

Wst06

Design for disassembly and adaptation

Objective:

To avoid unnecessary materials use, cost and disruption arising from the need for future adaptation works as a result of changing functional demands and to maximise the ability to reclaim and reuse materials at final demolition in line with the principles of a circular economy.

Actions:

- i. Undertake a study of **functional adaptability** and **ease of disassembly** including project recommendations
- ii. Review the implementation of the study recommendations
- iii. Produce a building **adaptability and disassembly guide**

i. Functional adaptability and ease of disassembly study

The **functional adaptability** and **ease of disassembly** study should explore the ease of disassembly and the functional adaptation potential of different design scenarios and be completed prior to the **end of RIBA Stage 2**. The study must include the following as a minimum:

Functional adaptability

Feasibility: The likelihood to contain multiple or alternative building uses, area functions and different tenancies over the expected life cycle, e.g. related to the structural design of the building.

Accessibility: Design aspects that facilitate the replacement of all major plant within the life of the building, e.g. panels in floors and walls that can be removed without affecting the structure, providing lifting beams and hoists. Accessibility also involves access to local services, such as local power, data infrastructure etc.

Versatility: The degree of adaptability of the internal environment to accommodate changes in working practices.

Adaptability: The potential of the building ventilation strategy to adapt to future building occupant needs and climatic scenarios.

Convertibility: The degree of adaptability of the internal physical space and external shell to accommodate changes of in-use.

Expandability: The potential for the building to be extended, horizontally or vertically.

'Refurbishment potential': The potential for major refurbishment, including replacing the façade.

Note: This document is intended as guidance only. Consult your BREEAM AP or Assessor to ensure compliance is achieved.

Ease of disassembly

Accessibility: (see functional adaptability).

Durability: use materials which require less frequent maintenance, repair or replacement, considering them within the context of the life span of the building.

Exposed and reversible connections: making the connections more visible provides opportunities to optimise material and product reuse. Welded connections prohibit disassembly and it is preferable to use screws and bolts to allow for disassembly and material reuse.

Layer independence: designing building systems and components in layers so that removal, adjustment or replacement of some elements is feasible, especially when different components have different life spans and maintenance needs.

Avoidance of unnecessary toxic treatments and finishes. Some finishes can contaminate the substrate in a way that they are no longer reusable or recyclable. This should be avoided unless finishes serve a specific purpose.

Standardisation can accommodate reuse and upgrading. It involves aspects such as dimensions, components, connections and modularity.

ii. Implementation

At **RIBA Stage 4**, an update should be provided on how the recommendations or solutions proposed in the original study have been implemented where practical and cost effective. Any omissions need to be **justified** within the report.

If there are any **updates** to the recommendations and solutions during the development of RIBA Stage 4, these should be documented.

The implementation will be specific to the building and scope of the project, but information should be made available to the assessor covering:

- **Options** for multiple building uses and area functions based on design details, e.g. modularity.
- **Routes and methods** for major plant replacement, e.g. networks and connections have flexibility and capacity for expansion.
- Accessibility for local plant and service **distribution routes**, e.g. detailed information on building conduits and connections infrastructure.
- The potential for the building to be **extended**, horizontally or vertically.

iii. Adaptability and disassembly guide

Produce a building **adaptability and disassembly guide** to communicate the characteristics allowing functional adaptability and disassembly to prospective tenants.

This should include only the recommendations which are relevant to, and have been implemented within, the final building design. The guide is intended to provide future owners and tenants with basic information to aid any desired change of use or disassembly of the building.

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Examples of design measures allowing future adaptation:

	Accessibility	Spatial adaptability	Expandability
Fabric and structure: <ul style="list-style-type: none"> - External walls - Cladding - Ground and first floor - Roof 	Use of products or systems which allow easy replacements	Location of structural components within the floor space	Provision to add extensions or alterations to increase building capacity
Core and local services: <ul style="list-style-type: none"> - Mechanical and electrical - Plumbing - Stairs and lifts - Fire 	Inclusion of facilities management requirements and construction design management feedback for future operational needs		Provision of capacity in infrastructure to enable future expansion and adaptation
Interior design: <ul style="list-style-type: none"> - Finishes - Floors - Interior walls - Connections 	Use of products or systems which allow easy replacements	<ul style="list-style-type: none"> - Layout in standardised grids - Use of inherent finishes to allow replacement - Use of standardised material sizes 	<ul style="list-style-type: none"> - Identifying or recognising potential future functional requirements - Efficient use of space to allow for any increase in occupancy

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Examples of design measures allowing future disassembly:

Principles for disassembly	Examples of design measures and aspects to consider
Durability	<ul style="list-style-type: none"> - Durability of different building elements based on warranties and risk of being broken during disassembly - Consider building elements within the context of the building life span and the building sector - Use of temporary structures when a short life span is expected
Exposed and reversible connections	<ul style="list-style-type: none"> - Exposed and reversible connections facilitate disassembly - Consider space availability between building elements when aiming to accommodate disassembly - Poured and welded connections are likely to harm components and prevent disassembly
Layer independence	<p>Layers standing independently, especially when components have different lifespans.</p> <p>The following principal layers can be identified as follows:</p> <ul style="list-style-type: none"> - Structure: foundation and load-bearing elements - Skin: exterior surfaces - Services - Space plan: the interior layout - Furnishings and carpets
Standardisation	<ul style="list-style-type: none"> - Standard-size materials can accommodate multiple uses, reuse and upgrading - Standard types of connections can be separated and reused more easily - Modularity allows elements to be slotted together or taken apart to promote disassembly and flexible environments

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