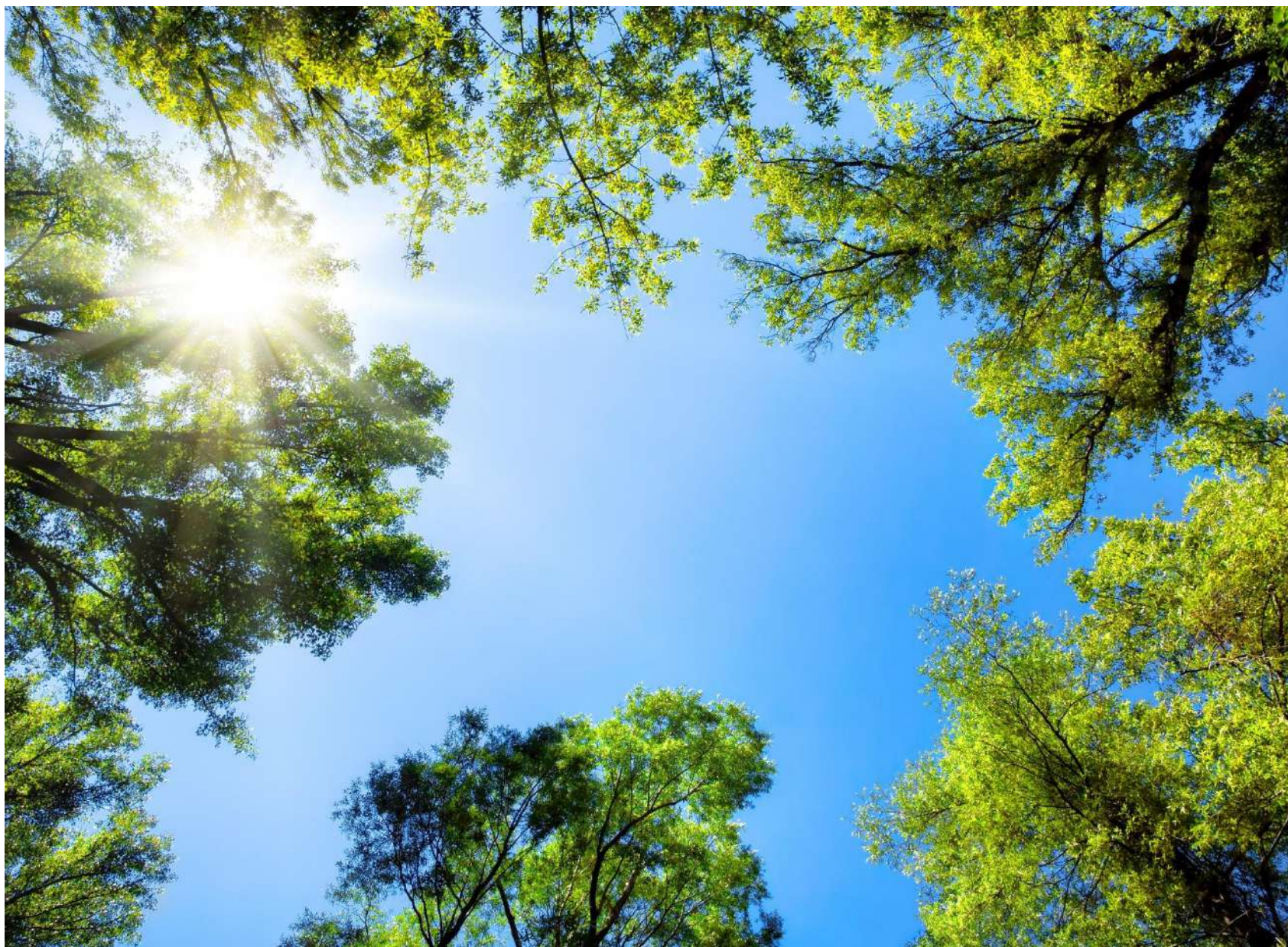




Cambridge Halls, Manchester

Waterman Sustainability Services
Circular Economy Statement
RIBA Stage 4
CAM-WBS-ZZ-XX-RP-X-000010

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C01	Final issue
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Cnn	Contractual	S2	Information
		S3	Review & Comment
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We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

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1. INTRODUCTION

1.1 The Brief

Waterman Building Services Limited (Waterman) has been instructed by Graham Construction Ltd. to prepare a Circular Economy Statement (CES) for the development of Cambridge Halls of Residence (the 'Proposed Development'). The site lies within the administrative boundary of Manchester City Council (MCC).

This statement has been prepared to support discharge of a planning condition relating to material efficiency and lifecycle environmental impact.

1.2 The Proposed Development

This CES accompanies a full planning application for Phase 1 and Phase 2 of the redevelopment of Cambridge Halls of Residence. The development comprises:

“Demolition of existing halls of residence and erection of two buildings of 30 and 24 storeys above ground, plus basement and rooftop plant levels, comprising purpose-built student accommodation with internal and external rooftop communal amenity space (Sui Generis). Ground floor commercial and community uses (Flexible Use Classes E, F1 or F2). Hard and soft landscaping and associated highway works.”

1.3 The Site

The Site is currently occupied by a four-storey student accommodation building, constructed in 1998.

The Development will comprise of two buildings, Phase 1 and Phase 2 of 24 and 30 storeys respectively, both of which are predominantly purpose-built student accommodation (PBSA) with community and retail space situated across the ground and first floor.

The Applicant anticipates 1,101 bedrooms to be completed in Phase 1 by September 2029 and an additional 1,201 bedrooms in Phase 2 by September 2030.

1.4 Report Scope

This Circular Economy Statement has been prepared in response to the planning condition:

‘Notwithstanding the details submitted with the application, prior to the commencement of above ground development a Circular Economy Statement (Materials), to include details of the strategy for securing more efficient use of non-renewable material resources and to reducing the lifecycle impact of materials used in construction and how this would be achieved through the selection of materials with low environmental impact throughout their lifecycle, shall be submitted to and approved in writing by the Local Planning Authority.’

The statement draws upon the project material schedule (Appendix A) to demonstrate how material selection, design optimisation, and construction practices collectively reduce environmental impact across the building lifecycle.

This document should be read in conjunction with other submission documents, including the Sustainability Statement, Whole Life Carbon Assessment and Operational Waste Management Strategy.

1.5 Policy Context

This Circular Economy Statement has been informed by national, regional, and local policy and guidance, including:

- Manchester City Council Core Strategy (2012) and emerging Local Plan
- Places for Everyone Joint Development Plan (Greater Manchester)
- Manchester Climate Change Framework (2020–2025) and Climate Action Plan (2025-2030)
- Greater Manchester Waste Plan
- National Planning Policy Framework (NPPF) – promoting sustainable resource use and waste minimisation
- DEFRA Waste Hierarchy – prioritising reduction, reuse, recycling, and recovery over disposal
- RIBA 2030 Climate Challenge – reducing embodied carbon in construction
- Greater London Authority Circular Economy Guidance

The Proposed Development aligns with these objectives by embedding circular economy principles within material selection, design, and construction processes.

2. CIRCULAR ECONOMY ASPIRATIONS

A circular economy, as defined by the European Commission¹, is an economic system that shifts away from the ‘take-make-use-dispose’ model, instead aiming to keep products, materials, and resources in use for as long as possible, minimise waste, and regenerate natural systems. It seeks to decouple economic growth from resource use, reduce environmental degradation, and contribute to climate neutrality while boosting sustainable growth, jobs and resilience.

2.1 BREEAM Certification

The Proposed Development aims to achieve BREEAM ‘Excellent’ certification under the BREEAM UK New Construction (NC) v6.1 scheme. BREEAM UK New Construction (NC) v6.1 represents high standards in environmental, social, and economic sustainability performance.

A BREEAM Pre-Assessment has been undertaken for the Proposed Development to set out the preliminary BREEAM strategies and required steps.

Table 1 shows an overview of the credits that have been identified as setting out best practice in response to circular economy principles as well as which of them are targeted according to the BREEAM Pre-Assessment.

Through pursuit of the BREEAM criteria, the design of the Proposed Development will broadly address the principles of the circular economy, particularly those relating to materials, waste, adaptability, and disassembly. It is expected that the measures addressed within these credits will be explored and considered throughout the development of the scheme, being implemented where practicable.

Table 1: BREEAM Credits Setting Out Best Practice in Response to Circular Economy Principles

Credit		Credit targeted?
Man 03	Responsible Construction Practices	Targeted
Ene 01	Reduction of Energy Use and Carbon Emissions	Targeted
Ene 02	Energy Monitoring	Targeted
Wat 01	Water Consumption	Targeted
Wat 02	Water Monitoring	Targeted
Mat 01	Life Cycle Impacts	Targeted
Mat 02	Environmental Product Declarations	Targeted
Mat 03	Responsible Sourcing of Materials	Targeted
Mat 05	Designing for Durability and Resilience	Targeted
Wst 01	Construction Waste Management	Targeted
Wst 03	Operational Waste	Targeted
Wst 05	Adaptation to Climate Change	Targeted
Wst 06	Design for Disassembly and Adaptability	Targeted

2.2 Key Project Objectives

The Proposed Development is guided by the following circular economy objectives, which establish a clear framework for reducing material consumption and lifecycle environmental impacts:

- Reduce overall material demand through efficient design
- Lower embodied carbon in proposed construction materials
- Minimise construction waste through optimised design and delivery methods
- Ensure materials are durable, adaptable, and recoverable

These objectives provide a consistent and measurable framework, linking design and procurement decisions to demonstrable circular economy outcomes and ensuring alignment with the requirements of the planning condition.

¹ European Commission, ‘Circular Economy’, [Circular economy - European Commission](#)

3. CIRCULAR ECONOMY STRATEGY

This section expands on the key project objectives set out in Section 2.2 and defines how these are implemented through the design, material specification, and construction approaches.

3.1 Reducing Material Demand

Reducing material demand at source is the primary driver of circular economy performance. The Proposed Development adopts a design-led approach to minimise the quantity of materials required, focusing on efficient structural solutions, reduction of applied finishes, and coordinated design.

This includes optimised structural layouts, lean specification, and standardisation of components to avoid over-specification and reduce material consumption.

Further detail on how material quantities have been reduced is provided in Section 4.

3.2 Lowering Embodied Carbon in Proposed Materials

Where material use cannot be avoided, the strategy prioritises the selection of materials with lower embodied carbon and higher recycled content. This focuses on key structural and façade elements, which represent the largest contribution to embodied carbon.

Measures include the use of cement replacement in concrete, high recycled content in metals, and specification of manufacturer-specific Environmental Product Declarations (EPDs) where available.

Further detail on material specification and embodied carbon reductions is provided in Section 5.

3.3 Minimising Construction Waste

The strategy extends material efficiency into the construction phase by reducing waste and improving material yield. This is achieved through the use of off-site manufacturing, prefabricated elements, and standardised construction processes.

These approaches reduce on-site waste generation, improve accuracy, and minimise material losses during installation.

Further detail on construction-stage measures is provided in Section 6.

3.4 Ensuring Durability, Adaptability, and Recoverability in Materials

To support long-term circularity, the development is designed to retain material value over time. This includes selecting durable materials, enabling access for maintenance and part replacement, and ensuring materials can be reused or recycled at end-of-life.

Materials are prioritised based on their durability, physical integrity, and recovery potential, with established recycling pathways considered during specification.

Further detail on lifecycle performance and material recovery is provided in Section 7.

4. EFFICIENT USE OF MATERIALS

This section sets out how material quantities have been reduced and optimised through design and construction strategies.

4.1 Measures to Minimise Material Use

Material demand has been reduced at the outset through efficient structural design and specification, targeting the highest impact elements such as the frame, substructure, and façade.

Key measures include:

- Structural optimisation, including rationalised grid layouts and efficient span arrangements, reducing overall concrete and steel quantities to avoid over-specification.
- Reduction of applied finishes, including exposed structural elements (e.g. concrete cores), eliminating additional lining materials.
- Standardisation and specification of modular components, improving coordination and reducing offcuts.

These measures are supported by detailed structural material take-offs, recorded at strategic RIBA stages, enabling optimisation of concrete volumes across the development. This level of quantification allows targeted reduction of material use and supports efficient allocation of resources.

4.2 Optimised Design

Material efficiency is further enhanced through an integrated design approach that combines structural optimisation with modern construction methods.

A ‘building in layers’ approach has been adopted, allowing different building systems (structure, façade, services, internal fit-out) to be designed, maintained, and replaced independently, improving long-term adaptability and reducing lifecycle material demand.

The design also incorporates:

- In-situ and precast concrete systems, optimising material distribution and structural efficiency.
- Modular coordination of façade and internal systems such as finishes and internal walls, reducing material waste and improving installation accuracy.
- Integration of off-site manufactured components, including façade panels, window systems, and bathroom pods.

Concrete specification has been further optimised through grade-specific allocation across structural elements, ensuring higher-strength concrete is only used where required (e.g. columns and walls), while lower-strength mixes are used in foundations and slabs. This avoids overdesign and reduces embodied carbon associated with unnecessary cement content.

Ongoing design development includes the consideration of:

- CIIA concrete mixes for foundations and ground slabs.
- CIIIB mixes with active setting for upper floor slabs, supporting reduced embodied carbon while maintaining programme requirements.

4.3 Use of Recycled and Secondary Materials

Following the reduction of overall material demand, the remaining materials have been specified to maximise recycled content and support circular supply chains.

High levels of recycled and secondary materials are incorporated across key building elements, particularly within structural and façade systems, as summarised below in Table 2. In doing so, this reduces the demand on virgin materials.

Table 2: Recycled Content of Materials

Material	Recycled content
Reinforcement steel	~97%
Aluminium window frames (see Appendix B)	~82%
Window glazing / Flat glass products (see Appendix C)	~19%
Aluminium façade (see Appendix D)	~35%

Technal has confirmed that Hydro CIRCAL 75R, utilised for Aluminium window frames, is made with 82% recycled post-consumer scrap for this project. This demonstrates a substantial reduction in reliance on virgin materials, particularly systems such as façade and structure, where circular material sourcing delivers the greatest environmental benefit.

5. LOW IMPACT MATERIAL SELECTION

This section explains how materials are selected not only for efficiency but also for their performance across the full lifecycle.

Material selection builds on the efficiency strategy by prioritising options that minimise environmental impact over their lifecycle. This includes reducing embodied carbon, improving durability, and ensuring materials can be recovered at end-of-life.

Where higher impact materials are required for performance reasons, their use is limited and balanced by durability and long service life.

5.1 Reducing Lifecycle Environmental Impacts

The strategy extends to reducing impacts across the full lifecycle of materials. This includes lowering embodied carbon at specification stage, reducing replacement through durable design, and ensuring materials can be recovered at end-of-life.

Lifecycle impacts are addressed across all stages:

- Production (A1-A3): selection of low-carbon and high recycled content materials
- Transport (A4): optimisation of logistics, with preference for lower-carbon transport modes
- Construction (A5): reduction of site waste and construction impacts through off-site fabrication
- Use stage (B1-B5): minimisation of maintenance and replacement through durable material selection
- End-of-life (C1-C4, D): maximising reuse, recycling, and recovery potential

Measures incorporated into the Proposed Development include:

- Minimising applied finishes, for example through leaving structural concrete cores exposed, reducing material consumption and future refurbishment requirements.
- Selecting materials with established recycling pathways, including steel, aluminium, and mineral-based products with high recovery rates, alongside minimising waste through prefabricated elements such as precast façade panels and off-site manufactured components (e.g. Techrete systems). These measures directly target the project's highest embodied carbon contributors identified in the Whole Life Carbon Assessment (WLCA), including concrete and steel.
- Designing for durability, for example, using materials such as granite with high compressive strength (~138 MPa) and low water absorption (<0.30%) to extend service life.
- Incorporating systems with quantifiable operational impacts, including MEP systems designed with high refrigerant recovery efficiency (99%) and low leakage rates (2% annually).
- Enabling end-of-life recovery, with materials such as stone in landscaping achieving up to 75% reuse / recycling potential, and metals remaining fully recyclable.

Overall, these decisions reduce both upfront embodied carbon and long-term environmental impact, while ensuring that materials retain value beyond their initial use.

5.2 Reduced Embodied Carbon

Embodied carbon reductions are achieved through targeted specification of low-carbon materials and high recycled content systems, particularly within structural and façade elements.

Key measures include:

- GGBS substitution in concrete, achieving up to 50% cement replacement for some substructure elements and 25% for some superstructure elements, reducing carbon intensity.
- High recycled content in steel, with reinforcement steel achieving a low embodied carbon value of approximately 0.49 kgCO₂e/kg due to a recycled content of ~97%.
- Recycled aluminium systems, reducing façade embodied carbon by approximately 40-50% compared to typical European averages (see Appendix B).

Additionally, key materials have been assessed using project-specific EPDs, and compared to the Inventory of Carbon and Energy (ICE) v4.1 database as summarised below:

Table 3: Example Project-Specific EPDs Used

Material/ System	Embodied Carbon (A1-A3) from EPDs	ICE v4.1 Typical Value	Key Circular Attribute
Precast concrete façade	~0.22 kgCO ₂ e/kg slightly higher than ICE v4.1 likely due to white cement/ high spec finish	0.20 kgCO ₂ e/kg	100% recycled steel reinforcement
Concrete blocks (i.e. Lignacite)	~0.15 kgCO ₂ e/kg 6% lower than ICE v4.1	0.16 kgCO ₂ e/kg	100-year design life
Structural steel (framing)	~3.21 kgCO ₂ e/kg higher than ICE v4.1 average	1.7-2.5 kgCO ₂ e/kg	12.8% recycled input / 95% recyclable output
Aluminium façade system	4.9 kgCO ₂ e/kg ~40-50% lower than ICE v4.1	8-12 kgCO ₂ e/kg	100% recyclable; contains ~75% recycled content

When normalised to kgCO₂e/kg for direct comparison with ICE v4.1, project-specific EPD data demonstrates reduced embodied carbon across key materials, particularly for steel and concrete products through cement replacement and optimised manufacturing.

These measures ensure that embodied carbon reductions are focused on the highest impact materials, delivering meaningful lifecycle benefits.

5.3 Durability and Longevity

Durability is prioritised to reduce lifecycle impacts by extending material lifespan and minimising replacement frequency. It is also important to ensure that damage to surrounding materials is minimised when replacement is being undertaken.

Key strategies include:

- Use of concrete and steel structural systems with design lives of 60-100 years.
- Minimal applied finishes, including exposed structural elements, reducing maintenance and refurbishment.
- Selection of durable external materials such as granite.
- Additional design measures include:
 - Internally beaded windows allowing replacement from inside.
 - Services accessible via corridors to improve maintenance efficiency.

These measures reduce replacement cycles and associated material demand over the building lifecycle.

5.4 Responsible Sourcing

Responsible sourcing is supported through supplier engagement and the use of verified environmental data, ensuring that material selection is based on robust, comparable and transparent information. This is critical as it enables consistent and evidence-based decision making, supports accurate whole life carbon assessments, and demonstrates compliance with recognised standards and planning requirements, therefore reducing reliance on generic assumptions and improving the reliability of lifecycle impact reporting.

Key measures include:

- Use of Environmental Product Declarations (EPDs) to quantify material impacts – Project specific EPDs are prioritised to assess embodied carbon (A1-A3) and circular attributes of key materials. However, it is recognised that EPD availability is currently limited for building services (MEP) equipment. As such, CIBSE TM65 calculations are being sought to quantify embodied carbon for key systems, including Air Source Heat Pumps (ASHP), Mechanical Ventilation with Heat Recovery (MVHR) units, Variable Refrigerant Flow (VRF) systems, and some lighting systems.
- Specification of materials with verified recycled content – Materials such as steel, aluminium, and façade systems are selected based on documented recycled content and circular attributes, supported by EPDs and supplier declarations.
- Ongoing engagement with suppliers to obtain updated environmental data – The design team continues to engage with manufacturers and contractors to obtain dynamic EPDs and updated carbon data, particularly for façade systems, precast elements, and MEP equipment.

This ensures material selection is evidence-based and aligned with circular economy best practice.

6. CONSTRUCTION AND WASTE REDUCTION

This section outlines how circular economy principles are carried through into construction, ensuring that design efficiencies are realised on site.

6.1 Waste Reduction and Material Management

Construction waste is actively managed through a combination of design coordination, procurement control, and on-site segregation.

The Pre-demolition Audit (Ref. no. 15299-WAT-XX-XX-RP-V- 59009) and Reuse Strategy (Ref. no. 15299-WAT-XX-XX-RP-V-59011) produced to support this scheme identify opportunities to recover materials from the existing building, enabling early-stage planning of material flows and reducing reliance on virgin materials. These have been shared with the Design Team and Principal Contractor and are currently under consideration.

The material schedule shared in Appendix A indicates that proposed construction elements have relatively low associated waste rates, supported by prefabrication and standardisation.

Key measures incorporated into the Proposed Development include:

Table 4: Material Waste Rates

Material Category	Estimated Waste Rate	Management Strategy
Structural steel	<2-3%	Off-site fabrication, precise cutting
Precast elements	~0-2%	Factory-controlled production
Façade systems	~0-3%	Pre-installed panels / windows
Finishes (plasterboard, insulation)	5-10%	Segregation + recycling pathways
Metals (general)	~100% recyclable	Closed-loop recycling streams

Waste is further reduced through:

- On-site segregation aligned with reuse / recycling pathways.
- Material tracking linked to procurement schedules
- Design simplification to reduce offcuts and over-ordering.

The Stage 3-4 Whole Life Carbon Assessment (15299-WAT-XX-XX-RP-V-59028) identifies that reductions in A5 impacts are primarily driven by minimising construction waste and improving material yield, reinforcing the importance of these coordinated site and procurement measures.

As a result, typical construction waste rates for primary structural materials such as concrete and steel are limited to approximately 5% in accordance with the RICS 2nd Edition Guidance. This may be reduced to 1% where the concrete is precast. For this project, the external wall cladding is confirmed to be supplied by Techrete, a prefabricated concrete façade manufacturer. It is therefore expected that the construction waste for these elements can be reduced as a result.

Off-site fabrication significantly improves material yield and reduces waste, with certain elements (particularly façade systems) having the potential to achieve near 0-1% waste rates, compared to conventional on-site construction.

6.2 Reuse of Materials On-Site

The project incorporates early-stage consideration of reuse informed by the site audit from the Reuse Strategy, identifying opportunities to retain material value within the project or wider supply chain.

Materials are assessed using a Material Quality Rating system, ensuring reuse decisions consider physical integrity, compliance and functionality.

The priority reuse opportunities that have been identified are summarised in Table 5. This will be the responsibility of the principal contractor to assess the feasibility and ultimately adopt these strategies within the construction.

Table 5: Material Reuse Potential

Material Type	Reuse Potential	Strategy
Metal cladding (~607 m²)	Moderate-High	Direct reuse or façade repurposing
Windows (~2,415 m²)	Moderate-High	Refurbishment and reuse or component recovery
Structural steel elements	Moderate-High	Reuse or reuse networks
Doors (2,000+ units)	Moderate	Refurbishment and redistribution
FF&E (kitchens, furniture)	Moderate	Redistribution or reuse networks

This approach can support diversion from landfill and would align with circular economy principles of retaining material value. However, reuse is largely dependent on-site constraints, supply chain and material condition, The Stage 3-4 WLCA recognises that material reuse can contribute to reduced upfront embodied carbon by offsetting the need for new material production (A1–A3), and supports lower lifecycle impacts when retained within the project or supply chain.

6.3 Efficient Construction Methods

Efficient construction methods are a key driver of waste reduction. The scheme incorporates extensive off-site manufacturing, including:

- Façade systems and pre-installed window units
- Modular bathroom pods (e.g. GRP, OSB-based systems)
- Potential precast concrete elements
- Standardised internal components

The adoption of off-site manufacturing and standardised construction approaches enables a measurable improvement in material efficiency and waste reduction. These methods shift production into controlled environments, reducing variability, improving accuracy, and minimising material loss. The key construction strategies and their associated impacts on waste reduction and material efficiency are summarised in Table 6 below.

Table 6: Construction Methods and their Impacts

Strategy	Impact
Off-site fabrication	Reduction in on-site waste
Modular systems	Reduced rework and material damage
Precast elements	Near-zero waste production
Standardisation	Reduced surplus procurement

These construction methods contribute to a significant reduction in on-site waste generation, improved material utilisation, and enhanced quality control. This also supports circular economy objectives through reduced resource consumption, minimised material damage, and greater potential for component reuse and recovery.

7. LIFECYCLE AND CIRCULARITY

This section demonstrates how the development has been designed to retain material value over time, reducing lifecycle impacts and enabling future reuse and recovery.

7.1 Design for Adaptability and Long-Term Use

The development is designed to maximise longevity and adaptability, ensuring materials and systems remain functional and adaptable over time through the following strategies:

- Exposed structural finishes reducing applied materials.
- Internally beaded windows allowing replacement from inside.
- Accessible service routes via corridors
- Modular internal layouts enabling reconfiguration.

The Reuse Strategy (Ref. no. 15299-WAT-XX-XX-RP-V-59011) reinforces this approach by prioritising reuse of materials with:

- High physical integrity ratings
- Proven durability and reuse potential
- Standardised components suitable for reinstallation

This therefore reduces lifecycle material consumption and enhanced building adaptability.

7.2 Maintenance and Replacement Strategy

Material selection and system design reduces maintenance frequency and enables efficient replacement. Durable materials such as concrete, steel, aluminium, and high-performance glazing extend service life while maintaining performance. This approach reduces lifecycle material consumption and associated environmental impacts over the building’s operational life.

Key measures incorporated into the Proposed Development include:

- Material selection and system design to reduce maintenance frequency and enable efficient replacement where unavoidable.
- Specification of durable materials such as concrete, steel, aluminium, and high-performance glazing which extend service life while maintaining performance.
- The reuse strategy identifies that many components (e.g. windows, doors, FF&E) remain functional and suitable for reuse with minimal intervention, reducing replacement demand.
- A plant replacement strategy may be explored for the project to facilitate repair and replacement of MEP systems and components throughout the building lifespan. This will also help to enable careful disassembly at the end of life.

For building services, circularity principles are increasingly applied. While EPD data is limited for MEP systems, alternative assessment methods are used to ensure lifecycle performance is considered. In particular, CIBSE TM66 assesses the circularity of lighting systems rather than embodied carbon.

The specified Zep downlights (Appendix E) achieve a TM66 score of 2.0, indicating “definite/ substantial progress to circularity”, with strong performance in product design, manufacturing, and ecosystem considerations.

7.3 End-of-life Reuse, Recycling, and Recovery

The material specification strategy applied in the design stages of the project prioritises high recovery potential at end-of-life, supported by established recycling and reuse pathways.

Clear material recovery routes are available for the proposed materials at end-of-life, these include:

Table 7: Material Recovery Performance

Material	End-of-Life Pathway	Recovery Potential
Steel / aluminium	Recycling / reuse	~95-100%
Concrete	Crushing to secondary aggregates	~80-90%
Glass	Recycling / reuse	~20-60% (system dependent)
Timber	Reuse / energy recovery	Variable
MEP equipment	Specialist recycling / refurbishment	Increasing

As illustrated above, materials such as metals retain a high value and are assumed to be fully recyclable, maintaining circular material flows. Where materials have limited circularity (e.g. insulation, composites), their use is:

- Minimised
- Justified by performance requirements
- Managed through best available recycling pathways

Reuse network integration can be facilitated through established supply chain and waste management processes, ensuring that materials identified for recovery are effectively captured and directed into appropriate reuse, refurbishment, or recycling pathways, including:

- Salvage and redistribution platforms
- Local recycling facilities
- Contractor-led material recovery processes

Consequently, a high proportion of materials are retained within the economy, supporting circularity, landfill reduction, and long-term resource efficiency.

8. IMPLEMENTATION AND MONITORING

This section sets out how the circular economy strategy will be delivered, monitored, and verified throughout the project lifecycle. The approach aligns measurable targets with defined responsibilities to ensure compliance with planning requirements and delivery of circular economy outcomes.

Table 8: Implementation and Monitoring Strategies

Action Area	Measure / Commitment	Current Progress	Monitoring Method	Responsibility
Design optimisation	Reduce material quantities through structural efficiency and standardisation	Structural design developed to optimise material use; reductions demonstrated through design development and WLC modelling from RIBA Stage 2 onwards	Design reviews at each RIBA stage, supported by material schedules, and WLC model comparisons to track material efficiency improvements	Design Team / Structural Engineer
Embodied carbon reduction	Specify low-carbon materials and high recycled content (steel, aluminium, concrete)	Low-carbon material strategies embedded in design; project-specific EPDs used where available to inform material selection	EPD analysis, periodic updating of carbon modelling reports	Design Team
Recycled content	Incorporate high recycled content in primary materials	Steel ~60-97%, Aluminium ~82%, Glass ~19% have been incorporated into specific design elements	Review of supplier documentation and EPDs, procurement records submission to verify recycled content	Contractor / Procurement Team
Off-site construction	Use prefabrication (i.e. façade panels, pods, precast elements)	Off-site and prefabricated systems incorporated into design to improve material efficiency and reduce construction waste	Review of construction method statements, site audits or inspections to confirm extent of off-site manufacturing and installation	Contractor
Construction waste management	Segregation and recycling of construction waste	Site Waste Management Plan to be implemented, targeting high levels of diversion from landfill in line with industry best practice	Site waste reports implementation, waste transfer notes to verify segregation and disposal routes	Contractor
Material reuse	Recover and reuse materials identified in reuse strategy (i.e. cladding, windows, doors, FF&E)	Reuse opportunities identified through pre-demolition audit and reuse strategy; implementation subject to contractor and site constraints	Reuse inventory tracking, reporting on reuse outcomes and documentation of materials retained, redistributed or repurposed	Contractor
Material recovery pathways	Ensure high-value materials (i.e. metals, concrete) are directed to reuse / recycling streams	Recovery routes to be confirmed at construction stage	Review of waste documentation, recycling certificates	Contractor
Durability and adaptability	Design for long-life structure and adaptable layouts	>60-year design life for primary structure	Verification through design specifications, lifecycle strategy documentation demonstrating durability and adaptability principles	Design Team
Maintenance and replacement	Use durable, replaceable systems (i.e. windows, finishes, MEP components)	Design includes accessible and replaceable components to support efficient maintenance and reduce lifecycle impacts.	O&M manuals to be maintained, product specifications review during design and handover stages	Contractor / FM Team
EPD and product data	Use verified environmental data for key materials and products	Project-specific EPDs incorporated for key materials where available; ongoing engagement with suppliers to increase data coverage	Maintenance of an EPD register, review of procurement logs	Contractor
MEP circularity	Target circular economy data for major equipment (i.e. ASHPs, MVHR, VRF, lighting)	TM65 / TM66 data available for key systems where feasible	Reviewing supplier submissions, design coordination	MEP Engineer / Contractor
Structural materials	Optimise concrete mix design and volumes	Concrete specification and structural design optimised to reduce material quantities and embodied carbon where feasible	Carbon modelling (LCA/ EPD comparison)	Structural Engineer / Contractor

9. CONCLUSION

This Circular Economy Statement has been prepared to address the requirements of the planning condition and demonstrates how the Proposed Development will secure the efficient use of non-renewable material resources and reduce the lifecycle environmental impacts of materials used in construction.

The strategy is embedded from the outset of design, prioritising the reduction of material demand through efficient structural design, standardisation, and the use of off-site manufacturing. Key material categories have been targeted to minimise resource use and optimise performance, particularly those with the greatest embodied carbon impact.

Material selection is informed by verified environmental data, including Environmental Product Declarations (EPDs), ensuring that materials are specified based on embodied carbon, recycled content, durability, and end-of-life recovery potential. Materials with high recycled content and established recycling pathways have been prioritised, supporting a reduction in reliance on virgin materials.

A Pre-demolition Audit and Reuse Strategy have been undertaken to identify opportunities for the recovery and reuse of existing materials. This includes façade elements, structural components, and internal fixtures, enabling retention of material value and reducing waste generated by the development.

During construction, waste will be minimised through coordinated procurement, off-site fabrication, and on-site segregation, with a commitment to high levels of material recovery and diversion from landfill. Over the building lifecycle, durability, adaptability, and maintenance strategies ensure that materials remain in use for longer, reducing replacement frequency and associated environmental impacts.

The implementation of the strategy will be supported by defined monitoring measures, ensuring that circular economy objectives are delivered and can be verified throughout the project lifecycle.

Accordingly, this Circular Economy Statement demonstrates that the development will achieve the efficient use of materials and reduce lifecycle environmental impacts and therefore satisfies the requirements of the planning condition.

ABBREVIATIONS

WBS	= Waterman Building Services
CES	= Circular Economy Statement
MEP	= Mechanical, Electrical & Plumbing
RIBA	= Royal Institute of British Architects
EPD	= Environmental Product Declaration
WLC	= Whole Life Carbon
WRAP	= Waste and Resources Action Programme
BREEAM	= Building Research Establishment Environmental Assessment Method
PBSA	= Purpose-built Student Accommodation
ICE	= The Inventory of Carbon and Energy



APPENDICES

A. Materials Schedule

Request for Information to Circular Economy Statement

Project Name: Cambridge Halls, Manchester
Date: 27/03/2026
Completed by: CP Architects

Resource	Further Description	Building element	Please describe if and, in particular, how the following materials and systems respond to the following circular economy themes				
			Recycled Content (%)	Embodied Carbon Factor (kgCO2e/kg)	Assumed End of Life Strategy	Assumed Construction Waste Rate (as per RICS 2nd Edition)	Further Comments *
XPS insulation panels		1.1.Foundations and piling	Assumed 0%	2.71	Incineration	7%	
EPDM waterproofing membrane		1.1.Foundations and piling	Assumed 0%	3.4	Incineration	10%	
Reinforcement steel (rebar)		1.1.Foundations and piling	97%	0.49	Recycling	5%	
Ready-mix concrete		1.1.Foundations and piling	20% GGBS	Weighted carbon factor tbc	Crushed and downcycled	5%	
XPS insulation panels		1.2.Basement retaining walls and lowest slab	Assumed 0%	2.71	Incineration	7%	
EPDM waterproofing membrane		1.2.Basement retaining walls and lowest slab	Assumed 0%	3.4	Incineration	10%	
Ready-mix concrete	Basement Slab, Capping Beams and Basement Liner Wall	1.2.Basement retaining walls and lowest slab	20% GGBS	0.1	Crushed and downcycled	5%	
							minimal finishes proposed to cores, jump-form/slip-form concrete finish to be exposed over Level 02 (current design proposal) - improves resilience, reduces ongoing maintenance and refurbishment
Ready-mix concrete	Columns and Core Walls	2.1. Frame	70% GGBS	Weighted carbon factor tbc	Crushed and downcycled	5%	
Reinforcement steel (rebar)		2.1. Frame	97%	0.49	Recycling	5%	
Structural steel profiles		2.1. Frame	60%	2.12	Recycling	5%	
Ready-mix concrete		2.2.Upper floor	70% GGBS	Weighted carbon factor tbc	Crushed and downcycled	5%	
Reinforcement steel (rebar)		2.2.Upper floor	97%	0.49	Recycling	5%	
Rubberized hot melt waterproofing membrane for roofs	ProTherm Insulation	2.3.Roofs	Assumed 0%	0.38	Incineration	6%	
PIR insulation boards, aluminium composite foil faced		2.3.Roofs	Assumed 0%	4.52	Incineration	7%	
Foamglass insulation		2.3.Roofs	Assumed 0%	1.39	Incineration	7%	
Steel security doors with louvres	Plant screening	2.3.Roofs	Assumed 0%	7.25	Recycling	1%	
Soil substrates for green roofs		2.3.Roofs	Assumed 0%	0.36	Landfill	10%	
Drainage floor underlay from EPS		2.3.Roofs	Assumed 0%	7.53	Incineration	7%	
Bitumen waterproofings		2.3.Roofs	Assumed 0%	0.7	Recycling	6%	
Aluminium soffit for exterior applications	Soffit Finish	2.3.Roofs	Assumed 0%	23.05	Recycling	1%	
Ready-mix concrete		2.3.Roofs	70% GGBS	Weighted carbon factor tbc	Crushed and downcycled	5%	
Reinforcement steel (rebar)		2.3.Roofs	97%	0.49	Recycling	5%	
Ready-mix concrete		2.4.Stairs, ramps and safety guarding	10% GGBS	0.16	Crushed and downcycled	1%	
Reinforcement steel (rebar)		2.4.Stairs, ramps and safety guarding	90%	0.61	Recycling	1%	
Stainless steel handrail		2.4.Stairs, ramps and safety guarding	Assumed 0%	10.55	Recycling	1%	
Structural steel profiles	Inner Leaf studwork	2.5.External envelope including roof finishes	20%	2.5	Recycling	1%	
Gypsum plasterboard, sound blocking		2.5.External envelope including roof finishes	Assumed 0%	0.22	Recycling	4%	
Stone wool/mineral wool insulation		2.5.External envelope including roof finishes	Assumed 0%	1.31	Recycling	7%	
Architectural precast concrete cladding	Techrete cladding	2.5.External envelope including roof finishes	Assumed 0%	0.23	Crushed and downcycled	1%	
Float glass, single pane	Triple glazing - Glass	2.6.Windows and external doors	Assumed 0%	2.04	Recycling	1%	
Aluminium flat-rolled products	Triple Glazing - Aluminium window frame	2.6.Windows and external doors	75%	6.52	Recycling	1%	all accommodation windows to be fitted off-site
Aluminium balustrade system		2.6.Windows and external doors	Assumed 0%	11.32	Recycling	1%	
Structural steel profiles	Metal studwork	2.7.Internal walls and partitions	20%	2.5	Recycling	1%	
Gypsum plasterboard, sound blocking		2.7.Internal walls and partitions	Assumed 0%	0.22	Recycling	4%	
APR Insulation		2.7.Internal walls and partitions	Assumed 0%	2.23	Recycling	7%	
Regular gypsum plasterboard		2.7.Internal walls and partitions	Assumed 0%	0.35	Recycling	4%	
Concrete block wall		2.7.Internal walls and partitions	Assumed 0%	0.1	Crushed and downcycled	1%	
Wooden doors		2.8.Internal doors	Assumed 0%	0.3	Coated timber treatment	0%	
Acrylic emulsion paint		3.Finishes	Assumed 0%	2.22	Landfill	6%	
Structural steel profiles	Suspended Ceiling System	3.Finishes	20%	2.5	Recycling	1%	
Gypsum plasterboard	Suspended Ceiling System	3.Finishes	Assumed 0%	0.37	Recycling	4%	
Foam backed vinyl (PVC) flooring rolls and planks		3.Finishes	Assumed 0%	3.91	Landfill	7%	
Latex Adhesive		3.Finishes	Assumed 0%	0.89	Landfill	4%	
Skirting board		3.Finishes	Assumed 0%	0.86	Incineration	2%	
Washing machine		4.Fittings, furnishings and equipment	Assumed 0%	8.19	Recycling	0%	
Laundry tumble dryer		4.Fittings, furnishings and equipment	Assumed 0%	8.18	Recycling	0%	
MFC Joinery		4.Fittings, furnishings and equipment	Assumed 0%	0.37	Incineration	2%	
Composite material consisting of acrylic resin and natural mineral	Kitchen tops and Splashbacks	4.Fittings, furnishings and equipment	Assumed 0%	3.41	Incineration	2%	
Hot rolled seamless steel tube	Table top leg supports and hanging rails inside wardrobes	4.Fittings, furnishings and equipment	Assumed 0%	1.90	Recycling	0%	
Electric built-in oven	Kitchen Oven	4.Fittings, furnishings and equipment	Assumed 0%	2.68	Recycling	0%	
Cooktop with four induction hobs	Kitchen Hobs	4.Fittings, furnishings and equipment	Assumed 0%	5.18	Recycling	0%	
Microwave	Microwaves	4.Fittings, furnishings and equipment	Assumed 0%	5.39	Recycling	0%	
Stainless steel	Kitchen Sinks	4.Fittings, furnishings and equipment	Assumed 0%	4.18	Recycling	0%	
Modular sofa		4.Fittings, furnishings and equipment	Assumed 0%	5.09	Coated timber treatment	0%	
Bar stool		4.Fittings, furnishings and equipment	Assumed 0%	3.83	Coated timber treatment	0%	

Mirror		4.Fittings, furnishings and equipment	Assumed 0%	1.31	Recycling	0%	
Wall-mounted display boards	Cork Boards	4.Fittings, furnishings and equipment	Assumed 0%	4.22	Coated timber treatment	0%	
Office chair	Desk chairs	4.Fittings, furnishings and equipment	Assumed 0%	4.77	Coated timber treatment	0%	
Steel door handle	Drawer handles	4.Fittings, furnishings and equipment	Assumed 0%	4.75	Recycling	0%	
Oriented strand board (OSB)	Associated with Walker Bathroom Pods	5.1.Public Health	Assumed 0%	0.36	Incineration	0%	
Glass Reinforced Plastic - GRP - Fibreglass	Associated with Walker Bathroom Pods	5.1.Public Health	Assumed 0%	8.10	Landfill	0%	
Laminated safety glass	Associated with Walker Bathroom Pods	5.1.Public Health	Assumed 0%	2.17	Recycling	0%	
Ceramic bathroom washbasin	Associated with Walker Bathroom Pods	5.1.Public Health	Assumed 0%	1.89	Crushed and downcycled	0%	
Ceramic toilet bowl	Associated with Walker Bathroom Pods	5.1.Public Health	Assumed 0%	1.89	Crushed and downcycled	0%	
Shower and bath faucet, brass	Associated with Walker Bathroom Pods	5.1.Public Health	Assumed 0%	8.39	Recycling	0%	
Drinking water supply piping network		5.1.Public Health	Assumed 0%	3.38	Recycling	1%	
Sewage water drainage piping network		5.1.Public Health	Assumed 0%	2.37	Recycling	1%	
Outdoor unit for air/air heat pump	ASHP R744	5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	8.99	Recycling	0%	
Heat pump	4 x ASHP - R32	5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	5.71	Recycling	0%	
VRF heat pump, exterior unit	8 X PURY- M500YNW-A	5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	8.78	Recycling	0%	
Outdoor unit for air/air heat pump	2 x Heat Pump Outdoor Unit	5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	8.48	Recycling	0%	
Cold water storage tank	Cold water storage tank	5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	5.36	Recycling	0%	
Heat distribution piping network		5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	3.41	Recycling	1%	
Radiator		5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	2.71	Recycling	0%	
Fan coil unit		5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	9.24	Recycling	0%	
Mechanical ventilation system with heat recovery (MVHR)		5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	6.66	Recycling	0%	
Air extractors, ventilators and fans	Extract Fans FOR KITCHEN	5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	6.34	Recycling	0%	
Cassette type air conditioner with outdoor unit, ceiling-mounted	Ceiling Cassettes	5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	8.75	Recycling	0%	
PVC ventilation ducting		5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	3.73	Recycling	1%	
Galvanized steel ventilation duct		5.2.Heating, Ventilation and Cooling (HVAC)	Assumed 0%	4.00	Recycling	1%	
Combined refrigerator-freezer		5.3.Electrical installations	Assumed 0%	3.55	Recycling	0%	
Electricity distribution system, cabling and central		5.3.Electrical installations	Assumed 0%	5.11	Recycling	1%	
Lighting		5.3.Electrical installations	Assumed 0%	2.58	Recycling	0%	
Lifts / Elevators		5.5.Systems including Lift and conveyor installations	Assumed 0%	2.89	Recycling	0%	
Concrete paving	Paving Stone	8.External Works	Assumed 0%	0.17	Crushed and downcycled	10%	
Paving blocks	Permeable Paving- Roof Works	8.External Works	Assumed 0%	0.10	Crushed and downcycled	10%	
Granite with split finish for cobbles and kerbing	Kerbs	8.External Works	Assumed 0%	0.13	Landfill	10%	
Bicycle rack		8.External Works	Assumed 0%	22.56	Recycling	0%	

B. Example Aluminium Carbon Footprint Declaration

Appendices



CARBON FOOTPRINT DECLARATION

Cambridge
Halls

DRIVING DECARBONIZATION - BEYOND LCA & EPD STANDARDS

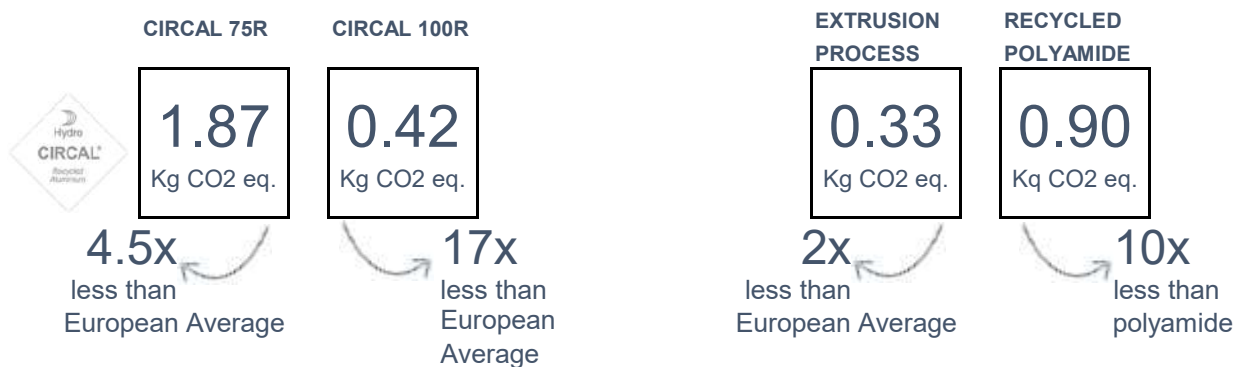
At Hydro building Systems, our main priority is to minimize our products' environmental impacts. From responsible and circular sourcing of aluminium and other materials to the improvement and optimization of our extrusion and production process.

This is how we change the world together.

DID YOU KNOW?

For us, circularity is not an option that you can choose from for specific projects but a pledge: since 2021, all our main products are made with Hydro CIRCAL: 75% post-consumer recycled aluminium.

SOME FIGURES



YOUR PROJECT

The below carbon footprint refers to the product stage module A1-A3 of the Life Cycle Assessment carried in Environmental Product Declaration according to ISO 14025 AND EN15804.

**Your project
Carbon Footprint**

660,061.31
kgCO2e

Without Glazing

339,174.40
kgCO2e

Project Carbon Footprint
with CIRCAL 100R

547,516.36
kgCO2e

Project Carbon Footprint
with European Average

1,063,901.85
kgCO2e

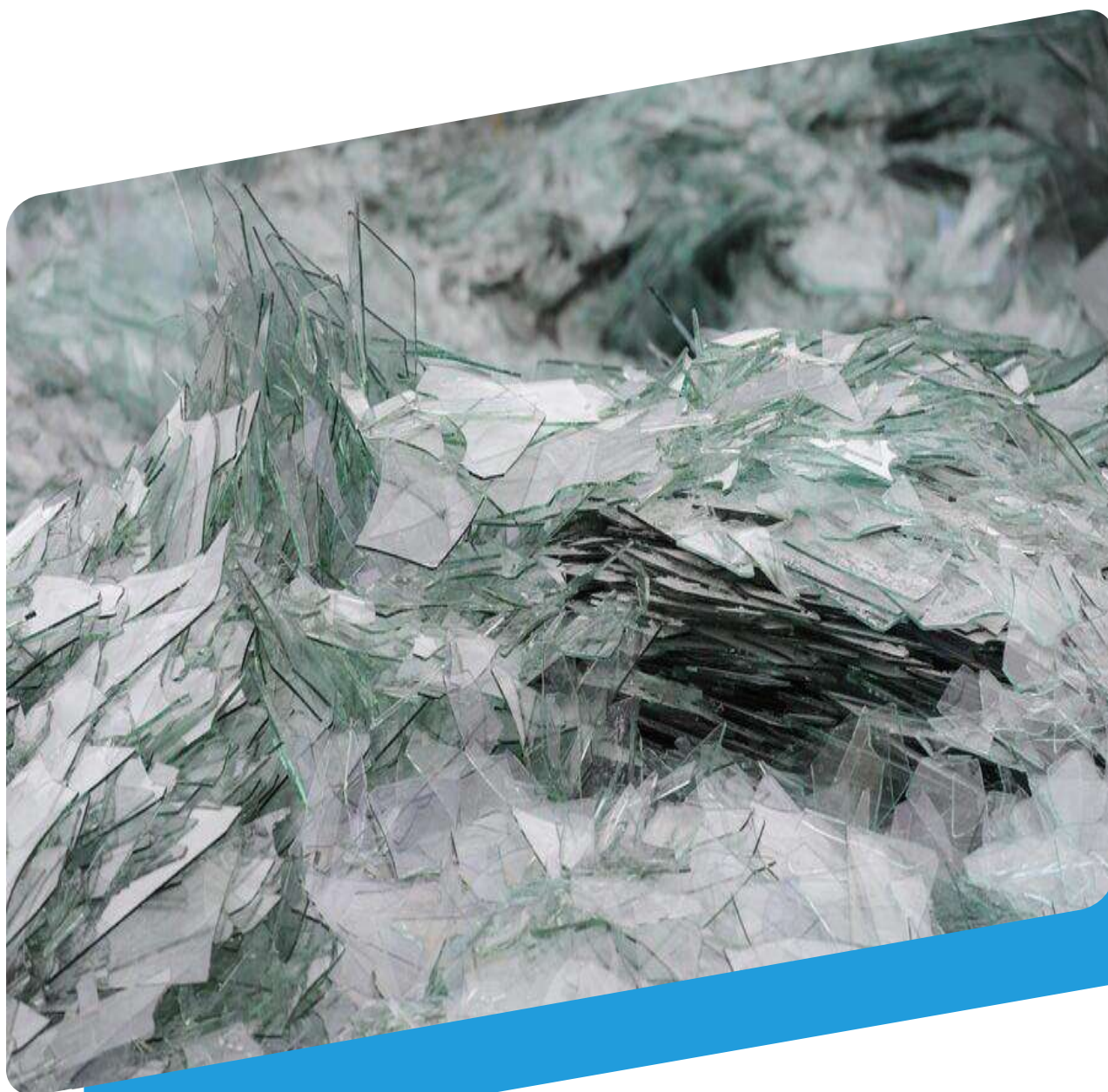
Designation	Value	Unit
Aluminium-cast alloy EN AC-46100	3,159.711	kg
Stainless steel X8CrNiS18-9	1,476.818	kg
Stainless steel screw A2-21H	474.778	kg
Aluminium EN AW-6060 T66	10,645.092	kg
Polyamid 6 PA6	427.372	kg
EPDM	4,327.615	kg
Hardware components	3,313.122	kg
Zinc cast alloy ZP2	1,494.052	kg
Polyamid 66 GF PA6 GF15	60.636	kg
EPDM foam	2,239.815	kg
ABS	1,060.991	kg
TPE Santoprene 8221-65M300	2,622.121	kg
PE foam PE Foam	1,746.145	kg
CIRCAL 75	63,088.371	kg
Powder coating	1,909.832	kg
Glass, Float	286,506.173	kg
PU foam 025	4,165.639	kg
Polyamid 66 GF recycled PA66 GF25 RE	8,371.256	kg
Anodizing	0.000	kg
REDUXA	16.297	kg

Total Weight	397,105.838	kg
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C. Example Glass Recycled Content Declaration

Appendices



RECYCLED CONTENT DECLARATION

Date of issue: 20.06.2023

*PLANICLEAR®, PARSOL®, DIAMANT®
Manufactured in our European floats*

RECYCLED CONTENT DECLARATION

We declare that the percentage of external cullet^a included in the composition of flat glass products manufactured by Saint-Gobain Glass in Europe is the following:

Pre-consumer cullet	19 %
Post-consumer cullet	<1 %

The standard ISO 14021:1999 calculates the recycled content as follow:

$$\frac{\text{post-consumer cullet} + \text{pre-consumer cullet}}{\text{post-consumer cullet} + \text{pre-consumer cullet} + \text{new glass}^b}$$

Following this method, the recycled content of flat glass products manufactured by Saint-Gobain Glass is 19% by weight.

The building standard LEED v4.1 “*Building product disclosure and optimization - sourcing of raw materials*” criteria calculates the recycled content as follow:

$$\text{post-consumer content} + \frac{1}{2} \text{pre-consumer content}$$

Following this method, the recycled content of flat glass products manufactured by Saint-Gobain Glass is 9.5% by weight.

Did you know?

Using one ton of cullet in glass production:

- Saves 1.2 tons of virgin raw materials
- Reduces Greenhouse gas emissions (CO₂) by approximately 700 kg (scopes 1, 2, 3).

^a Scraps of glass

^b Glass resulting from the melting of the new primary raw materials

DEFINITIONS^c

The following definitions are taken from section 7.8.1.1 of ISO 14021:1999 Environmental labels and declarations, where:

Recycled content: proportion, by mass, of recycled material in a product or packaging. Only pre-consumer and post-consumer materials shall be considered as recycled content.

Post-consumer material: material generated by households or commercial, industrial and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose.

In practice, in the case of flat glass, all material coming from glass recycling collection schemes falls under this category, i.e. glass waste from end-of-life vehicles, construction and demolition waste, etc.

Pre-consumer material: material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

In the case of flat glass, this waste originates from the processing or re-processing of glass that takes place before the final product reaches the consumer market. Pre-consumer waste flat glass is made of cut-offs, losses during laminating, bending and other processing, including the manufacture of insulating glass units or automotive windscreens. This processing could be at the same facility as the production furnace but is separate to the flat glass manufacturing process.

Only material that would otherwise have entered the solid waste stream but is in fact being reused qualifies as recycled content. Pre-consumer recycled content therefore excludes material that can be reclaimed within the same process that generated it. Cullet generated in the furnace plant, and which is reintroduced into the furnace cannot be considered as pre-consumer recycled content, since there was never an intent to discard it and therefore it would never have entered the solid waste stream.

^c Source: Glass for Europe [statement on Recycled Content of flat glass for LEED Certification](#), December 2014

D. Summarised EPD for Façade

Environmental product declaration

Summarized EPD



Declaration owner: Hydro Building Systems Germany GmbH
Construction project: Cambridge Halls
Publisher: R&D account

Date of issue: 30/10/2025



The Summarized EPD includes the following listed products

Declaration number	Declared product	Declared unit (mm)
WND-01	K/Acorn.24.09.2025.12.35.05	1,149 x 3,815
WND-02 A	K/Acorn.24.09.2025.11.45.40	1,200 x 1,510
WND-02 C	K/Acorn.24.09.2025.12.36.27	1,200 x 1,862
WND-02 D	K/Acorn.24.09.2025.12.37.43	1,200 x 1,898
WND-02 E	K/Acorn.24.09.2025.12.38.34	1,200 x 1,282
WND-02-F	K/Acorn.24.09.2025.12.41.48	1,200 x 1,647
WND-03	K/Acorn.24.09.2025.12.41.49	2,000 x 1,212
WND-05	K/Acorn.24.09.2025.13.05.24	1,200 x 3,810
WND-06A	K/Acorn.24.09.2025.12.41.50	1,200 x 1,742
WND-06B	K/Acorn.24.09.2025.12.41.51	1,200 x 2,592
WND-06C	K/Acorn.24.09.2025.12.41.52	1,200 x 1,892
WND-07 A	K/Acorn.24.09.2025.13.26.01	1,200 x 3,650
WND-07 B	K/Acorn.24.09.2025.13.30.31	1,200 x 5,192
WND-08 A	K/Acorn.24.09.2025.13.36.00	1,200 x 3,582
WND-08 C	K/Acorn.24.09.2025.13.36.57	1,200 x 3,815
WND-08 D	K/Acorn.24.09.2025.13.40.24	1,200 x 4,130
WND-09	K/Acorn.24.09.2025.13.41.13	1,200 x 3,815
WND-10 A	K/Acorn.24.09.2025.13.45.20	1,200 x 2,150
WND-10 B	K/Acorn.24.09.2025.13.46.45	1,200 x 1,800
WND-11	K/Acorn.24.09.2025.12.42.01	1,670 x 1,670
WND-12	K/Acorn.24.09.2025.12.42.02	1,200 x 1,000
WND-13	K/Acorn.24.09.2025.13.48.23	1,200 x 1,428
WND-13 A	K/Acorn.24.09.2025.13.49.26	1,200 x 650
WND-14	K/Acorn.24.09.2025.12.42.05	1,660 x 1,976

WND-15	K/Acorn.24.09.2025.13.52.06	1,200 x 1,672
ED-01-A	K/Acorn.25.09.2025.09.28.07	2,262 x 1,775
ED-01-A.1	K/Acorn.25.09.2025.09.31.12	2,830 x 2,075
ED-01-B	K/Acorn.25.09.2025.09.32.16	2,262 x 1,775
ED-01-B.1	K/Acorn.25.09.2025.09.40.17	2,830 x 2,075
ED-01-B.2	K/Acorn.25.09.2025.09.40.40	2,830 x 2,075
ED-01-C	K/Acorn.25.09.2025.09.41.10	2,262 x 1,775
ED-01-C.1	K/Acorn.25.09.2025.09.41.35	2,262 x 1,775
ED-01-C.2	K/Acorn.25.09.2025.09.41.55	2,262 x 1,775
ED-01-D	K/Acorn.25.09.2025.09.42.18	2,280 x 1,685
ED-03A	K/Acorn.25.09.2025.09.43.01	2,262 x 1,275
ED-03A.1	K/Acorn.25.09.2025.10.05.52	2,837 x 1,275
ED-03B	K/Acorn.25.09.2025.10.06.30	2,262 x 1,275
ED-03B.1	K/Acorn.25.09.2025.10.06.57	2,837 x 1,275
ED-03C	K/Acorn.25.09.2025.10.07.35	2,262 x 1,275
ED-03C.1	K/Acorn.25.09.2025.10.08.01	2,837 x 1,275
ED-03D	K/Acorn.25.09.2025.10.08.35	2,262 x 1,275
ED-04A	K/Acorn.25.09.2025.10.10.26	2,100 x 1,775
ED-04A.1	K/Acorn.25.09.2025.10.11.17	2,812 x 2,075
ED-04A.2	K/Acorn.25.09.2025.10.11.51	2,375 x 2,387
ED-04A-X	K/Acorn.25.09.2025.10.12.24	2,812 x 2,075
ED-04D	K/Acorn.25.09.2025.10.12.57	2,075 x 2,262
ED-05A	K/Acorn.25.09.2025.10.13.36	2,812 x 2,075
ED-05A-X	K/Acorn.25.09.2025.10.14.11	2,812 x 2,075
ED-05B	K/Acorn.25.09.2025.10.14.54	2,812 x 2,075
ED-05C	K/Acorn.25.09.2025.10.15.10	2,812 x 2,075

ED-05C-X	K/Acorn.25.09.2025.10.15.35	2,812 x 2,075
ED-07	K/Acorn.25.09.2025.10.19.16	2,262 x 875
ED-07.1	K/Acorn.25.09.2025.10.20.03	2,262 x 1,275
ED-08A	K/Acorn.25.09.2025.10.20.31	2,800 x 2,131
ED-09	K/Acorn.25.09.2025.10.54.37	2,262 x 2,100
CW01	K/Acorn.25.09.2025.10.56.01	3,500 x 2,540
CW01.1	K/Acorn.25.09.2025.11.01.36	3,500 x 2,862
CW01.2	K/Acorn.25.09.2025.11.02.46	3,500 x 3,100
CW01.3	K/Acorn.25.09.2025.11.03.25	3,500 x 3,272
CW01.4	K/Acorn.25.09.2025.11.04.04	3,500 x 3,530
CW01.5	K/Acorn.25.09.2025.11.05.40	3,500 x 3,765
CW01.6	K/Acorn.25.09.2025.11.55.20	3,500 x 3,900
CW01.7	K/Acorn.25.09.2025.11.55.55	3,500 x 4,900
CW02	K/Acorn.25.09.2025.12.05.50	3,500 x 1,410
CW02.1	K/Acorn.25.09.2025.12.07.03	3,500 x 2,075
CW02.2	K/Acorn.25.09.2025.12.08.37	3,500 x 2,500
CW02.3	K/Acorn.25.09.2025.12.09.22	3,500 x 2,647
CW02.4	K/Acorn.25.09.2025.12.09.53	3,500 x 3,450
CW02.5	K/Acorn.25.09.2025.12.10.25	3,500 x 3,660
CW02.6	K/Acorn.25.09.2025.12.11.03	3,500 x 3,765
CW02.7	K/Acorn.25.09.2025.12.11.36	3,500 x 4,087
CW03	K/Acorn.25.09.2025.12.12.25	3,500 x 1,300
CW03.1	K/Acorn.25.09.2025.12.13.49	3,500 x 1,435
CW03.2	K/Acorn.25.09.2025.12.19.35	3,500 x 1,601
CW03.3	K/Acorn.25.09.2025.12.20.27	3,500 x 1,810
CW03.4	K/Acorn.25.09.2025.12.30.29	3,500 x 2,220

CW04	K/Acorn.25.09.2025.12.31.52	3,500 x 810
CW05	K/Acorn.25.09.2025.12.37.44	3,500 x 2,545
CW06	K/Acorn.25.09.2025.12.39.26	2,100 x 3,582
CW06.1	K/Acorn.25.09.2025.12.40.41	2,100 x 3,815
CW07	K/Acorn.25.09.2025.12.41.30	2,100 x 3,815
CW08	K/Acorn.25.09.2025.12.43.34	2,100 x 1,450
CW09	K/Acorn.25.09.2025.12.46.32	2,250 x 3,765
CW09.1	K/Acorn.25.09.2025.12.48.35	2,250 x 3,769
CW10	K/Acorn.25.09.2025.12.50.19	2,250 x 914
CW10.1	K/Acorn.25.09.2025.12.51.58	2,250 x 1,400
CW10.2	K/Acorn.25.09.2025.12.52.54	2,250 x 1,843
CW10.3	K/Acorn.25.09.2025.12.53.26	2,250 x 3,765
CW10B	K/Acorn.25.09.2025.12.54.05	2,250 x 1,500
CW11	K/Acorn.25.09.2025.12.54.40	3,500 x 1,196
CW11.1	K/Acorn.25.09.2025.12.55.40	3,500 x 1,460
CW11.2	K/Acorn.25.09.2025.12.56.13	3,500 x 1,690
CW11.3	K/Acorn.25.09.2025.12.56.48	3,500 x 2,540
CW13	K/Acorn.25.09.2025.12.57.30	3,500 x 2,560
CW14	K/Acorn.25.09.2025.13.00.36	4,450 x 3,700
CW15	K/Acorn.25.09.2025.13.02.22	2,250 x 615
CW16	K/Acorn.25.09.2025.13.04.45	2,250 x 3,765
Greenhouse Side 1	K/Acorn.25.09.2025.13.33.10	5,100 x 9,290
Greenhouse Side 2/3	K/Acorn.25.09.2025.13.39.30	3,790 x 3,930
Greenhouse Top	K/Acorn.25.09.2025.13.43.10	5,040 x 9,290

LCA: Results

The results of the impact assessment, resource use and waste and other output streams are shown below
The results are calculated from the values of the individual EPDs.

SPECIFICATION OF THE SYSTEM LIMITS (X = INCLUDED IN LIFE CYCLE ASSESSMENT, MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement ¹⁾	Refurbishment ¹⁾	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X

RESULTS OF THE LIFE CYCLE ASSESSMENT ENVIRONMENTAL IMPACT:

Parameter	Parameter	Unit	A1-A3	A4	C3	C4	D
GWP	Global warming potential	[kg CO ₂ -Eq.]	660,061.3 ₁	0.00	72,627.69	7.99E02	-123,073.42
ODP	Depleting the stratospheric ozone layer	[kg CFC ₁₁ -Eq.]	1.12E-02	0.00	6.13E-04	1.49E-11	-5.09E-03
AP	Acidification potential of soil and water	[kg SO ₂ -Eq.]	4.36E03	0.00	7.02E01	2.72E-01	-5.48E02
EP	Eutrophication	[kg (PO ₄) ³ -Eq.]	3.98E02	0.00	1.63E01	7.75E-01	-3.27E01
POCP	Forming potential for tropospheric ozone	[kg Ethen-Eq.]	-1.96E02	0.00	3.51E00	2.01E-01	-3.83E01
ADPE	Potential for the abiotic degradation of non-fossil resources	[kg Sb-Eq.]	1.54E01	0.00	1.06E-01	1.44E-05	-1.14E01
ADPF	Potential for the abiotic degradation of fossil fuels	[MJ]	9,923,428.18	0.00	103,454.18	7.86E02	-1,345,156.86

RESULTS OF THE LIFE CYCLE ASSESSMENT RESOURCE ACCOUNT:

Parameter	Parameter	Unit	A1-A3	A4	C3	C4	D
PERE	Renewable primary energy as an energy source	[MJ]	1,338,901.57	0.00	1.49E04	5.06E01	-175,765.39
PERM	Renewable primary energy to the material use	[MJ]	1,841.68	0.00	0.00	0.00	0.00
PERT	Total renewable primary energy	[MJ]	1,340,743.25	0.00	1.61E04	7.05E01	-545,654.21
PENRE	Non-renewable primary energy as an energy source	[MJ]	8,442,945.93	0.00	762,758.08	6.55E02	-438,775.26
PENRM	Non-renewable primary energy to the material use	[MJ]	662,459.19	0.00	-641,279.91	0.00	0.00
PENRT	Total non-renewable primary energy	[MJ]	9,107,001.20	0.00	121,478.17	8.16E02	-1,709,857.80
SM	Use of secondary materials	[kg]	137,479.73	0.00	0.00	0.00	0.00
RSF	Renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00
NRSF	Non-renewable secondary fuels	[MJ]	0.00	0.00	0.00	0.00	0.00
FW	Use of freshwater resources	[m ³]	2.44E03	0.00	1.82E02	1.27E-01	-1.14E03

RESULTS OF LIFE CYCLE ASSESSMENT OUTPUT RIVERS AND WASTE CATEGORIES:

Parameter	Parameter	Unit	A1-A3	A4	C3	C4	D
HWD	Hazardous waste of landfill	[kg]	5.81E01	0.00	3.89E02	6.14E-06	3.76E01
NHWD	Discarded non-hazardous waste	[kg]	114,477.66	0.00	7.55E04	3.92E03	-32,333.50
RWD	Discarded radioactive waste	[kg]	2.66E02	0.00	2.46E00	1.19E-02	-1.19E02
CRU	Components for reuse	[kg]	0.00	0.00	0.00	0.00	0.00
MFR	Materials for recycling	[kg]	0.00	0.00	58,876.66	0.00	312,965.26

MER	Materials for the energy recovery	[kg]	0.00	0.00	1,703.83	0.00	0.00
EEE	Exported electrical energy	[MJ]	467.12	0.00	79,416.88	24,025.50	0.00
EET	Exported thermal energy	[MJ]	920.84	0.00	142,216.27	42,944.54	0.00

LCA: Scenarios and technical information

(according table chapter 4)

The following informations are basis for the declared modules and products in this summary EPD:

Transport to construction site (A4)

Designation	Value	Unit
Liters of fuel		
Train (Diesel)	0.01158	l / 100 km
Plane (kerosine)	0.42164	l / 100 km
40 tons truck (Diesel)	0.00165	l / 100 km
7,5 tons truck (Diesel)	0.00591	l / 100 km
22 tons truck (Diesel)	0.00231	l / 100 km
Ship (heavy heating oil)	0.00040	l / 100 km
Transport distance		
Train	0.00	km
Plane	0.00	km
40 t truck	0.00	km
7,5 t truck	0.00	km
22 t truck	0.00	km
Ship	0.00	km
Utilisation (including empty runs)		
Train	51	%
Plane	61	%
40 t truck	55	%
7,5 t truck	40	%
22 t truck	66	%
Ship	48	%
Volume utilisation factor	1	-

*) The transport distance indicates the easy distance from the place of manufacture to the construction site.

End of life cycle (C1-C4)

Designation	Value	Unit
Separately collected waste type	334,001.17	kg
Collected as mixed construction waste	60,580.48	kg
For reuse	0.00	kg
For recycling (D)	365,283.55	kg
For energy recovery (C3)	25,998.95	kg
For landfilling (C4)	5,823.34	kg
For thermal utilisation (C4)	0.00	kg

Listing of the raw materials and the auxiliary materials

(according table chapter 2.5)

Designation	Value	Unit
Aluminium-cast alloy EN AC-46100	3,159.71	kg
Stainless steel X8CrNiS18-9	1,476.82	kg
Stainless steel screw A2-21H	474.78	kg
Aluminium EN AW-6060 T66	10,645.09	kg
Polyamid 6 PA6	427.37	kg
EPDM	4,327.62	kg
Hardware components	3,313.12	kg
Zinc cast alloy ZP2	1,494.05	kg
Polyamid 66 GF PA6 GF15	60.64	kg
EPDM foam	2,239.81	kg
ABS	1,060.99	kg
TPE Santoprene 8221-65M300	2,622.12	kg
PE foam PE Foam	1,746.15	kg
CIRCAL 75	63,088.37	kg
Powder coating	1,909.83	kg
Glass, Float	286,506.17	kg
PU foam 025	4,165.64	kg
Polyamid 66 GF recycled PA66 GF25 RE	8,371.26	kg
Anodizing	0.00	kg
REDUXA	16.30	kg
Total weight	397,105.84	kg



E. TM66 for Lighting Summary

Appendices

ZEP RANGE TM66

Zep Downlights

Result: 2.0

Definite/substantial progress to circularity



Circular Economy Assessment Method - Make

(CIBSE TM66 digital tool)



Result

Category	Points Scored	Maximum possible points	Assessment
Product design	86.0	134.0	2.6
Manufacturing	21.9	46.5	1.9
Materials	5.0	24.0	0.8
Ecosystem	29.0	43.0	2.7
Overall performance	141.9	247.5	2.0

How to analyse the score

0 to 0.5	Very poor circular economy performance
0.5 to 1.5	Some circular economy functionality
1.5 to 2.5	Definite/substantial progress to circularity
2.5 to 4.0	Excellent circularity

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