Retrofit

Minimise impact

Design

RIBA Stages 0-1

Early Considerations

1. Evaluate whether this asset is suitable for retrofit.
2. Conduct an initial audit of the asset considering the current building fabric and layout and the needs of the client.
3. Host an initial workshop with the client to determine current and future use scenarios. This will inform the basis of the decision as to whether the existing building will satisfy the requirements.
4. Conduct initial building assessment of building fabric, air tightness, ventilation, and energy use of the existing building to determine whether retrofitting is the most efficient solution.

Project Planning & Design

RIBA Stages 2-4

1. Set out the required changes and performance targets. In this stage of works, the focus is on balancing maximum carbon savings (retaining the maximum within the existing structure) whilst achieving the desired building performance and function for the client’s use (current and future).
2. In the technical design phase, the sequence of works should be planned along with the details of the interventions.
3. Create an inventory of materials sent onward for reuse. Material passports ensure the future reuse of materials. Their production should begin as early as possible by surveying and logging the existing asset and new components.

Construction & Handover

RIBA Stages 5-6

1. Deal with any construction problems that might change a design detail. Develop strategies to address the uncertainties arising from using reclaimed materials (e.g., flexible procurement).
2. The design and construction teams should collaborate to find solutions to enable problems without compromising circular strategies. Hold regular workshops during the construction phase to maintain collaborative problem solving and information flow between the design and construction team.
3. Enrich the existing material passport data with exact specification information, including but not limited to type, quantities, material composition, and assembly details.
4. At Handover, hold workshops with the client explaining the format and information included in the material passports produced. Ensure the client or building management can monitor and modify the information contained in the passports so that the documentation can be updated in case of maintenance works during the asset’s life.

In Use & End of Life

RIBA Stage 7

1. At this stage of works, ideally, an end-of-life strategy is already in place (e.g., leasing agreements, pre-agreed take-back programmes). For building components with no end-of-life agreements. If for certain elements there was no agreement during procurement, re-engage with the product manufacturer during the use phase of the building to develop and end-of-life strategy for the building element together.
2. During the use phase of the building, ensure that there is a digital data management strategy that assigns responsibilities for data ownership and maintenance long-term.
3. Ensure refurbished parts are modelled in detail to enable future reuse.
4. Improve the detail of pre-deconstruction audits to be material passport quality.
5. Do not overlook the carbon savings that smaller reuse opportunities (e.g., finishes or interior elements) offer.

Minimise waste and cost

1. Hold a workshop with stakeholders to do future scenario modelling and explore how the building users’ needs might change over time.
2. Include a time factor within the design brief, which means that the design isn’t just focused on the initial programme but considers multiple-use scenarios for the building and its components, considering future occupants and users.
3. The building should be designed for disassemblability. Apply a layered approach, where each building layer is independent from each other. Layers should depend on element type and lifespan.

Removal

1. Hold an initial workshop with the client and relevant stakeholders to introduce key concepts of minimising waste and impact, such as the R-frameworks and material cascades.
2. Explain the idea of material cascades, which considers the possibilities of extending a material’s lifecycle by transforming it into different products.
3. Minimise the total input of materials while ensuring the quality of the design.
4. Prioritise natural, renewable and biodegradable materials whenever possible and engage with relevant stakeholders early.
5. Consider local resources.
6. Set targets to specify high percentages of remanufactured and recycled products.
7. Avoid mixing technical and biological materials together to preserve clean and non-toxic material cycles.
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<td>1. If the asset is not suitable to be reused entirely, its materials and components should be deconstructed (instead of demolished), ensuring their reuse is possible in another project.</td>
<td>1. Hold a workshop with stakeholders to do future scenario modelling and explore how the building user’s needs might change over time.</td>
<td>1. Conduct a reclamuation audit – materials should be carefully documented in the inventory. 2. Following the audit, proceed to make material passports for all the items that can be reused. 3. Evaluate whether the materials identified can be reused on site or sent to another site or material broker. 4. With respect to materials that would be reused off-site, the team should begin to search for buyers and set up a material storage policy. 5. Organise the logistics of the material handling with the contractor; to manage the storage, packaging and transportation of the materials.</td>
<td>1. Prepare a method statement for the disassembly of elements with the contractor, before the start of deconstruction. 2. At the start of this stage, carry out trials of deconstructing certain components to understand barriers and sensibly allocate time for deconstruction activities. 3. Evaluate the hierarchy of materials based on reuse value in the deconstruction plan. 4. Consider which materials are the most valuable based on environmental, economic and practical criteria. 5. As a general rule of thumb, working with reclaimed materials requires more flexibility from the construction team to terms of the timing and installation and from the client to allow for aesthetic variations. 6. Set up a storage and logistics plan for the materials salvaged before the works begin. 7. Hold regular workshops between the deconstruction and the design team and appoint a person in the team who is in charge of logging material details.</td>
<td>1. Achieve an end-of-life strategy that is already in place (e.g. leasing agreements, pre-agreed take-back programmes). For building components with no end-of-life agreements. If for certain elements there was no agreement during procurement, re-engage with the product manufacturer during the use phase of the building to develop and end-of-life strategy for the building element together. 2. During the use phase of the building, ensure that there is a digital data management strategy that assigns responsibilities for data ownership and maintenance long-term. 3. Ensure retrofitted parts are modelled in detail to enable future reuse. 4. Improve the detail of pre-deconstruction audits to be material passport quality. 5. Do not overlook the carbon savings that smaller reuse opportunities (e.g. finishes or interior elements) offer.</td>
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<td>2. Carry out a reclamuation audit for buildings scheduled for demolition or strip-out and refurbishment, identifying building components and materials with high reuse potential.</td>
<td>2. Include a time factor in the design brief; this means that the design isn’t just focused on the initial program, but considers material use scenarios for the building and its components, considering future occupants and owners. 3. The building should be designed for exchangeability. Apply a layered approach, where each building layer is independent from each other. Layers should depend on element type and lifespan. 4. Develop a strategy of dematerialisation. Make sure the design is optimised in terms of the structure. 5. Specify wherever possible, natural, renewable and biodegradable products and products with high remanufactured and recycled content. 6. Design with standardised and modular components and off-site manufactured products as these reduce construction waste significantly. 7. Avoid the use of glues and aim to use mechanical and accessible fixings where possible, while making sure fabric efficiency is not compromised. 8. Avoid unnecessary finishes and keep surfaces exposed where possible. 9. Develop strategy for future end-of-life. 10. Documenting the building components through material passports and BIM 11. Wherever possible, specify products from manufacturers with established take-back schemes. 12. Consider products as a service approach. 13. Develop a waste management strategy during construction.</td>
<td>3. Document the strategies of material handling with the contractor; to manage the storage, packaging and transportation of the materials.</td>
<td>3. Make sure a detailed waste management plan and a reuse mandate are part of the contractor’s tender documentation. 4. The waste management plan that is in place aspires towards 0% waste and stringent targets for the lead contractor and sub-contractors are set. 5. To ensure future reusability, make sure the components are physically tagged with product information during the construction process. 6. The design team should closely collaborate with the construction team during this stage and ensure a continuous flow of information.</td>
<td>1. Ideally avoid end of life by continuous refurbishment and keeping the building in use for as long as possible. 2. Include a circular management strategy in the O&amp;M manuals, which outlines the necessary future upgrades and adaptability instructions details the least intrusive ways to execute it. 3. Encourage an annual review of material end of life strategies by clients and maintenance teams. 4. Encourage a mid-term improvement plan. 5. Test out principles of deconstruction and material reuse on shorter lifespan assets that are more easily controlled to learn and then apply to longer lifespan assets.</td>
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<td>3. Produce a inventory consisting of the materials’ details: dimensions, quantity, condition, environmental impact, technical characteristics and disassembly.</td>
<td>3. Assess the future disassembly potential of the building. 4. Cluster elements and components together based on their life cycle where possible. 5. Interface design and physical connections. There are three distinct types of connections to consider: integral, accessory or filled. 6. Prioritise open or overlapping geometries in the design, as these are the easiest to disassemble. 7. Prioritise external joints where possible, as they provide an easier opportunity for dismantling. Hold workshops with all the relevant stakeholders to design all new joints. 8. Consider assembly and disassembly sequences.</td>
<td>4. Evaluate the hierarchy of materials based on reuse value in the deconstruction plan. 5. Consider which materials are the most valuable based on environmental, economic and practical criteria. 6. As a general rule of thumb, working with reclaimed materials requires more flexibility from the construction team to terms of the timing and installation and from the client to allow for aesthetic variations. 7. Set up a storage and logistics plan for the materials salvaged before the works begin. 8. Hold regular workshops between the deconstruction and the design team and appoint a person in the team who is in charge of logging material details.</td>
<td>4. Evaluate the hierarchy of materials based on reuse value in the deconstruction plan. 5. Consider which materials are the most valuable based on environmental, economic and practical criteria. 6. As a general rule of thumb, working with reclaimed materials requires more flexibility from the construction team to terms of the timing and installation and from the client to allow for aesthetic variations. 7. Set up a storage and logistics plan for the materials salvaged before the works begin. 8. Hold regular workshops between the deconstruction and the design team and appoint a person in the team who is in charge of logging material details.</td>
<td>1. The handover process should ensure that the user receive all the necessary information to operate the building in a circular manner. 2. The design team should stay engaged to carry out post-occupancy performance evaluation and aftercare reviews. 3. Decisions made post handover about modifying the asset should follow a circularity plan, which should be guided by the adaptability details outlined in the handover documentation. 4. Ensure that there is a long term strategy in place for material passporting, including assigning responsibilities for data ownership and maintenance. 5. At the building’s end of life, prepare the deconstruction audit to the quality of material passports, to spare time and costs.</td>
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### Early Considerations RIBA Stages 0-1

**1.** When sourcing new materials for a project, the priority is to look into reusing materials instead of sourcing virgin materials. Set reuse objectives with the client.

**2.** Hold a workshop with the key stakeholders to assess the viability of the most easily reusable materials to suit the concept design and to familiarise them with materials available for reuse and their specific performance and aesthetic characteristics.

**3.** Formulate the reuse objectives with the client and the design team by the end of this stage.

**4.** Hold a workshop with the client to establish specific reuse objectives alongside environmental and circularity ambitions.

### Project Planning & Design RIBA Stages 2-4

**1.** Agree with the client on reuse objectives or targets. Please objectives, either in a quantitative or qualitative form should be included in the contractor's contract documents and used as a basis for the tender.

**2.** Once the objectives are set; engage with the contractors via workshops.

**3.** Start developing a supply strategy to source the reclaimed materials and work alongside the contractors iteratively to develop the construction details and ensure there aren't any buildability issues.

**4.** Standard specification clauses are not written with reuse being considered. It is likely you will need to edit and adapt the clauses, tailoring them towards reuse.

### Construction & Handover RIBA Stages 5-6

**1.** Prepare a method statement for the disassembly of elements together with the contractor, before the start of deconstruction. Carry out trials of deconstructing certain components to understand barriers and sensibly allocate time for deconstruction activities.

**2.** Hold regular workshops with manufacturers and the design and construction team to allow for more collaboration.

**3.** Engage the facilities management team as early as possible into the built process, for them to contribute and have a good understanding of the new build.

**4.** Encourage the contractor to start collating the O&M manual early, and provide a comprehensive document that captures specific information on building elements, including deconstruction or any existing end of life interest from suppliers or customers.

**5.** At handover, hold workshops with the client explaining the format and information included in the material passports and other documentation produced. Ensure the client/building management can monitor and modify the information contained in the passports so that the documentation can be updated in case of maintenance works during the assets life.

### In Use & End of Life RIBA Stage 7

**1.** At this stage of works, ideally, an end-of-life strategy is already in place (e.g. leasing agreements, pre-agreed take back programmes). For building components with no end-of-life agreements. If for certain elements there was no agreement during procurement, re-engage with the product manufacturer during the use phase of the building to develop and end-of-life strategy for the building element together.

**2.** During the use phase of the building, ensure that there is a digital data management strategy that assigns responsibilities for data ownership and maintenance long-term.

**3.** Ensure retrofitted parts are modelled in detail to enable future reuse.

**4.** Improve the detail of pre-deconstruction audits to be material passport quality.

**5.** Do not overlook the carbon savings that smaller reuse opportunities (e.g. finishes or interior elements) offer.

**6.** Re-evaluate any existing storage plan for future reuse scenarios.