Let's Design Out Waste!

Well-considered design choices that extend the service life of buildings and close material flows are an important lever for the transition to a circular building economy.

These cards bring together the insights of designers, researchers and organisations from Brussels and beyond on designing buildings that are ready for change and circularity. They present concrete circular design approaches, concepts and qualities. With their open structure, they are a must-have at any design table.

Closed material flows provide environmental savings while the lasting value of buildings brings economic benefits. But these design qualities also offer other opportunities. Find out more in the related booklets and on our website.

www.vub.be/arch/circulardesign

LE BATI BRUXELLOIS SOURCE DE NOUVEAUX MATERIAUX

VUB ae ARCHITECTURAL ENGINEERING

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Approaches

To shift the built environment and construction sector towards a circular practice, designers and clients can take some basic approaches. Do you design for longevity, disassembly and reuse?

01
DESIGN FOR LONGEVITY

02
DESIGN FOR DISASSEMBLY AND DECONSTRUCTION

03
DESIGN FOR REUSE

Concepts

In past and present design practices, a variety of design concepts combine circular design qualities, tailored to a specific project context. Make yourself familiar with the most typical ones.

01
PACE-LAYERING

02
KIT-OF-PARTS

03
BUILDINGS AS MATERIAL BANKS

Qualities

Circular design qualities enable more effective reuse, recycling or renewal of buildings and building components. Walk through them and set your ambitions from the start of the project.

01
REUSED

Use building parts and components already present on site or reclaimed elsewhere.

02
RECYCLED

Look for building components made of low-value by-products or waste materials.

03
RENEWED

Use materials that are replenished continuously by responsible agriculture and forestry.

04
COMPOSTABLE

Choose materials that can be degraded into natural substances biologically.

05
SAFE AND HEALTHY

Use components that do not harm the environment or humans during their use, reuse or recycling.

06
PURE

Prefer components that consist of a single material instead of a blend.

07
DURABLE

Use components that resist the wear and tear of use and reuse.

08
SIMPLE

Go for low-tech, legible solutions rather than complicated ones.

09
MANAGABLE

Design building components that can be grabbed, moved and handled easily.

10
ACCESSIBLE

Integrate components so they can be reached and recovered without much effort or damage.

11
REVERSIBLE

Make it possible to undo connections without damage to the components they join.

12
INDEPENDENT

Assemble components so they are structurally, functionally and geometrically separated.

13
COMPATIBLE

Use building components that can be interchanged and (re)combined.

14
MULTI-PURPOSE

Design buildings and spaces that support changing needs and requirements without alterations.

15
VARIED

Introduce diversity rather than a one-fit-all solution.

16
LOCATION AND SITE

Recognise and develop the qualities of a place responsibly.

Building a Circular Economy
Design Qualities to Guide and Inspire
Building Designers and Clients

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Reusing building parts and components extends their service life, avoids them to be wasted and reduces resource consumption. On-site reuse could also diminish transport and local nuisance.

Pace-layering is a design concept that organises building components with a different durability in separate layers. Organising these layers in such a way that a layer with components of a shorter service life is independent from, and more accessible than, a layer with components with a longer life span, allows preserving the components' integrity during subsequent alterations.

In a circular design and construction practice, one can avoid new construction and review and revalue, upgrade and refurbish what already exists. Several architectural qualities keep a building's value up over time, facilitating maintenance and repair, while enabling current and future service life extensions. They include strategic qualities, for example the asset's location, but also spatial qualities such as a multi-purpose lay-out.

Through biological reproduction some materials are almost infinitely available. Many renewed materials also act as a temporary storage of the greenhouse gas carbon dioxide and could be biodegraded.

Recycling supports the reduction of construction's impact on the environment by reducing the use of virgin resources and decreasing waste incineration and landfill.

Designing buildings as material banks approaches the built environment as a stockpile of valuable components, waiting to be reclaimed whenever the building that hosts these components becomes obsolete. To enable the reuse of building components, it is necessary to use durable materials, keep the overall design simple and make connections as reversible as possible.

Kit-of-parts is a design concept that proceeds from systems of durable, multi-purpose, compatible and manageable building components, like Meccano toys. Those components are shaped according to a set of dimensional standards and assembled in a reversible way, optimising their production and construction process, facilitating their stock management and increasing their reuse potential.

To reduce the consumption of virgin, non-renewable resources, reclaimed building components and materials can be used again, repaired, remanufactured or recycled. Building components and materials should for example be safe and healthy to reuse or pure to recycle.

To close material flows, components and materials must be reclaimed without damage to maintain their value, facilitate their processing and minimise waste. Therefore, various technical design qualities are key factors. They relate to design choices about, for example, the durability of components, their independent assembly and the reversibility of their connection.

What's in It for Me?

These cards challenge us. They do so in view of future-proof buildings and a circular economy. Walk with the design team through these four steps, and formulate a clear-cut answer.

1. Analyse the assignment and context and select the most appropriate design approach. Do you design and build for longevity, disassembly or reuse?
2. Select the design qualities that flesh out the chosen approach. Review them and determine your ambitions from the start of a project.
3. Bring your choices together in a concise concept. Does pace layering or buildings as material banks mean something to you? Or do you have your own concept at hand?
4. Find out what the role of the two other approaches could be, and use them for specific building components or design aspects. Select the corresponding qualities and concepts.

Also engage with product developers and manufacturers on the basis of these circular design cards. Evaluate together the use and reuse potential of their products and redirect where necessary.

Finally, circular design qualities also provide clients, both private individuals and professionals, with circular approaches and concepts that can help determine design ambitions and needs.

Reversible connections enable selective disassembly and recovery of building parts. Eventually, purer material flows also make recycling and biodegradation more efficient.

Accessible components can be reached and recovered faster without being damaged or damaging components that sit around them. Furthermore, accessibility encourages efficient repair, replacements and adaptations.

Manageable components simplify building adaptations and increase the feasibility of take-back programs and return logistics. This practicability is crucial to make component reuse financially competitive with wasteful replacements.

Simple solutions are easy to understand, apply and adapt. They facilitate and speed up the recovery of building components and encourage their maintenance, repair and reuse.

Durable components withstand intensive use as well as repeated disassembly and reconstruction. Keeping their value over time, it is more likely that these components will be used again.

Mono-material components require less processing before recycling or biodegradation. Their purity increases the time and energy efficiency of closing their material loop.

Selecting components that are safe and healthy throughout their use and end-of-life processing facilitates their future reuse, remanufacturing and recycling, effectively closing the related loops.

At their end-of-life, building components of compostable materials are not wasted but can be converted again into water, carbon dioxide and biomass. The organic material can then be reused or disposed responsibly.

A well-located and qualitative site remains attractive and valuable over time. Buildings on these sites have higher chances to be maintained and redeveloped in the future.

A varied built environment allows users to relocate themselves rather than refurbish or replace their buildings to fulfil changing needs. This way, those buildings' service life is extended, and their components are reused.

A multi-purpose design avoids obsolescence and makes time and material intensive refurbishments unnecessary, extending the service life of buildings and building parts.

Compatibility increases the possibility to recombine and reuse components time and again. Possibly, compatibility also makes it easier to find spare parts and thus facilitates repair.

Independence of components allows to disassemble one component without removing another, simplifying its recovery for reuse. Independence also facilitates efficient repair, replacements and adaptations.

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This document could be further developed and updated as new insights become available. The authors do not warrant that the content of this booklet is accurate, complete or up-to-date. Instead, readers are invited to share their suggestions and insights on www.vub.be/arch/circulardesign.

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