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Atri7 6 Limited | Fusion, Vision – 10-12 Whitworth Street

Circular Economy Statement

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EXECUTIVE SUMMARY

Mainer Associates have produced a Circular Economy (CE) Statement to ascertain and set out how the RIBA Stage 2 designs for the Fusion, Vision – 10-12 Whitworth Street development, align to principles of a circular economy. Additionally, considerations and possible targets for future Stages will also be discussed.

This circular economy (CE) statement responds to the projects Sustainability Checklist and ESG goals, with regards to sustainability. Above all, this CE statement will help inform the project team on how current design proposals align to CE principles and allow early-stage decisions to be made to better the circularity of the proposals.

This report aims to set out how the scheme aligns to the six key circular economy principles for the built environment set out in the leading Circular Economy Guidance from the Greater London Authority (GLA), *Guidance on Circular Economy Statements (2022).* The report intends to demonstrate how the design is resource efficient and maintains products and materials at their highest value for as long as possible.

Circular Economy Principles:

1. Building in layers – ensuring that different parts of the building are accessible for maintenance and replacement where necessary
2. Designing out waste
3. Designing for longevity
4. Designing for adaptability or flexibility
5. Designing for disassembly
6. Using systems, elements or materials that can be reused and recycled.

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Introduction

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1.0 INTRODUCTION

Mainer Associates have undertaken a circular economy statement on the RIBA Stage 2 proposals for Fusion, Vision – 10-12 Whitworth Street, on behalf of Atri7 6 Limited. We have provided commentary on how the proposals align to 6 key strategies on circularity in the built environment.

Purpose

The main purpose of the studies at this early stage is to anticipate how the project currently performs, based on current design information. At Stage 2, the design team have contributed to the strategy as follows:

1. Provide qualitative response to the six key principles of building circularity and how they can be implemented effectively.
2. Additionally, the project team intend to discuss the results and agree a set of opportunities to consider and explore at the next stages of design development.

Description of Current Site Condition

Turfed site secured by 2.4m high metal fencing

Description of Proposed Development

Full planning permission for a 39-storey purpose-built student accommodation building.

Circular Economy



2.0 CIRCULAR ECONOMY

A Circular Economy is an economic model for sustainable growth and development whereby economic activity is decoupled from the use of finite resources. It is based on three key principles: design, circulate, regenerate.

1. **DESIGN** - Design out & eliminate waste and pollution. Design-in end-of-life strategies for products.
2. **CIRCULATE** - Retain and use products and materials in circulation, at their highest value over their life cycle. In contrast to consuming finite resources or downcycling materials, 'Waste' in the current linear economic model is instead resource in circular economic systems.
3. **REGENERATIVE** - We must ensure economic activity does not degrade nature but instead support its regeneration.

The London Plan Policy S17 defines a circular economy as:

> *"One where materials are retained in use at their highest value for as long as possible and are then reused or recycled, leaving a minimum of residual waste. The end goal is to retain the value of materials and resources indefinitely, with no residual waste at all. This is possible, requiring transformational change in the way that buildings are designed, built, operated, and deconstructed."*

By integrating the three principles into development projects and early proposals we start to design a building for a circular economy. Materials are primarily designed-out where possible, which is coupled with designing-in low impact materials with viable end-of-life strategies such as: re-use, reclamation, or recycling. This is facilitated by ensuring and designing-in ease of disassembly.

The ability to reuse building materials will be increasingly important as the earth's raw materials continue to deplete, and the environmental impact of consuming raw materials accumulates. The process of designing a circular economy moves us away from the linear economic model of; take, make, use, dispose. The classic butterfly diagram overleaf which has become synonymous with discussions on circular economy illustrates the alternative closed-loop economic model.

Local Planning Policy

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3.0 LOCAL PLANNING POLICY

3.1 Greater Manchester Combined Authority, Places for Everyone Joint Development Plan (2024)

JP-S6: Resource Efficiency

The achievement of a circular economy and a zero-waste economy will play a key role in meeting Greater Manchester's ambition of becoming a leading green city region by 2038. The following measures will help achieve this:

1. Development and implementation of the Zero Waste Strategy for Greater Manchester which promotes overall reduction in the level of waste produced and supports resource efficiency within the Plan area in order to gain the maximum value from the things we produce;
2. Recognition of the role of existing infrastructure in managing our waste and protecting such facilities to ensure adequate waste management capacity is maintained; and
3. Using sustainable design and construction techniques to reduce carbon emissions, adapt and future proof to the impact of climate change, reduce and recycle waste and minimise water use"

Project Key Performance Indicators

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4.0 PROJECT KEY PERFORMANCE INDICATORS

The following KPIs have been suggested for the project design and construction, based on current best-practice guidance a local planning policy. Where the project deviates from the below, justification for this will be provided based on buildability, functional performance and availability / programme impacts.

Construction Waste Generation - BREEAM KPIs

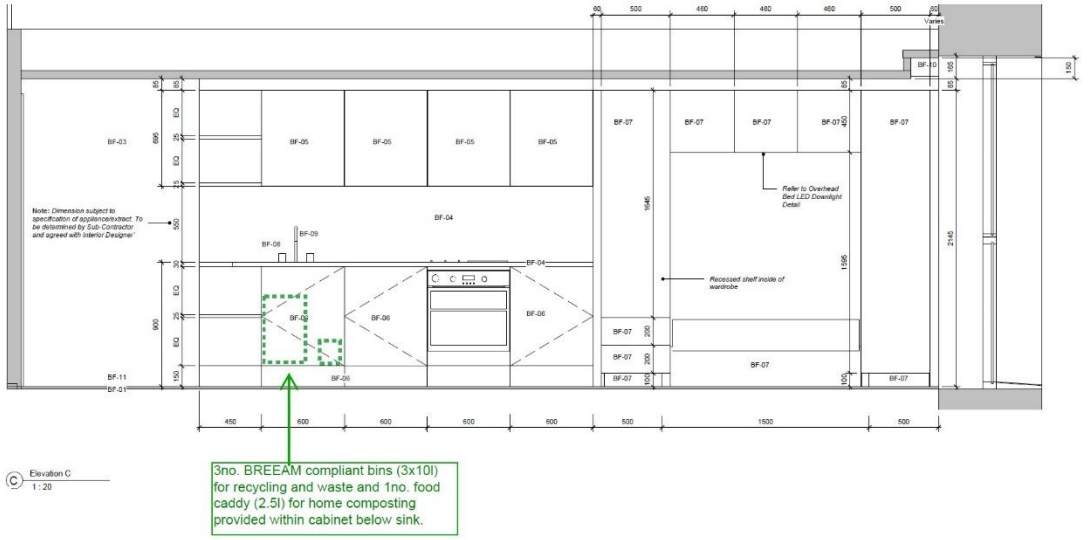
In response to Zero Waste Strategy for Greater Manchester and The Places for Everyone Joint Development Plan, the following targets have been set by the BREEAM Strategy for the project for the Design and Construction of the building:

- Less than 1.9 tons / 1.6m3 of Waste per 100m^2 of GIA
- Diverting 90% of Construction Waste from landfill
- Diverting 95% of the Demolition Waste from landfill
- Diverting 95% of excavation waste from landfill
- Achieve the BREEAM MAT06 credit
- Achieve both BREEAM WST06 credits

Operational Waste Management

To ensure that the development can contribute to the Zero Waste Strategy for Greater Manchester in operation, the development has included measures in respect of internal and external recyclable waste storage provision. The project will achieve the BREEAM WST03 credit, which ensures that suitable internal and external waste storage will be provided to best practice standards. This will consist of a central waste store, including at least four demarked areas for storage of different types of segregated waste including food composting.

This will reflect the provision in kitchen areas, as shown in the image adjacent, which includes general waste, two recyclable waste streams PLUS a caddy for food waste.



Water Consumption

Minimising water use in operation is also a key action to ensure that the development resource use is minimised. The project will adhere to design and specification of water consuming equipment in accordance with must adhere to AECB 'Good Practice Standards' as follows, unless suitable justification for deviation is provided:

- Showers: 6 to 8 l/min
- Basin and bidet taps: 4 to 6 /min
- Kitchen sink taps: 6 to 8 l/min
- Toilets: ≤ 6l/full flush – the development will employ 6/4 litre dual flush
- Baths: ≤ 180 litres to overflow

- Dead legs: ≤1.5 litres
- Dead legs off secondary circulation: ≤0.5 litres

The above table gives a brief summary of AECB Good Practice requirements, although during detailed design and specification, reference should be made to the full AECB standards documentation, available here:

https://aecb.net/aecb-water-standard/

Recycled Water

Due to the relatively low ratio of roof space to floor area, rainwater harvesting has been deemed at this stage to present a greater maintenance burden than the benefit of the system would provide to water efficiency. The project proposes to exceed the minimum standards set by the Water Consumption KPIs, rather than introduce the equipment necessary for greywater recycling – this to minimise installation cost / complexity and maintenance burdens in operation, whilst still achieving water efficiency objectives.

Recycled Content of Construction Materials

The below measures aim to maximise the recycled content of the building structure. KPI's will be reviewed with the Main Contractor to ensure buildability and availability, with any deviations justified on this basis.

- 98% recycled content to UK sourced reinforcement bar.
- 60-80% recycled rates for Structural Framing System steel.
- Recycled / GGBS contents in Concrete for:
    - Foundations – 40%
    - Floor slabs – 20%
    - Reinforced concrete columns – 20%
    - Concrete walls – 10% (owing to fast design strength required for slip/jump forming).

Life Cycle Assessment – BREEAM KPIs

The following KPIs are set by the project BREEAM assessment, to ensure that embodied carbon is a consideration of the design:

- MAT01: Carry out Concept Stage LCA: This has been completed during the RIBA Stage 2 design works with a number of the elemental-level recommendations made included in the design at this stage.
- MAT01: Carry out Technical Stage LCA: This will be completed during the RIBA Stage 4 design works, with further product-level recommendations made and considered for inclusion in the procurement of construction products.

At Concept Stage, calculations were carried out based on the BREEAM V6.1 Mat 01 - Whole Life Embodied Carbon emissions scope, which includes only the key building elements and RICS life cycle modules A1-A4, B4-B5, and C1-C4. Hence, cannot be classed as a full, RICSv2 embodied carbon assessment, which is vital to consider when comparing the reported results to other buildings. The BREEAM method also uses a different dataset to the RICS WLCA methodology.

That limitation aside, from the items within the scope of the BREEAM Mat 01 LCA, the total whole life embodied carbon emissions for the Proposed Development were estimated as 202.79 kgCO2e/m2, split across building elements as follows:

- Superstructure (BREEAM Mat 01 Scope) – 196.21 kgCO2e/m2
- Substructure (BREEAM Mat 01 Scope) – 6.29 kgCO2e/m2
- Hard Landscaping (BREEAM Mat 01 Scope) – 0.19 kgCO2e/m2.

These figures will be updated at RIBA Stage 4 – Technical Design, as part of the BREEAM Assessment process.

Environmental Product Declarations

At least 50% of the products used for the project to have Environmental Product Declarations either covering the manufacturer or product.

Supply Chain Resilience and Disclosure

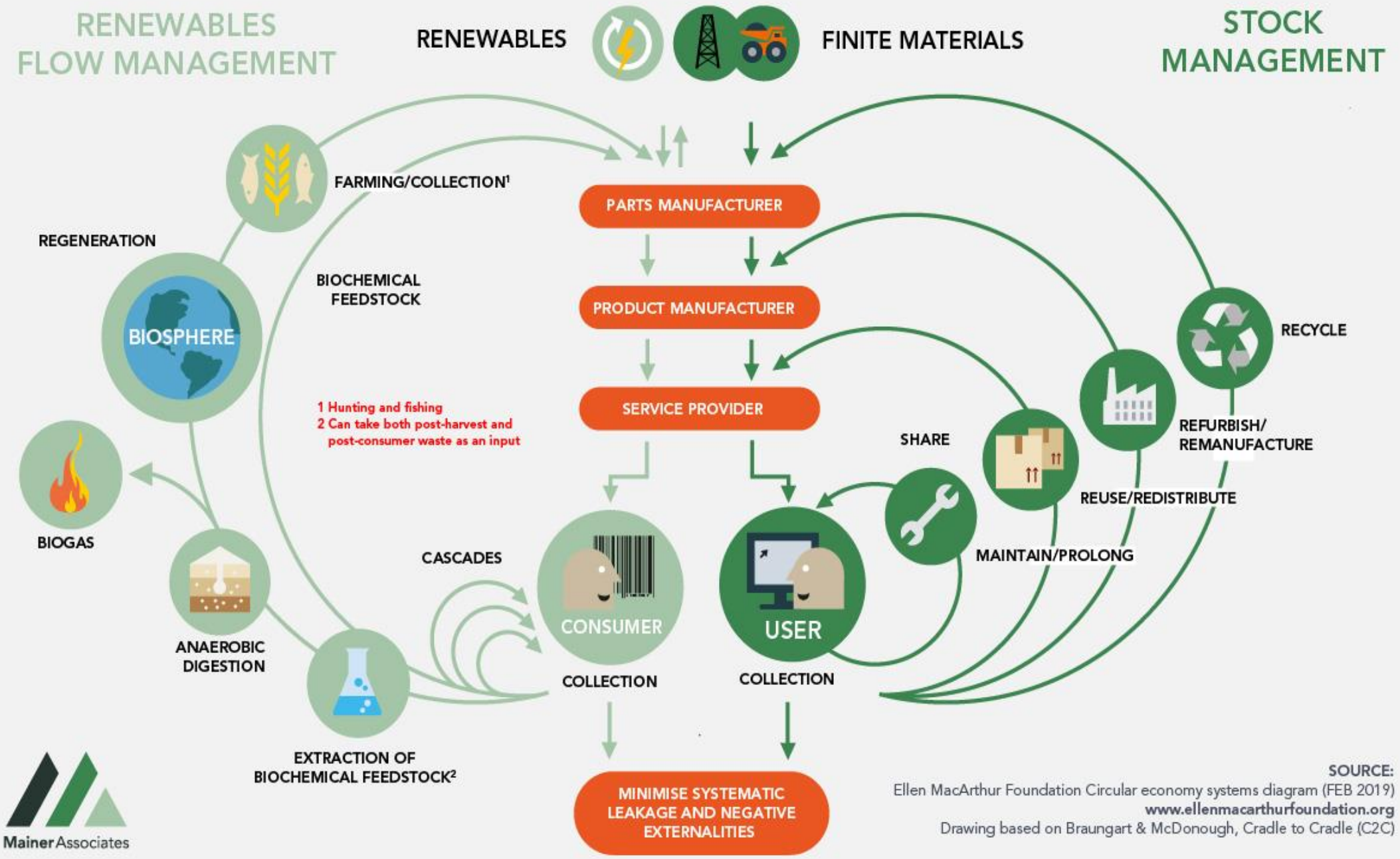


5.0 SUPPLY CHAIN RESILIENCE AND DISCLOSURE

The following measures are proposed towards the promotion of Supply Chain Resilience and Disclosure:

- Consideration of the use of Materials Passports as part of the procurement and documentation process. Materials Passports intend to inform building owners on the materials within their building, infer on likely cyclical replacements, and set out possible routes of reuse and recycling strategies.
- Implementation of a Sustainable Materials Procurement Plan, prioritising:
    - Suppliers who can provide Environmental Product Declarations containing relevant data for potential future embodied carbon assessments.
    - Suppliers with certified Environment Management Systems.
    - Consideration of local suppliers who despite not meeting the above requirements, present transport distances for materials that positively impact on embodied carbon and hence Scope 3 emissions.
    - A post-construction review of decisions made in light of the above, providing suggestions and lessons-learned which would:
        - Provide more complete data for the potential future assessment of Scope 3 emissions.
        - Present savings in carbon emissions which would be reflected in potential future Scope 3 assessments.

Circular Economy Butterfly Diagram



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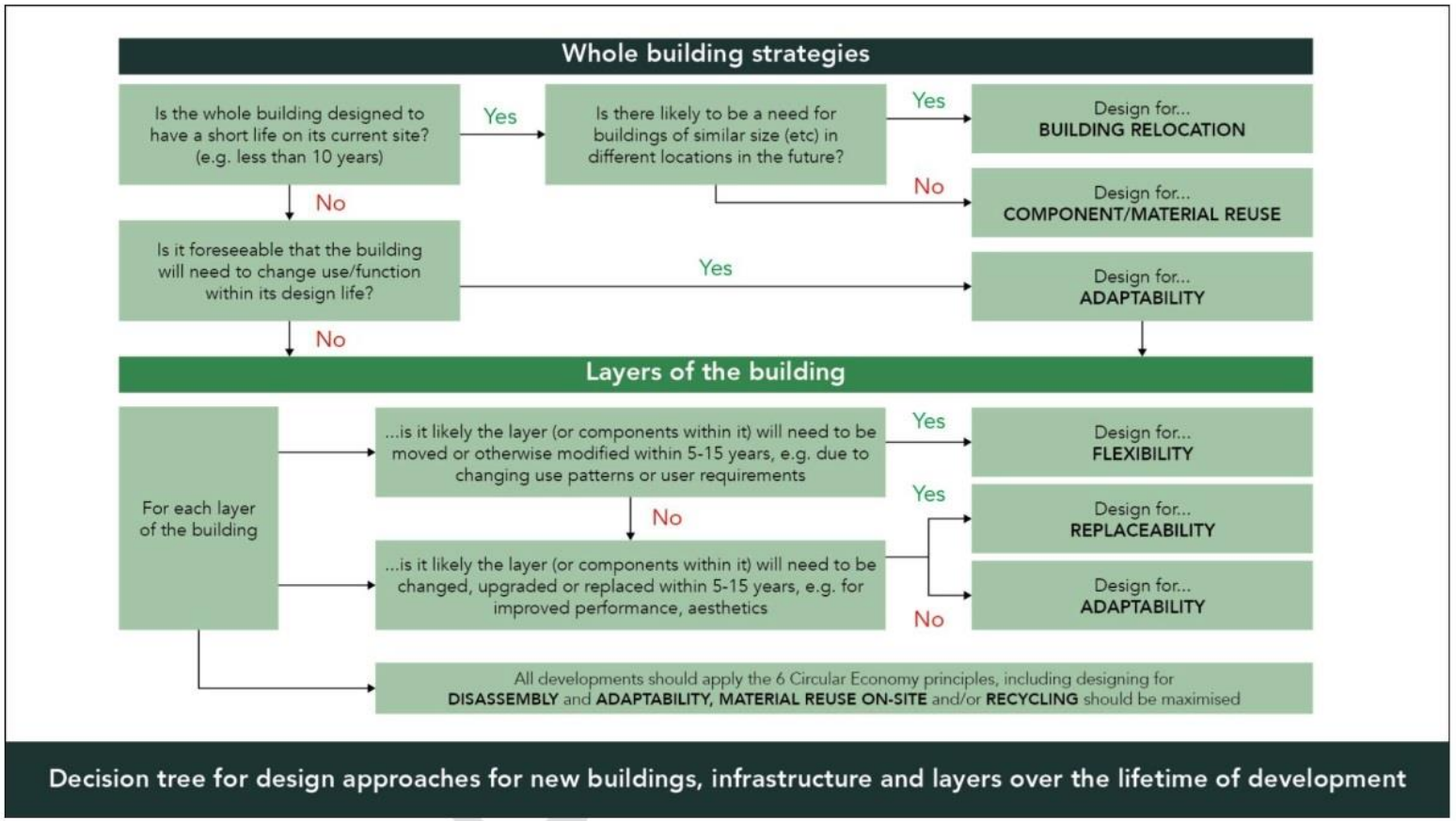
SOURCE:
Ellen MacArthur Foundation Circular economy systems diagram (FEB 2019)
www.ellenmacarthurfoundation.org
Drawing based on Braungart & McDonough, Cradle to Cradle (C2C)

Building in Layers



6.0 BUILDING IN LAYERS

The 'Building in Layers' concept provides a lens through which designers can consider design decisions in order to embed circularity principles as they work on specific elements of the development applicable to their own discipline. The Design Team have and will continue to consider their work in light of the below flow-chart in order to promote this principle.



Decision tree for design approaches for new buildings, infrastructure and layers over the lifetime of development

Some key insights on how the building has been designed with the above philosophy in mind are included below.

INTERNAL PARTITIONS: Whilst there is a desire for the building to remain as PBSA for as long as possible, in the next 15 years it could be required to modify the internal plans for differing social spaces, or different bedroom requirements. These have therefore been designed for 'Flexibility' to enable them to be reconfigured in the future if required. The specification for the internal walls will therefore be a metal stud partition (making use of the concrete building frame) to allow for deconstruction and repositioning.

EXTERNAL CLADDING: The rainscreen cladding may require to be changed/upgraded/replaced in the next 5-15 years and therefore should be designed for 'Replaceability'. The cladding needs to be made of suitable sized and regular panel sizes which can easily be removed and replaced as required. A system for removing/replacing the metal panels needs to be designed for. We have therefore proposed an aluminium panelised system, and a BMU system on the roof level.

Circular Economy Goals and Strategic Approach

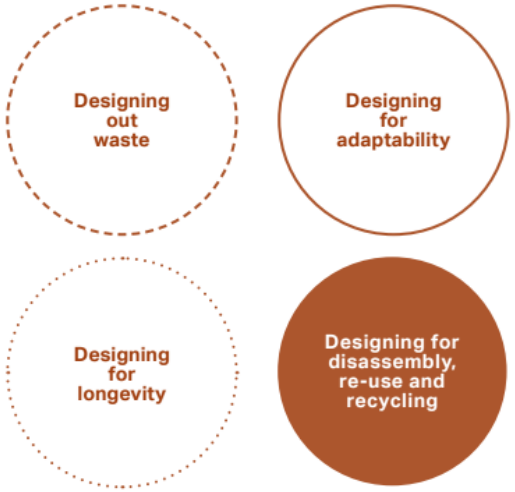
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7.0 CIRCULAR ECONOMY GOALS AND STRATEGIC APPROACH

With the construction industry cited as contributing 60% of total waste in the UK, there is increasing demand to integrate circular economy design principles into concept designs which are then taken forward into practical implementation during construction.

This CE statement will document how the proposals currently and could align to key circular design principles and strategies, summarised here:

1. Dematerialisation - Design out materials
2. Low impact materials
3. Dematerialisation - Design out waste.
4. Design for adaptability
5. Design for longevity
6. Design for disassembly, re-use, or reclamation, and finally recycling.



Dematerialisation – Design out Materials

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8.0 DEMATERIALISATION - DESIGN OUT MATERIALS

Within Appendix A of this report is the response of the Design Team to WRAP – Designing Out Waste and BREEAM MAT06 criteria for RIBA Stages 1 and 2 of the project. Some key highlights are drawn out below.

A key focus of dematerialization is to 'build less' and adapt the existing site and extend existing spaces. A Structural Option Appraisal was undertaken with regard to aesthetics, cost, carbon, layout, programme, service distribution etc. The preferred structural solution was determined as a result of this exercise. There is nothing on site that can be reused from a structural perspective.

The building is to be constructed in a concrete frame with flat slab and regular column grid, allowing for a simple arrangement and no load bearing partitions, therefore allowing for simple construction and standard sized materials, as well as lending itself to adaptations, without complete demolition. To further simply construction, the building is split into three zones – base, middle and top – and is arranged in a simple lozenge shape which maximizes the space on the site. Furthermore, whilst the structural frame is concrete, the internal partitions are made from metal studwork and can be dismantled/removed/reconfigured as required.

Basements have been avoided through design team coordination and finding space within the building for equipment that may otherwise have required a basement – this minimizes excavation. This was vital, as due to a lack of external landscaping, it is unlikely that excavated material will be re-used on site. Piled foundations are proposed for the building, as these are the most efficient and suitable for a building of this height.

Of the materials to be used, reinforced concrete is regularly recycled and highly desirable. Concrete can be crushed down and used in granular materials as well as a recycled aggregate. Steel reinforcement is also regularly recycled and highly desirable.

Low Impact Materials

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9.0 LOW IMPACT MATERIALS

Structure

Considerations have been made for embodied carbon when designing the structure of the proposed development. A BREEAM Concept LCA has been undertaken, alongside an early-stage structural options appraisal, to assess various structural design options for their feasibility, efficiency and sustainability.

The use of both steel and concrete in the building structure have significant impacts on the proposed development's embodied carbon. At future design stages, the impact of these materials can be reduced by utilizing increased replacement or recycled content within the materials. Lowering the impacts of the structural steel / concrete will largely come down to where the raw materials and finished elements are sourced from, and levels of recycled content that are achievable in the production process, considering functional requirements, buildability and supply availability.

To demonstrate the impact of recycled content on steel elements, using a default 300km distance and metric ton comparison, scrap content levels offer reductions against 100% virgin steel on A1-A3 emissions as follows:

- 15% - 0.465 tCO_2/t
- 20% - 0.705 tCO_2/t
- 40% - 0.910 tCO_2/t
- 60% - 1.01 tCO_2/t

Scrap content between 15% - 20% should be achievable with UK based source mills using blast oxygen furnace production methods. The design team could consider the cost benefit of enhanced supply chain engagement, and sourcing steel plate from production sites in Europe using EAF and high scrap levels against local sourcing from steelworks in the UK. Specifying steel with a high recycled steel content is paramount, as this will help with material circularity scores and champion use of low impact materials, as well as reducing the use of virgin materials.

The use of cement replacement would offer betterment in this area. Different levels of cement replacement for C40/50 concrete offer the following reductions in carbon per m^3 of concrete:

- 10% Replacement - 31.14 $kgCO_2e/m^3$
- 20% Replacement - 62.27 $kgCO_2e/m^3$
- 30% Replacement - 93.41 $kgCO_2e/m^3$
- 40% Replacement – 124.54 $kgCO_2e/m^3$
- 50% Replacement – 155.68 $kgCO_2e/m^3$

See the KPI Section above for what has been proposed for this development.

Façade

Cladding panels will likely contribute significantly to the embodied carbon impacts. The current design allows the panels to be assembled off-site, although as the specification is yet to be refined, care should be taken to specify products with the lowest feasible embodied carbon.

The glazing system proposed will need to be assessed in further detail when design becomes more detailed. It is likely with better detail and quality data on this system; the aluminum framing and glazing would bear a greater % contribution to the carbon results associated with the façade.

The project team should consider specifying glass, aluminum, and cladding products from manufacturers which have Environmental Product Declarations (EPDs). These are product-level LCAs quantifying the embodied carbon of a specification or generic material at defined functional unit. EPDs provide transparency on the embodied carbon impacts of the specified systems and will permit comparison of specifications at future design and procurement stages. This may prove particularly useful when considering the final cladding panel specification, as many manufacturers have EPDs specific to their products.

Production of aluminum billets and curtain wall framing for glazing units regularly features scrap aluminum. Minimum levels could be written into work package tenders to challenge the supply chain.

For glazing there is a significant opportunity within the construction sector and commercial glazing industry to shift to a closed-loop recycling for commercial glazing which is currently under explored. Silica sand is a key component to glass production and only occurs in a small number of locations within the UK. Recycled glass cullet can be used in lieu of silica but currently only averages between 20-25% use in European glass manufacturing. Many large glass manufacturers produce panels in Europe; we recommend the tender challenges the eventual Contractor to utilize UK based glass manufacturers.

Design out Waste

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10.0 DESIGN-OUT WASTE

The principle of Designing Out Waste should be considered at each RIBA Stage and applied across all building elements. It is one of the key metrics with regards to circularity, concerned with how we can design-out waste during the design process itself, reduce waste on site, and at the building's end-of-life. Methods to reduce materials and waste during design should guide and aid the selection of materials with clear and viable end-of-life strategies.

A Materials Database or 'Passport' could potentially be developed for use as a tool when the 60-year life span is reached. Materials Passports intend to inform building owners on the materials within their building, infer on likely cyclical replacements, and set out possible routes of reuse and recycling strategies for each material at building end-of-life, which would need review as the end of the building life cycle nears.

The current Façade design allows for the off-site construction of the cladding system as well as the glazing system units. Off-site manufactured GRP bathroom pods are also under consideration. These units can then be lifted and installed in situ, thus reducing waste generated on site, although the site is restricted to the south side due to the railway line, and neighboring properties are close to the east/west of the building. The north of the site is accessible fully from Whitworth Street and would be the proposed method of access for off-site manufactured components.

Due to the extent of facade, thought could be given to connection and fixing methods that would ease the future disassembly which would encourage tactful deconstruction methods. When considering reusing these elements it is vital they can be deconstructed in a way that maintains good condition, to ensure the products still hold the highest possible value. Both structural steel and insulated panels can be reused where viable options are available, at the time of future demolition.

To reduce the waste produced during the construction phase of the project, the developers have aimed to achieve 4 credits in the Site Waste Management - Construction Resource Efficiency and Diversion of Construction Water from Landfill section of the BREEAM Assessment. Through this they have committed to the production of a Site Waste Management Plan with the following waste limits:

- Less than 1.9 tons of Waste per 100m^2 of GIA
- Diverting 90% of Construction Waste from landfill
- Diverting 95% of the Demolition Waste from landfill.

- Diverting 95% of the Excavation Waste from landfill.

Other processes to consider when designing and procuring the building materials:

1. Specify and procure products with existing and proven financially viable end-of-life strategies which involve reclamation, repurposing, recycling or downcycling. Materials that can only be landfilled should not be considered.
2. Design for deconstruction and disassembly, to permit separation of systems or materials during future demolition.
3. Where specialist systems are designed in, liaise with manufacturers where appropriate, in the design process to limit waste on site.
4. Collation of materials properties digitally into a Material Database or Passport, that when accessed in the future, will provide the information required to increase the likelihood of materials being reused, repurposed or remanufactured at end of use/life.
5. Collaboration with suppliers, local organizations and charities that may be able to re-use / take-back waste without the need for recycling at external facilities.

Design for Adaptability

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11.0 DESIGN FOR ADAPTABILITY

Within Appendix B is the response of the Design Team in response to Functional Adaptability and End-of-Life criteria, drawn from the BREEAM WST06 credit. Highlights have been drawn out below.

Layout

The building layout has been designed for student residence use, with spaces as required to meet current market demands. Due to limited space on site, the building orientation and floor plan is largely predefined. Even so, the following measures are in place to encourage future adaptability:

- Open plan areas available to become cellular
- Use of lightweight partition systems that are easily deconstructed to enable reconfiguration without major works

Structure

Within the current design, the depth of the floorplates makes it challenging to adapt the building to some use classes in future. Nevertheless, the large column-free space and regular façade design may be appropriate for hotel or office units. The following specific measures have been included for:

- Slab to accommodate access equipment for high level refurbishment (i.e. Riser cupboards)
- Concrete minimizing internal load-bearing elements (i.e. Load-bearing walls limited to those around the core)
- Structural design to allow for additional floors
- Bolted rather than welded joints to enable easy disassembly
- Structural allowances to enable incorporation of future PV installation on roof

Façade

As noted, the standardized layout of the façade will be designed to enhance internal flexibility. The adaptability of the façade itself and whether the ratio of solid-to-glazed needs to change and respond to changing needs, depend on the fastening system and the ease of which sections can be disassembled. The current design allows for the removal of façade units without affecting structural integrity.

'Dry' construction techniques should be favored as it would ease construction and future maintenance. Mechanical fastening techniques allow quick and cost-effective disassembly of individual sections.

The following specific measures are included:

- Cladding with an appropriate installation sequence to allow for any extension from the proposals without excessive deconstruction.

Building Services

The M&E design for the project will be specialized to cater for the large number of flexible zones that are required for residential development; however, the following specific measures are included:

- Plant sized such that it can be maneuvered through permanent openings
- Modular plant so individual sections can be removed or repaired as required (i.e. Condensers / AHU's)
- Panels in the floors/walls so that plant can be removed without affecting the structure (i.e. Raised access floors, suspended ceilings, riser cupboards, etc.)
- Space around building to allow access for future changes/refurbishment activities (i.e. fire access track)
- Plant decking appropriate for future plant changes
- Lifting Beams / Hoists to facilitate moving plant
- Internal plant located on the perimeter with vehicular access
- Use of suspended ceilings which enable services to be rerouted
- Service drops from roof void making rearrangement of services not intrusive

- Riser cupboards installed in the walls so that local plant/services can be removed without intrusive works
- Specification of services to allow for future expansion e.g., facilities for additional connections on distribution boards (i.e. Spare LV panel added for future installation of PV)
- Cable / duct sizing to allow for additional future capacity
- Service runs with access
- Power connections allow for additional capacity without intrusive works (25% spare LV capacity)
- Data connections to allow for additional capacity without intrusive works
- Water connections to allow for additional capacity without intrusive works

Design for Longevity



12.0 DESIGN FOR LONGEVITY

Structure

The concrete frame currently proposed is an appropriate option that would offer longevity and last the building life cycle with minimal maintenance.

Façade

The chosen materials for the external elements of the façade are robust and durable with the cladding panels likely offering longevity of between 25 and 30 years. Furthermore, individual panels can be removed and replaced easily in the case of significant damage. It is widely acknowledged commercial glazing would withstand the life cycle of the building and are unlikely to require replacement. The proposed system will be modular, with glazing elements easily replaced if damaged in operation.

Finishes

At future design stages the finishes schedule will be developed according to different function areas in the packing facility. Durability in the context of the building's use and typical replacement factors will be a key consideration when specifying these finishes.

Design for Deconstruction / End of Life

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13.0 DESIGN FOR DECONSTRUCTION / END-OF-LIFE

Within Appendix B is the response of the Design Team in response to Functional Adaptability and End-of-Life criteria, in response to the BREEAM WST06 credit. Highlights have been drawn out below.

Layout / External Areas

The following specific measures are included to promote ease of deconstruction at end-of-life:

- Space around building to allow access for future changes/refurbishment activities
- Sufficient maneuverability space for vehicles to prevent damage to building (i.e. Vehicle tracking / turning circles)
- Space around building to allow access for MEWPs to access the roof or to clean guttering (i.e. Fire access track)
- Fences to keep out intruders and protect against malicious damage
- Frequent cleaning of building materials to prevent dirt/wear build-up
- Bollards, and other exterior protection to protect external panels from damage

Structure

The concrete frame, foundations and floors are not easily deconstructed or recycled, although can be used as recycled aggregate on local sites, if crushed. This type of reuse is limited by concerns over consistency and quality of crushed materials, which can limit the use for high grade applications. The following specific measures are included to promote ease of deconstruction at end-of-life:

- Standard types of connections can be separated and reused more easily
- Grass/Weed control products used to prevent from growing through concrete/causing cracks in concrete

Façade, Roof, Windows and Doors

Materials across the façade can and should be designed to be demounted and as a minimum recyclable at end-of-life. Focus should also be applied to the disassembly of the component parts to the glazing system. Easy disassembly will naturally encourage separation of the different materials at building end-of-life and therefore increase the likelihood that the aluminum framing and glass are recycled or downcycled. This also makes it easier to replace the glass

at necessary stages of the building's life cycle should replacement be required. The chosen façade sub-contractor could be contracted to produce a disassembly guide for the client, which can be referenced should replacement or deconstruction be needed.

Material types without an existing waste management strategy, not including landfill disposal, should not be specified.

The following specific measures are included to promote ease of deconstruction at end-of-life:

- Standard size cladding panels for ease of finding replacement parts
- Standard-size windows and doors for ease of finding replacement parts
- Non-structural façade treatments used so can be replaced without impacting structural integrity of the building Stainless Steel exterior panels to protect from rusting
- More durable construction materials used, that can last for the lifespan of the building

Internal Walls

Internal walls constructed from lightweight drywall or masonry can be reclaimed and reused or crushed and recycled, while the metal studs in the drywall partitions can be easily recycled. Gypsum board is currently more difficult to recycle; however, this may have changed within the serviceable life of the building.

The following specific measures are included to promote ease of deconstruction at end-of-life:

- Standard modular elements used so they can be slotted together or taken apart to promote disassembly and flexible environments
- Open plan office spaces or use of partition walls to enable easy removal of certain areas

Building Services

The following specific measures are included to promote ease of deconstruction at end-of-life:

- Modular services to enable one or more to be removed without impacting other connections
- Standard plant room components for ease of finding replacement parts
- Use of IPS paneling in sanitaryware spaces to provide access to pipework / cisterns / etc.
- Non-Welded pipework connections
- Electrical/Pipework components in an accessible location for ease of maintenance

- Insulated water pipes to prevent winter freezing
- Plant decking appropriate for future plant changes
- Internal plant located on the perimeter with vehicular access (plant deck usually above office space.)
- External Plant (i.e. Condensers) are located on the perimeter with vehicular access.
- Plant sized such that it can be maneuvered through permanent openings i.e., doors
- Modular plant so individual sections can be removed or repaired as required
- Panels in the floors/walls so that plant can be removed without affecting the structure

Internal Finishes

The following specific measures are included to promote ease of deconstruction at end-of-life:

- Carpets not to be used in entrance/lobby areas to prevent dirt/moisture entering
- Use of barrier matting at entrances to prevent dirt/moisture entering
- Stairs / CAT ladder / Ships ladder (delete as appropriate) to access plant deck for plant maintenance
- Stairs / CAT ladder / Ships ladder (delete as appropriate) to access roof for maintenance

Quantitative Assessment and Reporting

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14.0 QUANTITATIVE ASSESSMENT AND REPORTING

Paris Climate Accords and UN GRIs

It is necessary to establish a methodology by which construction projects are able to provide meaningful information which could be used to contribute to reporting against the Paris Climate Accords and UN GRI indicators. This should be considered in the following primary lights:

1) Quantitative Data
2) Lessons Learned for Knowledge Sharing

Quantitative Data

At RIBA Stage 4, it will be possible to enhance the existing Circular Economy Strategy with details of achievable quantitative data – in line with the KPIs suggested earlier in this report – and to support the qualitative assessment described above. This will be based on the collation of any data available with respect to, for example, the following as a minimum:

- % of products with documented EPDs – enhancing Supply Chain disclosure and hence the ability of the project to contribute to Scope 3 emission assessments.
- Recycled content of building materials and elements.
- % of components or prefabricated units that can be easily separated on disassembly/de-construction into material types suitable for recycling or reuse.

Lessons Learned for Knowledge Sharing

Via the collation of the above quantitative data, alongside monitoring and post-construction reporting, the ability of the project to provide meaningful information towards reporting aligned to UN GRIs and vitally, the objectives of the Paris Climate Accords will be enhanced. Post-Construction, it is recommended that an exercise is carried out to define how this might be improved / formalised for future projects.

It is also suggested that the client also consider the instigation of Post-Occupancy Evaluations, to include at least the following reviews throughout the lifecycle of the project:

- Operational Energy and Water consumption against predictions.
- Occupant Satisfaction, focusing on decisions made to promote carbon / resource efficiency.
- Evaluate maintenance burdens against WLCA predictions.
- End-of-Life review against WLCA predictions.

The formulation of a standard methodology for future projects in the above respects could be applied towards the identification and assessment of key lessons learned, which can be used by all stakeholders to enhance future design work, as well as for sharing with the industry more broadly. In the spirit of the Paris Climate Accords, this will contribute in a meaningful way to reporting against the commitments made at Government level towards the reduction of global carbon emissions.

Conclusion

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15.0 CONCLUSION

Mainer Associates have undertaken a circular economy analysis on the RIBA stage 2 proposals for the development. We have provided commentary on how the proposals align to 6 key strategies on circularity in the built environment. At later stages we will compile quantitative data as outlined in Section 13 above, and review performance against the KPIs in Section 4.0, which can be reviewed at key project stages and post-construction.

The main purpose of the study at this early stage and therefore been to:

1. Provide qualitative response to key strategies for building circularity and how they can be implemented effectively.
2. Additionally, the project team intend to discuss the results and agree a set of opportunities to consider and explore at the next stages of design development.

The focus of future Circularity Work will focus on collation of quantitative data, and the potential of the project to contribute meaningfully towards Paris Climate Change objectives.

Appendices

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APPENDIX A: MATERIALS EFFICIENCY

APPENDIX B: FUNCTIONAL ADAPTABILITY AND END-OF-LIFE