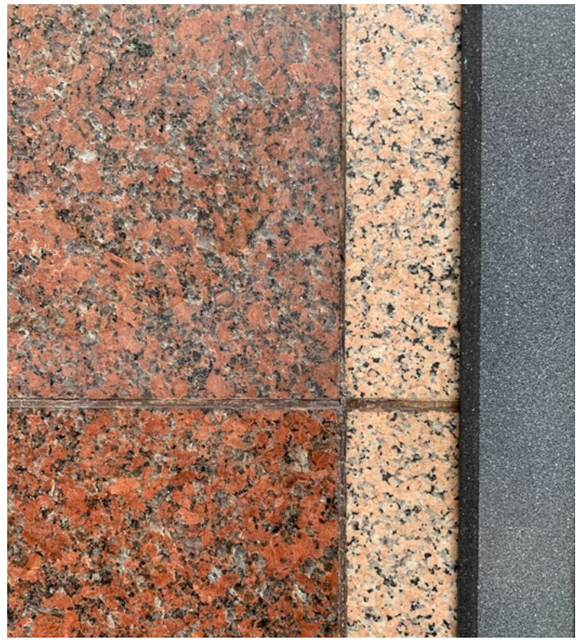


Proposed - Maximum Heights

7.3 Facade Replacement

Existing Facade - Imperial Red & Rosa Limbara Granite





7.3 Facade Replacement

Options for existing granite facade

Granite Reuse

The existing building is clad with approximately 3000m2 of granite. The two varieties of granite, red imperial and rosa limbara, are fixed to a unitised facade with resin-bonded anchors. The design team has explored a number of options to reuse or recycle the stone. The proposed design incorporates reclaimed slabs of rosa limbara granite as a 'plinth' at ground floor, and recycled red imperial granite aggregate in precast panels.

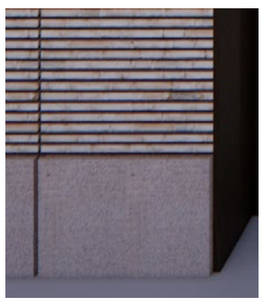
Further opportunities to reuse existing materials on site will be identified and explored throughout the design process.

Tiles / paving

- Reuse
- Low carbon
- Low transport
- Storage onsite
- Final use onsite

Planters / landscaping

- Reuse
- Low carbon
- Low transport
- Storage onsite
- Final use onsite

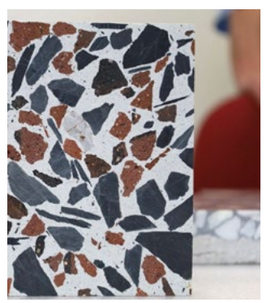


Stone-faced precast

- Reuse
- Medium carbon
- Medium transport
- Offsite storage cost
- Final use onsite

Stone reclamation

- Reuse
- Medium carbon
- Medium transport
- No storage
- Final use offsite



Terrazzo flooring

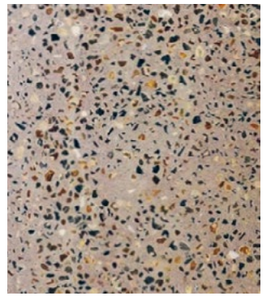
- Recycle
- Medium carbon
- Medium transport
- Offsite storage cost
- Final use onsite

Gravel

- Recycle
- Medium carbon
- Medium transport
- No storage
- Final use offsite

Waste-based bricks

- Recycle
- Medium carbon
- High transport
- Offsite storage cost
- Final use onsite



Precast aggregate

- Recycle
- High carbon
- Medium transport
- Offsite storage cost
- Final use onsite

Concrete aggregate

- Recycle
- High carbon
- High transport
- No storage
- Final use offsite

7.3 Facade Replacement

Options for existing granite facade

Who we've spoken to so far....

- Stonecycling
- Local Works Studio
- Kenoteq
- Quiligotti Terrazzo Tiles Ltd
- McGee
- Colorminium
- EGG Lighting
- Reco Lighting

Local Works Studio

We have worked with Local Works Studio who have produced a granite re-use study. The strategies and aspirations can be seen on the following pages, but require further works, viability and testing of the existing materials to verify potential re-use opportunities.

Introduction

This report sets out the findings of a study into material reuse of the existing Granite facade on 2 Waterhouse Square.

A pre-deconstruction audit has been completed separately to this document, and has helped to inform the Material Reuse Strategy.

We have not worked to BREEAM requirements for the audit, but it is useful to understand them and how they relate to the reuse options suggested in this document. The suggested strategies within this document would likely contribute towards an innovation credit.

Our aim, as the design process progresses, is to find ways of building which have the least negative impact on the environment and highest reuse potential, through prioritising the following:

- careful deconstruction
- low embodied energy construction
- zero waste
- lowest possible transport miles
- minimal, low energy processing
- little or no toxic chemicals and additives
- using sustainable, rapidly renewable materials and/or industry waste-streams
- procurement that supports local economies and unstable supply chains

When conducting the survey on site, we quantified and assessed the condition of materials that have been identified for deconstruction. Within this document we have provided an overview of the primary materials that will be removed from the facade to enable its retrofit with external insulation.

Broadly speaking, the potential material palette from the deconstruction of the facade will include two types of Granite (with 3 different surface treatments), along with the stainless steel brackets and facade hanging system. Based on our experience, we have made informed assumptions about the suitability their reapplication in the future sustainable construction works at Waterhouse Square.

For the purpose of this report, we have completed a non-destructive, ground level survey of the stone alongside desk-based research that included a study of the original fabrication drawings for the facade.

Introduction

Built in the early 1990's as an extension to Alfred Waterhouse's listed building in Holborn, London, 2 Waterhouse Square's facade contains two types of granite:

1. Imperial Red (possibly from Sweden or India)
2. Rosa Majorca (probably Rosa Porrino from Galicia, Spain) - as named in the original facade design drawings by SCI

Generally, stone can provide a relatively low embodied carbon solution to masonry applications, but this is dependent on the quarrying techniques, fabrication and associated transportation. We would like to propose that the existing facade be viewed as an on-site granite quarry that contains extensive material for future use, thus significantly minimising the need for further mining, transportation and processing.

External Granite cladding on 2 Waterhouse Square

Creative re-use

We believe this retrofit project could pioneer an innovative method for the reuse of deconstruction materials on a circular, closed-loop construction project. In line with this vision, we put forward the questions:

- Can the deconstructed materials and fixing systems be reused on the building cladding or internal and external features?
- Can we make design decisions now that ease future deconstruction and reuse?
- Can existing material networks be used more efficiently to re-dimension stonework and fabricate other features required for the project?
- Can the processing of these materials happen on-site to minimise material movement?

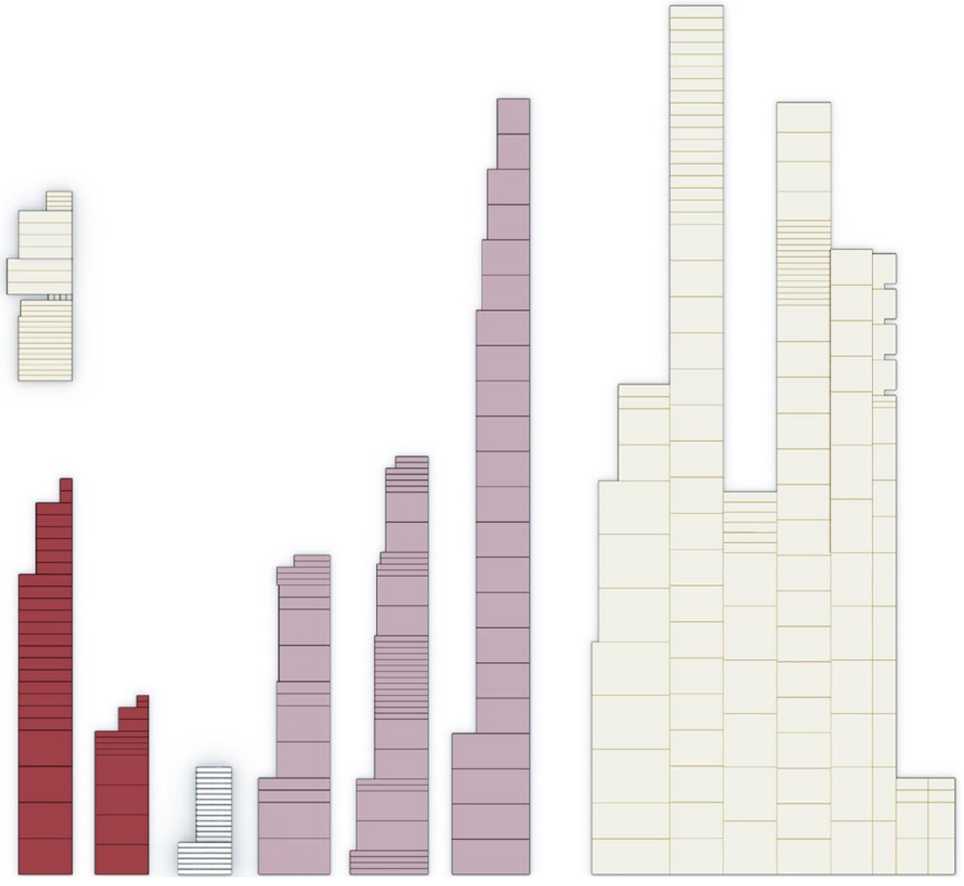
Rosa Porrino Granite quarry in Galicia, Spain: the assumed source of the paler Granite on the building.

Granite Audit - An overview

This page summarises the granite included within one bay of the building, by breaking it down into its component parts.

We intend for the full catalogue of granite to inform the storage and labelling requirements on-site, as well as providing the design team with an invaluable tool to plan the new facade treatment and minimise waste.

This bay is neighboured by other repeating bays across the facade, as well as some irregularities.



The heaviest pieces of Granite in this bay weighs 135 kg
1300 x 900 x 40 mm

Base Stone	Finish	Type	Dimension H (mm)	Dimension W (mm)	Quantity
Red Imperial	Polished	Slab - 1	900	600	
		Slab - 2	900	150	
		Slab - 3	200	900	
		Slab - 4	200	600	
		Slab - 5	200	200	
		Mitre - 1	900	500	
		Mitre - 2	900	140	
		Mitre - 3	200	500	
		Mitre - 4	200	140	
		Bullnose	200	600	1
		Bullnose Sill	200	900	
	Rough	Slab - 6	1200	600	
		Slab - 7	1200	200	
		Slab - 8	900	600	
		Slab - 9	900	200	
		Slab - 10	860	600	
		Slab - 11	860	200	
		Slab - 12	100	900	
		Slab - 13	100	600	
		Mitre - 5	1200	500	
		Mitre - 6	1200	140	
		Mitre - 7	900	500	
		Mitre - 8	900	140	1
		Mitre - 9	860	500	
		Mitre - 10	860	140	
		Mitre - 11	1300	140	
		Mitre - 12	800	140	
		Mitre - 13	700	500	
		Mitre - 14	545	140	
		Chamfer - 1	1300	600	
		Chamfer - 2	900	600	1
		Chamfer - 3	800	600	
		Chamfer - 4	700	600	
		Chamfer - 5	545	600	
Rosa	Rough	Slab - 1300 - 1	1300	900	
		Slab - 1300 - 2	1300	600	
		Slab - 1200 - 1	1200	900	
		Slab - 900 - 1	900	600	1
		Slab - 900 - 2	900	200	1
		Slab - 900 - 3	900	600	2
		Slab - 900 - 4	900	140	2
		Slab - 900 - 5	900	900	
		Slab - 900 - 6	900	170	
		Slab - 900 - 7	900	500	
		Slab - 860 - 1	860	600	
		Slab - 860 - 2	860	200	
		Slab - 700 - 1	700	900	
		Slab - 700 - 2	700	600	
		Slab - 395 - 1	395	900	
		Slab - 395 - 2	395	600	
		Slab - 395 - 3	395	140	
		Slab - 395 - 4	395	595	
		Slab - 545 - 1	545	600	
		Slab - 545 - 2	545	200	
		Slab - 445 - 1	445	600	
		Slab - 445 - 2	445	200	
	Blocks	Block 100x90	900		1
		Block 100x90	860		
		Block 200x90	1000		
		Block 200x120	900		

Granite Audit - An overview

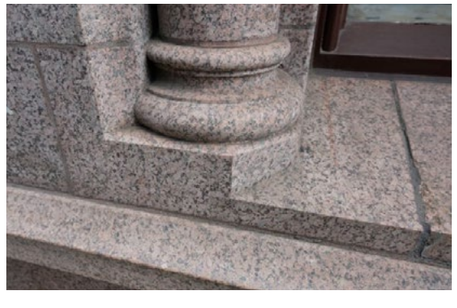
Granite finishes

The Imperial Red is a darker tone granite with large red feldspar crystals, black mica and opaque quartz. This image shows the *polished* finish of this stone. This finish is currently mostly featured at pavement level.

This image shows the same Imperial Red granite, but with a *honed* finish - achieved by grinding the stone down to a flat, consistent finish but stopping earlier than polishing to achieve a matt finish. This is a duller surface and appears slightly lighter in tone than the polished version.

This is the second type of granite, identified as Rosa Majorca. It is probably Rosa Porrino granite sourced from North West Spain. The surface treatment here is *flamed* - achieved by torching the surface of the stone with a high temperature flame, which causes the surface to chip off in flakes leaving a medium textured surface.

The last image shows the same Rosa Granite with a honed surface, which is flat but not polished.



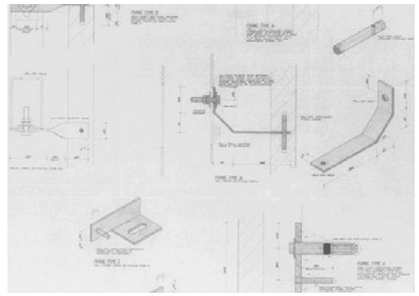
Hanging system

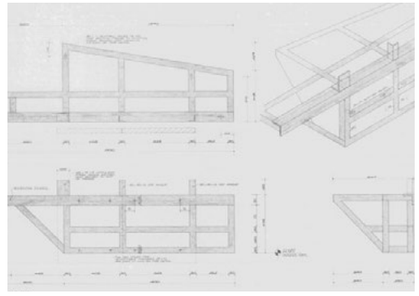
The original fabrication drawings contain extensive details that show the various kinds of brackets used within the hanging system.

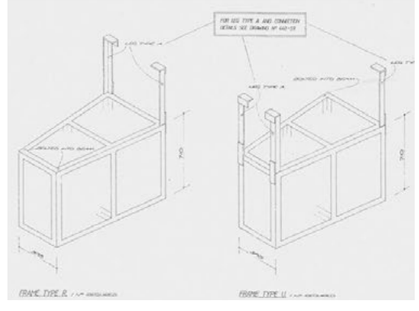
There are standard stone cladding fixings that seem to consist of a stainless steel (s/s) bracket bolted to an aluminium frame, with a plastic washers separating the two. The bracket holds the stone in place with a 5mm s/s dowel that locates into the rebated stone. We would like to explore the reuse of this standardised item for the hanging of the new cladding.

There are also many bespoke, welded brackets that create the backbone for the shape of the facade - projecting certain elements and features from the structural frame. These bespoke feature frames may be harder to reuse for the new cladding, but we would like to explore the possibility of using them for other applications.

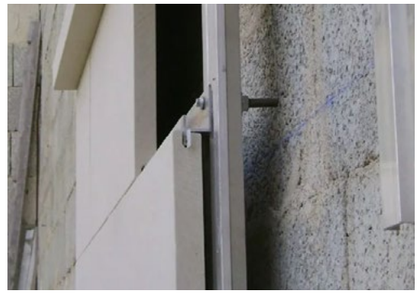
Note: The frames are made with angle s/s at 80 x 80 x 10mm or 50 x 50 x 6mm sections.







This image shows a modern cladding fixing system, which is similar to the one described in the drawings for 2 Waterhouse Square.



Processing the Granite - Workflow

Deconstruct

Store

Label

Transport

Handling the granite

Cut

Crush

Cast

Finish

Transforming the granite

Clean

Dry install

Wet install

Re-installing the facade

Additional materials

Additional materials

New materials and also waste from other nearby construction sites could be added to the palette of materials for the design of new cladding. This could bring wider aesthetic and performance outcomes for the facade.

Stages of working with the granite

This glossary of processes describe a variety of steps in the potential reuse of the granite. They are referenced throughout the document to show the different stages required for the various design strategies.

The number of processes involved in the altering of the granite is not proportional to the relative carbon emissions, but - when overlapped with an understanding of the energy intensity of the processes and material movements - they give an early indication of the relative environmental impacts.

Deconstruct

A totally different approach to demolition, where materials are taken off the building in a careful way to limit damage and maximise their potential for reuse. The granite will need to be deconstructed from the top down, with the fixing system also kept for reuse.

Store

Ideally the granite will not leave Waterhouse Square due to its weight and is stored on the ground floor for easy access and future wet working.

Label

A simple tool for enabling reuse is an efficient labelling system for storage. It is crucial to know what you have in the store, what size it is, how much is usable, where it could be used and more. Physical labelling alongside a virtual database works well.

Transport

By storing and processing existing material on-site and reducing new materials where possible, the works will be kept local. If required, any external suppliers or fabricators would ideally be located within 30km of the site.

Cut

Introducing a temporary fabrication workshop on-site is preferable to simplify the re-dimensioning and re-finishing of the stone cladding.

Crush

Different sized aggregates could be achieved for pre-cast features through crushing and grading broken granite and off-cuts on-site, where possible.

Cast

Achieving new forms with a liquid version of the granite relies on hydraulic pressing into a mould (with cement-free binders), or pouring a waste-based concrete mix into reusable formwork.

Finishing

Different means of re-surfacing the stone and cast features can achieve different textures; polishing, washing, tooling and rendering are just a few.

Clean

Prior to storage and reinstall, the granite should be cleaned, and if possible, any adhesives or metalwork removed from the surfaces.

Dry install

The optimum installation solution for future reuse of a masonry facade would use a metal hanging system with little or no wet mortar filling, pointing or grouting. Reuse of the existing hanging system should be prioritised for this.

Wet install

Wet installations can be deconstructed easily if soft, lime mortars are used. Different applications include tiles adhered to a backing board and grouted with lime mortar, mortared and pointed bricks or render applied to a wall or soffit.

Sensitive deconstruction

Taking down the granite facade

The existing facade on the building has been carefully designed, fabricated, and installed. It has very little signs of damage or faults, and at only about 30 years old it is ideally placed for reuse. The refurbishment of 2 Waterhouse Square will require access to critical components and areas behind the current cladding, which would be impossible without significant dismantling of the facade.

The existing hanging system in the original fabrication drawings shows a well designed technical fixing that is also perfect for careful deconstruction, storage and reuse.

The deconstruction of the facade will need to start from the top of the building and work down through the stone courses. There will be some cases within the hanging system where resin or cementitious mastics have been used to hold a fixing, but these areas will remain unknown until a destructive survey can be undertaken to ascertain a trend.

The largest stone that we surveyed from pavement level is 1300 x 900 x 40mm, which would weigh approximately 135 kg - requiring at least 5 people to handle. The average stone size on the building would weigh approximately 53kg, which can be lifted safely by 2 people. These calculations are based on the safety standards that limit individuals to carrying no more than 25kg.

The images on the right show a well ordered store, with cleaned second-hand items ready for reuse. The site store could also act as a prototyping space, where the design team can try out different ways of affecting and assembling the stone parts for different aesthetic outcomes.

The store will also need to catalogue and archive the stainless steel bracketing system to ease reinstallation or adaptive reuse. It is possible that building insurance would require an assessment of these parts to validate the safety of their future use.

Local Works Studio, Waterhouse Square

Designing for deconstruction

The existing cladding was only built 30 years ago and if it is removed carefully it can be used in a different format for another (longer) life cycle on this building or other buildings. A well designed new facade system should be crafted to last longer than 30 years, whilst acknowledging the need for necessary maintenance, repair and even further reconfiguration.

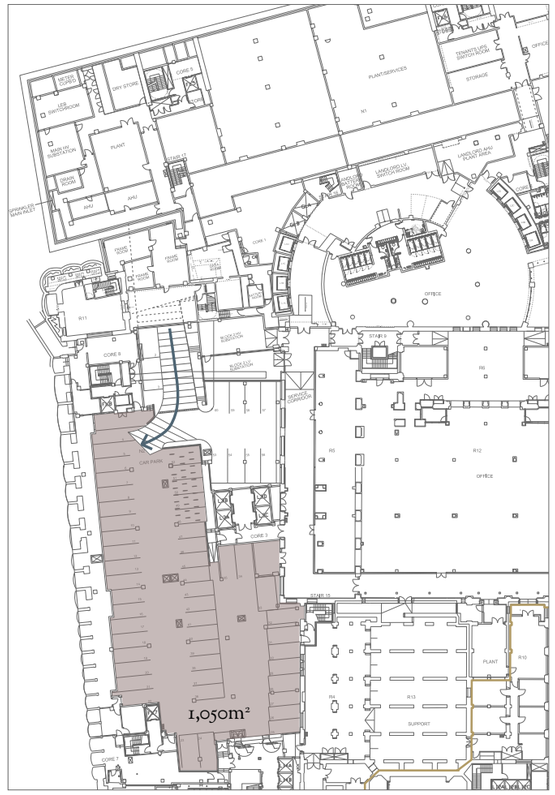
A dry install is the best construction technique to ensure the future reuse of the masonry facade elements. If adhesives, mortar beds, grouting and/or pointing are required, then a lime mortar should be used instead of harder, more cementitious material. Lime is lower carbon than cement, but also is softer than the granite stone, which is advantageous because it can be easily cleaned from the granite at end-of-life without damage.

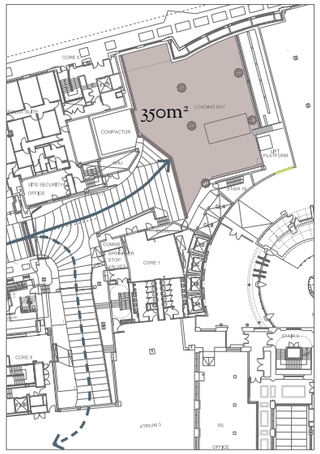
As well as specifying softer lime mortars where required, we also suggest using a traditional mastic material to seal the junction between windows and external masonry. Whereas modern mastic and silicone products are high-carbon and come in single-use packaging systems, Burnt Sand Mastic is a flexible jointing material that does not contai petroleum oil or require a disposable plasti applicator.

This project offers an exciting opportunity to use this natural mastic alternative at scale an could play a role in transitioning from wasteft construction norms. The base ingredients ar linseed oil (plant-based) and stone dust - th latter of which could be collected from the cuttin machines that are used to redimension the granite

The simple ingredients in Burnt Sand Mastic

Storage & Handling





^ Lower Ground Floor Plan -
Loading Bay = 350m²

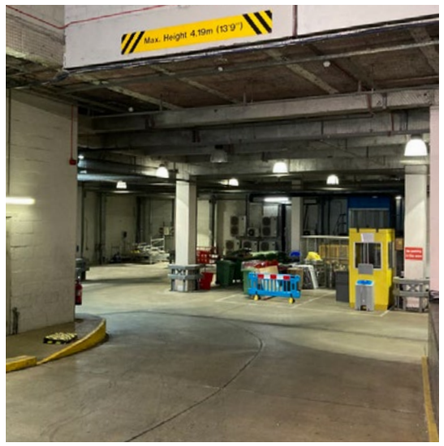
< Demise Plan -
Car Park = 1,050m²

The highlighted area is outside of the red line planning boundary, however storage options over the whole masterplan are being considered.

We would like to propose that the loading and parking bay areas within the lower ground floor at 2 Waterhouse Square could be used to store the granite cladding.

The entrance to the site loading and parking zones is accessed via the lane to the West of the building via a downwards sloping concrete ramp.

This area can be easily accessed with fork lift trucks to seamlessly move the granite into storage as it is removed from the building.



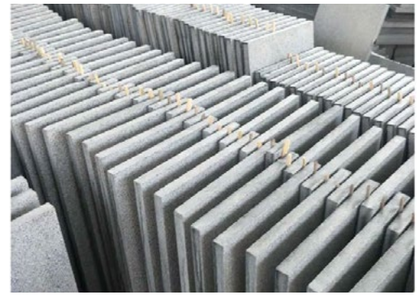
Handling with care

After the granite is removed from the building it needs to be cleaned to remove any dirt, adhesives and metal work that could inhibit re-dimensioning.

The stone should then be stored vertically to prevent further damage. We recommend using stone storage trolleys (as shown on the right) to minimise handling - and potential risk of damaging - the stone. Stones of the same type should be stored together, labelled and catalogued to reference a digital database.

The majority of the granite cladding is within the legal weight that can be safely lifted by 2 people (equivalent of 50kg). There are some larger pieces that would require a Risk Assessment to understand the equipment required to handle the stone.

The granite is strong but brittle and is therefore liable to crack if it is stored incorrectly; soft spacers should be used to separate the surfaces.



On-site storage would drastically reduce the material movements for this project. There is also a danger that if the material was moved away from a site, it could easily become lost or damaged beyond repair.

We propose that this project becomes a precedent for a central London site that retains and stores material for reuse. In the next section we suggest that this could be extended to include a temporary masonry workshop that deals with the re-dimensioning of granite and fabrication of any new cast features for the building.

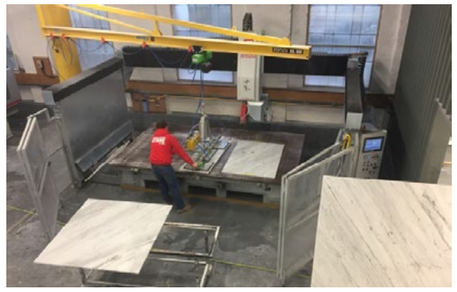
On-Site Workshops - Cutting & Casting

Training

We propose that the lower ground floor storage areas could also become a temporary stone cutting workshop where the granite could be re-dimensioned for the new facade, as well as internal and external features.

This work could either be done by bringing in skilled specialists for a residency, or the contractor could be trained to undertake the work themselves depending on the processes required.

Local Works Studio specialise in trialling and implementing fabrication processes that can be easily communicated and mastered using standard tools and machines. We are keen to ensure that materials are not wasted due to over-complicated or specialist processes that could become too costly for the project.

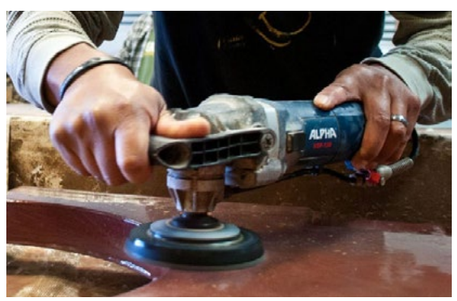


Cutting & finishing

Stone cutting and polishing processes are best done wet to suppress airborne dust and keep the saw cool, thus extending its lifespan. Stone saws that are made to be transported to construction sites can be hired or bought second-hand, and would have a self contained water recycling system.

Stone off-cuts and the wet saw 'sludge' would also become valuable materials for reuse
(see pages 50-51).

After re-dimensioning the stone, there may be some further working, such as polishing and drilling. These processes are also done with wet working tools, and a water collection area can be made for this work.



Crushing, grading, casting & finishing

Some of the proposed bespoke features for the new cladding could be made by pre-casting a waste-based concrete. This would require the granite to be crushed, graded and used as aggregate within the concrete mix. This is a flexible material solution that could be used on some of the more complex facade and/or furnishing features, but we strongly recommend that the majority of reuse should *not* depend on the crushing and reforming of the stone.

For those minority cast features, we suggest that the granite aggregate should be readable within the surface of the final product rather than hiding it within the composite matrix - this would effectively visualise the story of reuse if the old facade could be identified within the new. See page 50-59) for suggestions on how to best expose the aggregate beyond changing the overall pigment of the concrete mix.

We propose that at this small-to-medium scale, the granite off-cuts could be crushed on-site with a small jaw-crushing machine. These are fast processing machines that quickly crush stone to a variety of sizes; the crusher shown in the top right image is able to crush and grade hard brick masonry into two types: 12mm to 100mm and 12mm to dust. Separate grading machines called Trommels, can also be used to quickly separate aggregate sizes.

Reusable moulds can be made for repeat forms, or adapted to cast a family of similar features. We propose that this process is undertaken on-site, but within the audit we will also consider other, local possibilities.

Waste-based concrete

Up to a certain scale, concrete can be a low carbon material if fabricated close to site using 100% waste aggregates. This methodology only requires transportation of the dry binder to site - a very small proportion of the overall weight of the ingredients.

At Local Works Studio, we have been working with bespoke waste-based concretes across many different projects and scales. We always aim to include 100% waste aggregates and reduce cement content by including binders from industry waste streams and the correct aggregate grades. We have had our materials independently tested for their compressive strength and they exceeded the British Standard for Cast Stone (BS1217).

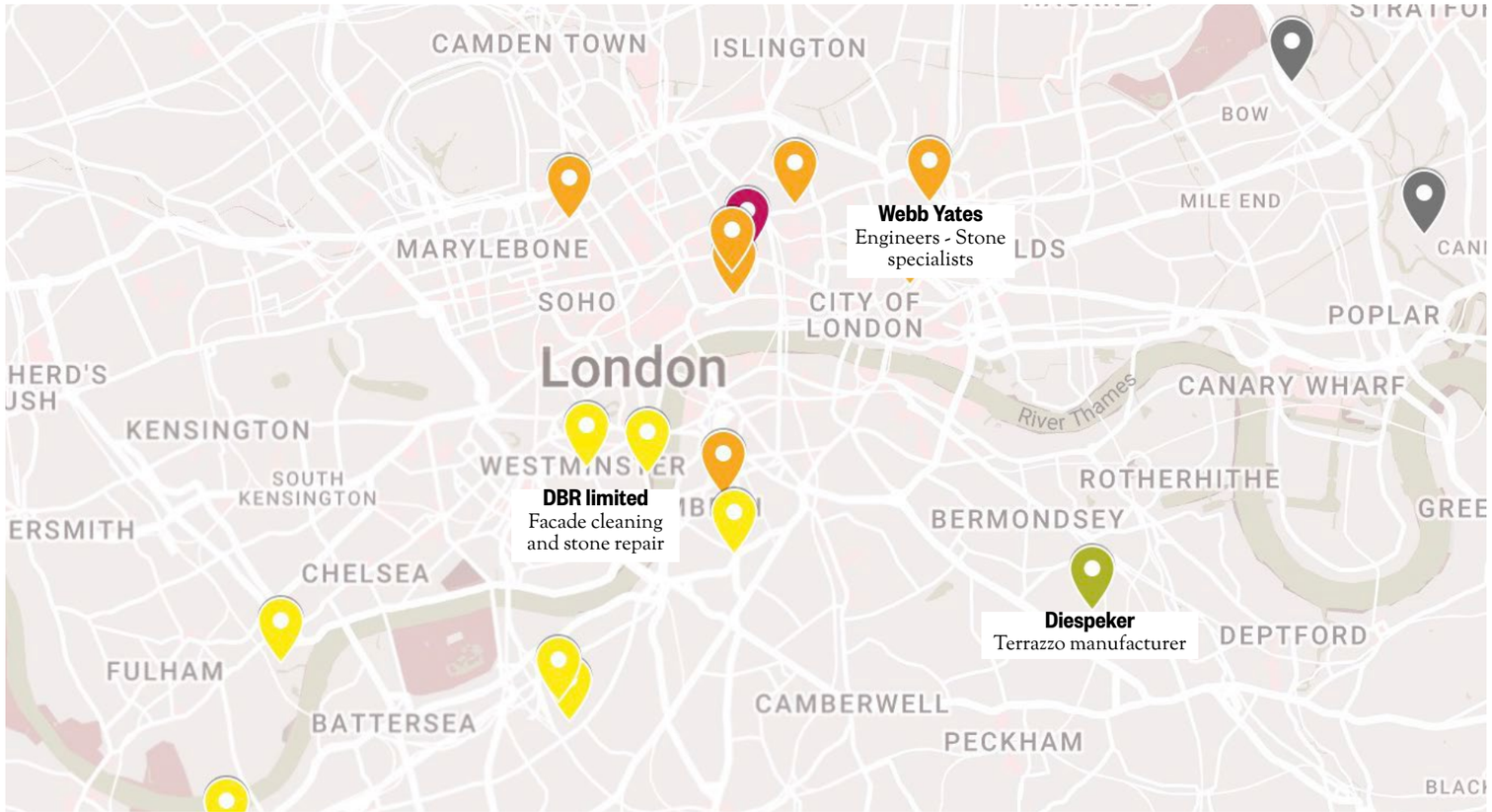
Off-site Processing & Fabrication - Radius Map

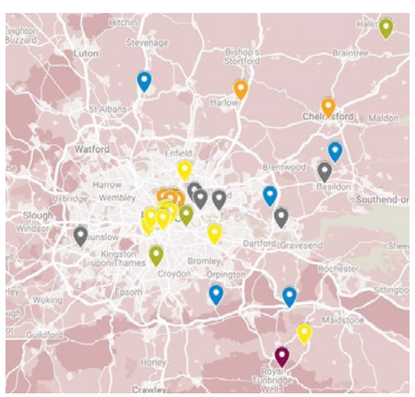
This page includes a work-in-progress radius map that brings together the local suppliers, processors and fabricators that are nearby to 2 Waterhouse Square. An exhaustive map and index will be included within the upcoming audit report.

The map includes some potential manufacturers for the project, as well as looking to tool suppliers, aggregate crushing companies and more. We do not endorse any of these companies, but include them here as an early scoping of local specialist solutions.

The images on this page are screenshots from Google maps, and the coloured pins correspond to:

- Waterhouse Square
- Aggregate crushing
- Facade engineers and supply companies
- Fabricators (precast applications)
- Mobile concrete cutting companies
- Stone masons
- Stone tool and machine companies

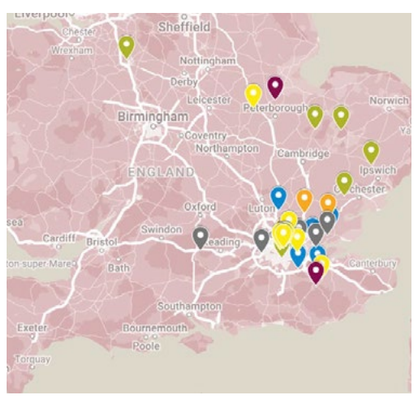




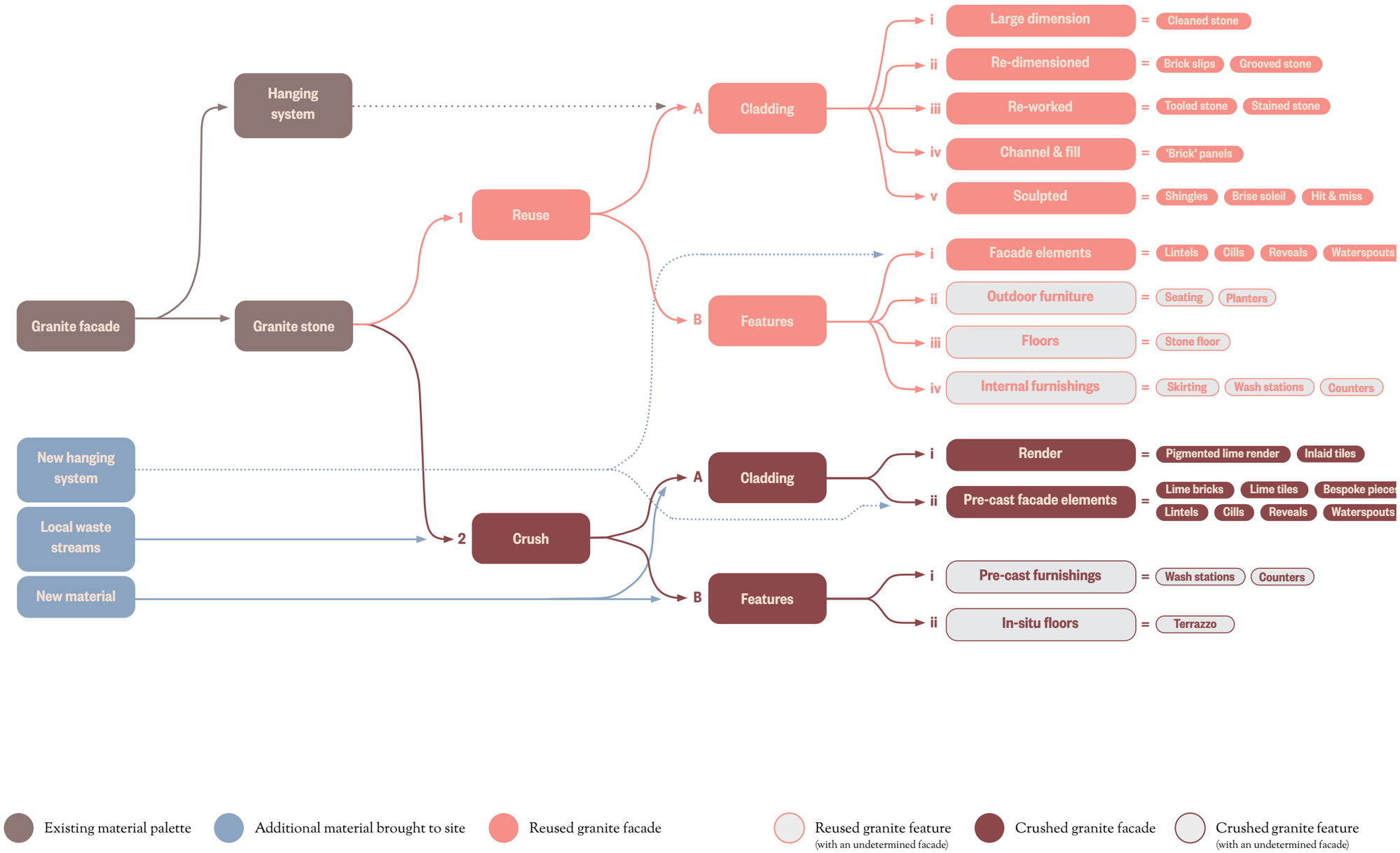
Transportation

If on-site processing of the granite is not possible, there will need to be some back and forth transportation to enable its reuse. To successfully reduce the distance travelled from and to the construction site, it is best to plan material movements that make sense rather than following arbitrary radial or straight lines of measurement. We recommend the following:

- Prioritise local (or even on-site) solutions.
- Pair up with existing, empty truck journeys from other deliveries or pick-ups
- Collate multiple processing methods under one fabricator to cut down additional movements.



Material Design Strategy - An overview



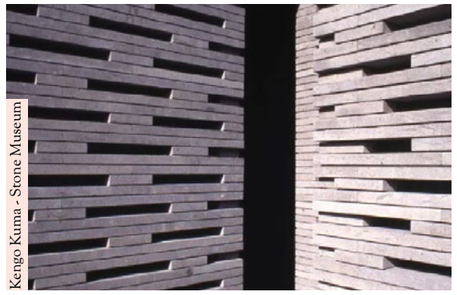
Material Design Strategy - An overview

Reused granite

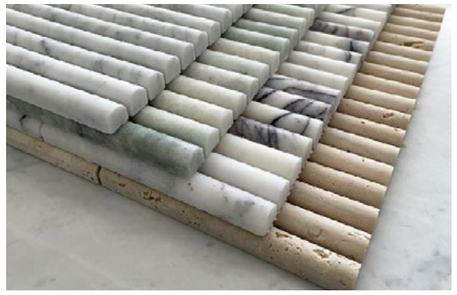
This is our preferred option for the majority of the facade.

The term *reused* implies that the granite is not crushed, but re-purposed as a rain screen material within the new facade build-up. It could be reused as-is without cutting, or it could be re-dimensioned, re-surfaced or even hung in a different way. The main advantage of this strategy is that it depends on relatively little processing or new material - making it a lower carbon solution than the *crushed* option. The fabrication works could be adapted for on-site working, thus further reducing emissions by transportation, and the new system could make a statement of its deconstruction past and possible future.

It may feel like a design limitation to work with the existing components, but such constraints often result in a more creative solution. We believe that the challenge presented by reusing the existing granite and hanging system in - or close to - its existing form presents an exciting design challenge that could make the retrofit of 2 Waterhouse Square a leading case study in material innovation.



Kengo Kuma - Stone Museum



Crushed granite

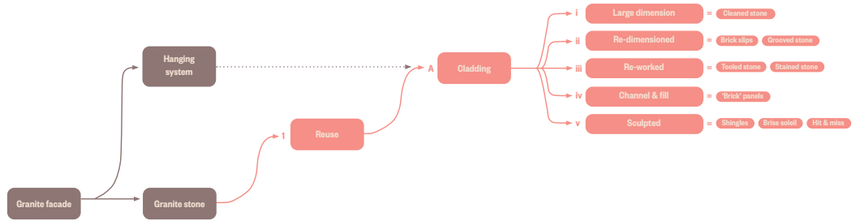
We think this option suits the fabrication of a few, bespoke features, but not the majority of the facade treatment.

Crushed granite depends on the use of a machine to mill the granite into different sized aggregates, which can then be used within a waste-based concrete recipe to make pre-cast forms. The aggregate can range from large peices of around 100mm down to gravel and sand sized aggregates and even stone dust. Crushing can be performed on-site, but often noise restrictions prevent this from happening within a dense urban location - especially if the works are extensive.

Crushing and re-forming hard materials can be a lengthy and carbon heavy process. The resulting precast surfaces and forms could quickly appear dated - it does not seem beyond belief that terrazzo surfaces will be one day be classed as a fad from the 2020s.

Finally, the granite is currently perfoming really well: it is undamaged and does not have a permanent patina of age, which build a strong case for its reuse.

Fernando Menis



Interpreting the web of ideas

The next pages detail different high-level strategies for how the granite could be reused or crushed in the future.

Each of the options can be mapped onto the flow-chart from the previous page, which is used as a wayfinding graphic throughout the remainder of the document. This details the basic distinctions between the many options explored in terms of the material processing and sourcing.

Of particular note, there are many options for reuse that transform the visual appearance of the two existing types of granite, and each material strategy has vastly different finishing and shaping options. The options are extensive at this stage and can be combined and refined to achieve a desirable appearance without incurring unnecessary carbon emissions, waste and time.

Our suggested strategies are not linear, but should be considered as a library of ideas from which to hone a more in-depth and technical strategy - after a full audit has been conducted.

We are keen to progress some of the reuse ideas, after a review, into a round of prototyping that could evolve alongside the overall concept and technical design.

Key

1 - A

2 - A

The colour tabs located at the top ri of each page reference the Material Strategy flow-chart (shown in full o the previous page), and are designec to ease the comparison and possible combination of different options.

Each page also includes a pin diagra that indicates the relevant material movements as follows:

All material is sourced & processed site

Most material is sourced & processe on site, except a new hanging syster

All material is sourced & processed site for use other than the facade wh remains unknown.

Existing material is processed on sit and mixed with other wastestreams new materials.

Existing material is processed and mixed on site for use other than the facade which remains unknown.

Existing material is processed off-sit and mixed with other wastestreams new materials on-site.

Reused for cladding

1 - A

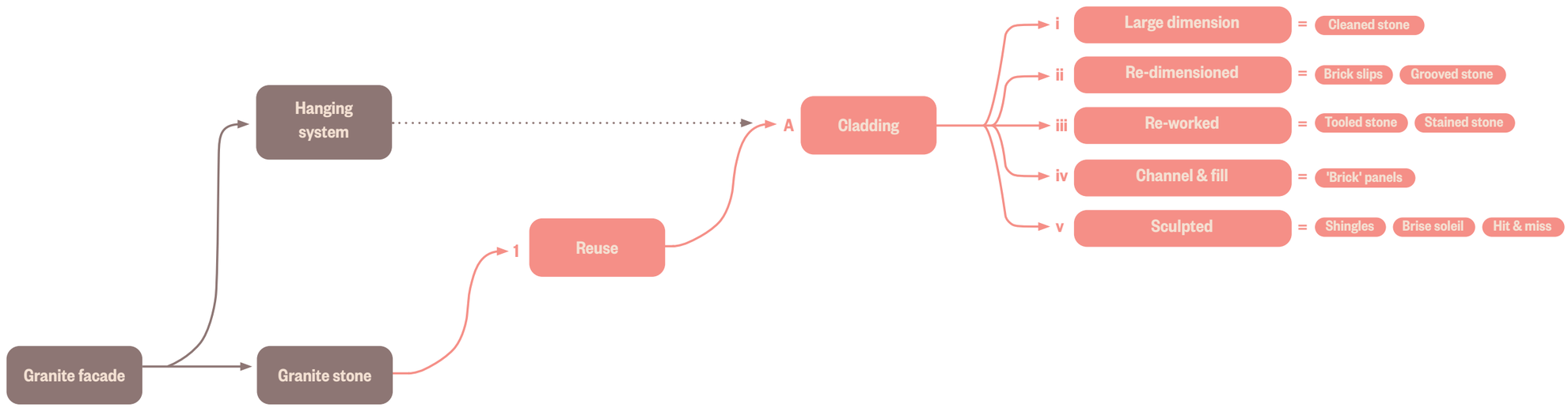
This is our preferred option for the majority of the facade.

The stone is currently rebated to take the stainless steel fixings and is 40mm thick. Reuse of the existing stone allows for greater, more efficient reuse of the existing steel hanging system. The welded brackets that currently form the projections of the facade could be altered and reused within any future formmaking to reduce waste even further. There are, however, also options for sourcing a new or second-hand hanging system to further free up the facade design.

The reused granite could also be wet-fixed with mortar as tiles, which gives a multitude of options for wide, pigmented grouting joints and rendered sections.

There is also scope to affect the surface of the granite to achieve different textures and interesting shadows. The image on the far right shows an example of the existing tooled granite finish featured at street-level - this can be achieved through a simple cutting and snapping process.

Francesca Torzo



Large dimension

Deconstruct
Careful removal to enable reuse with minimal processing

Label
Accessible cataloguing of original elements for reuse

Store
Safe storage, preferably on-site

Clean
To enable easier processing and reuse

Dry install
Reusing existing hanging system. For ease of future reuse

The current facade appears overly fussy and dated, but in isolation the stone is still a high quality material which can perform as a strong, practical, durable and beautiful surface if detailed well.

A refreshed look

Granite is a very hard stone and should be harder than - and therefore easily freed from - the existing cementitious grouting, which is relatively thin and brittle. From studying the fabrication drawings, there does not seem to be any fixings on the rear face of the stone, meaning that the entire tiles could feasibly be reused in their current dimension.

Some of the stones have one mitre-cut edge - an unnecessary corner detail on the building that has been subjected to some damage owing to the thinness of the bevelled point. We suggest that these mitres should be cut away to leave a square edge tile.

Cleaning and storage would be the only major processes required in this case, with minimal cuts required for damaged pieces.

Cleaning the stone with sponges may be enough, but for some of the dirtier sections the DOFF method may be required (a gentle form of steam cleaning). Tests can be done once the cladding has been removed.

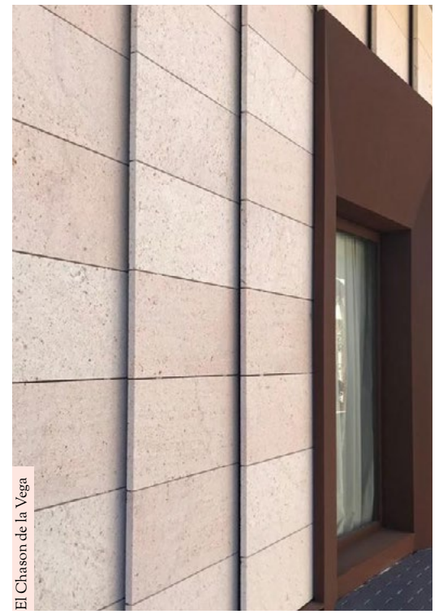
Making a statement

Large dimension reuse of the granite would suit a plinth course on the new facade. This would be immediately readable (to those who knew the former building facade) at pavement level as a reuse project, as well as creating a harder-wearing datum beneath a hung facade. These larger dimensioned stone pieces would also suit other facade treatments, such as window reveals, cills, and higher level sections of the building (see pages 40-41).

Given that the building will expand outwards with the additional thickness of the new insulation, there will be seams opened up at the external corners that the existing material cannot cover. The images on the right are suggestive of how these exposed corners could become elaborate features within the new cladding. Referencing historic detailing on the original Waterhouse building, the corners could become bold statements of reuse, that enliven the large dimension granite facade.

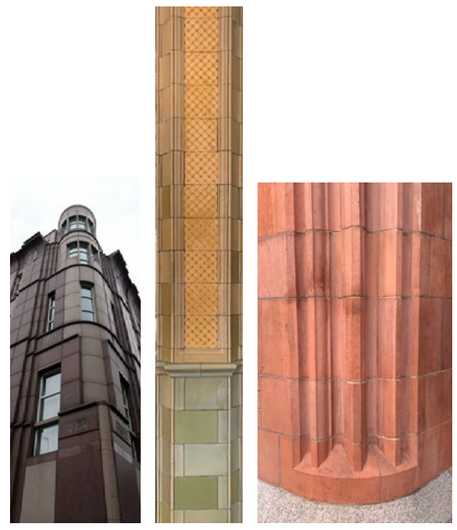
1-A-

Cleaned and stored Granite sheets ready for reuse

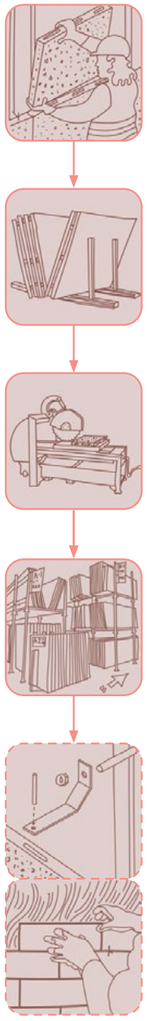


El Chason de la Vega

O'Sullivan Skouloglou Architects



Re-dimensioned



Deconstruct
Careful removal to enable reuse with minimal processing

Store
Safe storage, preferably on-site

Cut
Re-dimensioning stone

Label
Accessible cataloguing of new elements for reuse

Dry install
Reusing existing hanging system. For ease of future reuse

Wet install
Smaller dimension stone is adhered to a carrier board

Cutting down the granite into smaller dimensioned pieces can achieve a brick or tiled appearance, helping to break up the flat facade with continuous string courses. This option could work in tandem with the large dimension plinth discussed on pages 28-29, making the building appear lighter weight.

Brick slips

The granite could be cut into 40mm thick tiles, or slips, that are then dry or wet installed onto the facade. The wet installation build-up would make use of a lime adhesive to fix the tiles onto a woodwool backer board. This option presents many opportunities for different sizes and bond pattens.

Bricks

Standard sized bricks could be cut from the thicker sections of granite (the mullions are up to 100mm thick, for instance), or they could be laminated using two 40mm thick tiles to make an 80mm tall solid brick. These could be mortared as per standard brick laying, or there may be dry methods of installation too. If using solid bricks, this would be a limited feature and the exact quantity of granite over 40mm thick will be included within the future audit.

Bond patterns

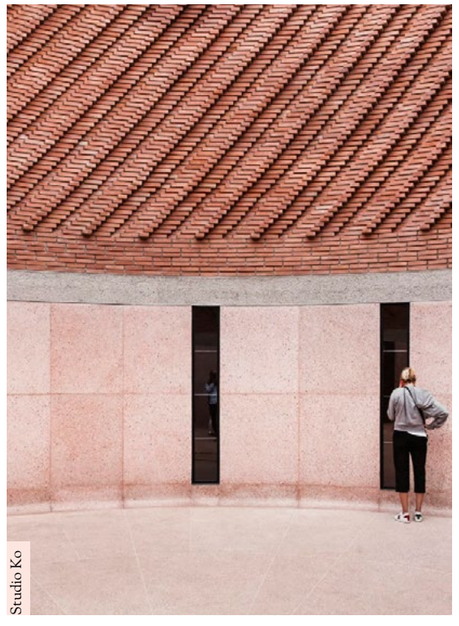
The smaller dimension stone (whether brick slips or laid bricks) could be arranged in vertical or diagonal bonds to unlock different textured surfaces across the facade.

Tessellating shapes

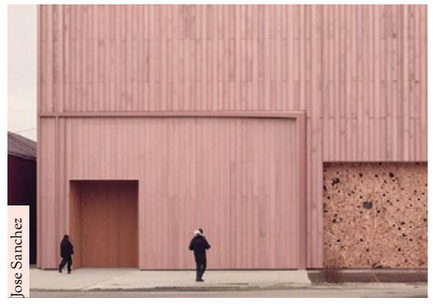
The granite could be cut into more intricate shapes, designed to make efficient use of the sheet material. This could provide a flexible solution for tessellating the facade around bespoke features, such as angled widow reveals.

1-A-

Jose Sanchez



Studio Ko



Jose Sanchez

Rungkut asri utara