



TEC1.6

# Ease of recovery and recycling

## Objective



Our objective is to ensure highly economical and efficient use of natural resources. Accordingly, we promote solutions that enable pre-existing value to be made reusable with a minimum of loss. In accordance with our goal of reducing the amount of primary resources required for construction and maintenance of buildings to virtually nothing, we strive to create a strategy to increase the current level of material efficiency – the purpose of which is to enable materials to be recycled with effectively no losses, in conjunction with a significant reduction in the materials used. To this end, the "Ease of recovery and recycling" criterion aims to address one of the most important issues for the DGNB: Creating a "Circular economy" that enables participants and users to reduce consumption of natural resources to a minimum and ideally to completely avoid consumption of natural resources, in order to ensure that once we have used resources for our own purposes, they will continue to be available to future generations to the highest extent possible – enabling those generations to develop in a way that ensures their well-being.

## Benefits

Building owners who implement reductions in the use of materials in their buildings can benefit from reduced costs even during the construction phase. In turn, users enjoy positive effects in the operating phase – with in some cases significantly lower costs and effort required for modernisation work as well as for maintenance, repair and above all conversion measures. The long-term objective of this criterion – which requires in-depth knowledge regarding the materials used in buildings – enables buildings to be considered as means of "storing" raw materials, and for building owners to plan buildings as a lucrative store of future value for themselves.

## Contribution to overriding sustainability goals



	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY	
 <b>Significant</b>	8.4	Global resource efficiency and decoupling economic growth	8.1	Resource conservation
	12.2	Use of natural resources		
	12.5	Reducing and eliminating waste		
 <b>Moderate</b>	12.4	Environmentally friendly handling of chemicals and waste		



## Outlook

The recycling paths of material groups are continuously changing, for instance due to process and equipment costs, achievable prices and the recycling path margins. Recycling logistics and recycling plants for a large range of material flows are still in testing or development – while new technologies are being continuously further developed. The associated evaluation tool with example assignments of (construction) materials to the recycling paths that are currently applied as standard is therefore subject to constant adjustments. In addition, as standards or reliable parameters for avoiding use of materials in conventional building components are applied with increasing frequency, it can be assumed that quality levels will increase ever further in future.

## Share of total score

	SHARE	WEIGHTING FACTOR
Office Education Residential Hotel	2.5%	4
Consumer market Shopping centre	2.9%	4
Department stores		
Logistics Production	2.7%	4
Assembly buildings	2.6%	4



## EVALUATION

Solutions that use the current recycling paths of construction materials as a benchmark can be used to select construction materials that are easy to recycle (indicator 1). These recycling paths are assigned to "quality levels" (QL). Points for the use of reused and reusable building components and the avoidance of building components are awarded separately via two specific circular economy bonuses. If the building structure is intended to be easy to recover, this can be described via the ease of disassembly and ease of separation of the building components in terms of material types contained as far as possible (indicator 2). The evaluation of the construction materials and design solutions used with regard to these two indicators should be applied to the majority of the Standard Building Components (SBC) used on a regular basis. In addition, an incentive is established for using evaluation methods that focus on recycling and recovery as part of the planning process for the building (indicator 3). In this criterion, a maximum of 100 points can be achieved in total without bonuses, or a maximum of 130 points including bonuses.

NO.	INDICATOR	POINTS	POINTS	POINTS
<b>1</b>	<b>Ease of recycling</b>			<b>Max. 20</b>
1.1	<b>Selection of easy-to-recycle construction materials</b> <b>Building components (relevant reference values)</b>	60% of the SBC at least in QL1	Upgrading to QL1: Per SBC, >10% in QL2 in addition <sup>1</sup>	60% of the SBC at least in QL2
	<b>External walls (m<sup>2</sup>)</b>			
	Non-load-bearing or prefabricated (External walls, parapets, infillings; Prefabricated façade units, consisting of external walls, windows, doors, claddings)	<b>+0.5</b>	+0.5	<b>+2</b>
	Cladding units of external walls (External claddings of external walls and columns), including plaster coats, damp-proofing, insulating and protective layers	<b>+0.5</b>	+0.5	<b>+1</b>
	Internal linings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers	<b>+0.5</b>	+0.5	<b>+1</b>
	External doors and windows (Windows and display windows, doors and gates, including sills, frames, fittings, actuating systems, ventilation components and other built-in elements)	<b>+0.5</b>	+0.5	<b>+1</b>
	<b>Internal walls (m<sup>2</sup>)</b>			
	Non-load-bearing or prefabricated (Internal walls, infills; sectional walls, consisting of internal walls, doors, windows, claddings, e.g. folding and sliding walls, sanitary partitions, crates)	<b>+0.5</b>	+1.5	<b>+4</b>
	Internal linings (of internal walls) (Claddings including plaster, sealing, insulating, protective layers on interior walls and columns)	<b>+0.5</b>	+1.5	<b>+4</b>

<sup>1</sup> Applicable up to the maximum number of evaluation points, as in the column "60% of the SBC at least in QL2"



NO.	INDICATOR	POINTS	POINTS	POINTS
	Internal doors and windows (Doors and gates, windows and shop windows including frames, fittings, drives and other built-in elements))	+0.5	+1	+3
	<b>Floors and ceilings (m<sup>2</sup>)</b>			
	Floorings (Coverings on floors, including screeds, damp-proof courses, insulating and protective layers, wearing surfaces; false floors for services and floating floors)	+1	+2	+6
	Ceiling linings (Linings of ceilings, including plastering, damp-proof courses, insulating and protective layers; false ceilings for lighting and other services)	+1	+1	+5
	<b>Roofs (m<sup>2</sup>)</b>			
	Roof coverings (Coverings on roof structures including formwork, battens, slope, sealing, insulating, protective and wearing courses; drainage of the roof surface until connection to the drainage systems)	+0.5	+0.5	+1
	Roof linings (Roofing under roof structures including plaster, sealing, insulating, protective coatings; light and combination ceilings under roofs)	+0.5	+0.5	+1
	<b>Load-bearing structures (m<sup>2</sup>)</b>			
	Load-bearing external walls (Load-bearing external walls, including horizontal damp-proofing)	+0.5	+1.5	+4
	External columns (Columns and pillars with a cross-sectional ratio <1: 5)	+0.5	+0.5	+1
	Load-bearing internal walls (Load-bearing internal walls including horizontal seals)	+0.5	+1	+3
	Internal columns (Columns and pillars with a cross-sectional ratio <1: 5)	+0.5	+0.5	+1
	Floor structures (Floors, stairs, ramps, balconies, loggias, including suspender beams and joists, and infill elements such as hollow blocks, false floors, fills, but not including coverings and linings)	+0.5	+1.5	+4
	Roof structures (Constructions of roofs, trusses, space structures and Domes including over and undercarriages, filling parts such as hollow bodies, blind floors, fillings, but without coverings and claddings)	+0.5	+1	+2
	<b>Foundations (m<sup>2</sup>)</b>			
	Shallow or deep foundations (Single-, strip foundations, foundation plates; pile foundations including grates, well foundations;	+0.5	+0.5	+1



	anchorages)			
	Subsoil and base slabs and sealing of buildings (Subfloors and floor slabs, which do not serve the foundation; seals of the building including filter, separation and protective coatings)	<b>+0.5</b>	+0.5	<b>+1</b>
	Floorings (Coverings on floor and foundation slabs, e.g. screeds, sealing, Insulation protection, wear layers)	<b>+0.5</b>	+0.5	<b>+1</b>
<b>NO.</b>	<b>INDICATOR</b>			<b>POINTS</b>

Re 1.1	<b>INNOVATION AREA</b> Explanation: measures that are outside of the scope of analysis as defined above (building components, see above) or do not currently fall within the definition of the quality levels, but nevertheless contribute significantly to achievement of the objective, can be taken into account in indicator 1.1 in accordance with the evaluation logic applied above (adequate mass and replacement relevance over the reference period).			As in 1.1
1.2	<b>CIRCULAR ECONOMY BONUS – REUSE OR MATERIAL RECOVERY</b> Explanation: the circular economy bonus – reuse or material recovery is achieved for each Standard Building Component (SBC) > 10% if building components are reused or there is documentation of material recovery to create a comparable product (recycling path no. 2 and no. 3 in accordance with Table 1). Points can be awarded in addition to QL2			+20 (+1 per SBC)
1.3	<b>CIRCULAR ECONOMY BONUS – AVOIDING USE OF building COMPONENTS</b> Explanation: The circular economy bonus – avoiding use of building components is achieved for each Standard Building Component (SBC) > 10% if the solution plausibly and demonstrably avoids the use of raw materials or secondary materials to a significant degree. Points can be awarded in addition to QL2. Alternatively, the points can be awarded in indicator 1.1 for each structural element not used.			+10 (+1 per SBC)
<b>NO.</b>	<b>INDICATOR</b>	<b>POINTS</b>		<b>POINTS</b>

<b>2</b>	<b>Ease of recovery</b>			<b>Max. 70</b>
2.1	<b>Easy-to-recover building structure</b>	60% of the SBC		60% of the SBC at
	<b>Building components (relevant reference values)</b>	at least in QL1		least in QL2
	<b>External walls (m<sup>2</sup>)</b>			
	Non-load-bearing or prefabricated (External walls, parapets, infillings; Prefabricated façade units, consisting of external walls, windows, doors, claddings)	<b>+0.9</b>		<b>+5</b>
	Cladding units of external walls (External claddings of external walls and columns, including plaster coats, damp- proofing, insulating and protective layers);	<b>+0.9</b>		<b>+3.3</b>
	Internal linings of external walls and columns, including plaster coats, damp-proofing, insulating and protective layers	<b>+0.9</b>		<b>+3.3</b>
	External doors and windows	<b>+1.7</b>		<b>+3.3</b>



(Windows and display windows, doors and gates, including sills, frames, fittings, actuating systems, ventilation components and other built-in elements)

**Internal walls (m<sup>2</sup>)**

Non-load-bearing or prefabricated **+2.5** **+10**

(Internal walls, infillings; sectional walls, consist of internal walls, doors, windows, claddings, e.g. folding and sliding walls, sanitary partitions, crates)

Internal linings (of internal walls) **+1.7** **+10**

(Claddings including plaster, sealing, insulating, protective layers on interior walls and columns)

Internal doors and windows **+2.5** **+10**

(Doors and gates, windows and shop windows including frames, fittings, drives and other built-in elements)

**Floors and ceilings (m<sup>2</sup>)**

Floorings **+3.3** **+15**

(Coverings on floors, including screeds, damp-proof courses, insulating and protective layers, wearing surfaces; false floors for services and floating floors)

Ceiling linings **+3.3** **+15**

(Linings of ceilings, including plastering, damp-proof courses, insulating and protective layers; false ceilings for lighting and other services)

**Roofs (m<sup>2</sup>)**

Roof coverings **+0.9** **+3.3**

(Coverings on roof structures including formwork, battens, slope, sealing, insulating, protective and wearing courses; drainage of the roof surface until connection to the drainage systems);

Roof linings **+0.9** **+3.3**

(Roofing under roof structures including plaster, sealing, insulating, protective coatings; light and combination ceilings under roofs)

Re 2.1 **INNOVATION AREA**

Explanation: measures that are outside of the defined scope of analysis (building components, see above) or do not currently fall within the definition of the quality levels, but nevertheless contribute significantly to achievement of the objective, can be taken into account in indicator 2.1 in accordance with the evaluation logic applied above (adequate mass and replacement relevance over the reference period).



As in 2.1

NO. INDICATOR

POINTS

**3 Ease of recovery, conversion and recycling in the planning process**

**3.1 Recovery, conversion and ease of recycling in the early planning phases**

**Max. 10**

Evaluation methods for the ease of recovery and recycling are used in early service phases (1–3) to optimise the resource efficiency (including for possible conversion work).

**+5**

**3.2 Recovery, conversion and ease of recycling in the detailed design process**

Evaluation methods for the ease of recovery and recycling are used in the approval or

**+5**



detailed design service phases (4–5) to optimise the resource efficiency (including for possible conversion work).



## SUSTAINABILITY REPORTING AND SYNERGIES

### Sustainability reporting

Based on the evaluation, the share of building components with materials selected for ease of recycling, the share of building components that are easy to recover and the intended recycling and recovery quota for the entire building structure can be used as key performance indicators (KPI) for communication. Application of the criteria and calculation basis can be used in part for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators" (information regarding the EU framework is available under the [T&D\_02] chapter).

NO.	KEY PERFORMANCE INDICATORS (KPIs)	UNIT
KPI 1	Share of building components with materials selected for ease of recycling = sum of the shares of building components as a proportion of the corresponding reference value share in QL 2 or circular economy bonus – reuse or material recovery.	[% reference quantity share]
KPI 2	Share of building components that are easy to recover = sum of the shares of building components as a proportion of the corresponding reference value share in QL 2.	[% reference quantity share]
KPI 3	Intended recycling and recovery quota for the entire building structure = in accordance with the German Recycling Law (KrWG) (Section 14, 3), the percent by weight of the entire building structure that can be allocated to recycling paths 2, 3, 4, 5 and 7.	[% weight share]
KPI 4	Level(s) Indicator 2.2 "Life cycle scenarios" – Use of the DGNB criterion TEC1.6 in the planning process	[-]

### Synergies with DGNB system applications

- **DGNB RENOVATED BUILDINGS:** Indicators 1 and 2 correspond in large part to the indicators in criterion TEC1.6 from the scheme for renovated office and administrative buildings (version 2016).
- **DGNB INTERIORS:** Indicators 1 and 2 correspond in large part to the indicators in criterion TEC1.6 from the scheme for interiors.





## APPENDIX A – DETAILED DESCRIPTION

### I. Relevance

The core elements of the approach are clearly defining and assigning product responsibilities, for example for materials, construction products and systems used, etc., as well as demonstrating planning solutions that positively affect the ease of recovery and recycling of the building. High ease of recycling is a tangible sustainability quality, as it positively affects multiple important dimensions of sustainability (life cycle assessments, environmental impacts, operating costs, etc.). In accordance with the UN sustainable development goal 12 “Ensure sustainable consumption and production patterns”: by 2030, sustainable management and efficient use of natural resources alongside with the substantial reduce of waste generation through prevention, reduction, recycling and reuse have to be achieved by 2030 and already by 2020, environmentally sound management of chemicals and all wastes throughout their life cycle have to be implemented. The objective of this criterion should be considered in terms of this context.

### II. Additional explanation

Due to the high average expected lifetime of buildings and its components, many of the materials used in construction today will only become demolition material or potential waste 50 or 100 years in the future. The construction sector therefore constitutes a form of large-scale, anthropogenic temporary storage. It is therefore an important resource for future construction materials and should not be used as a temporary disposal site for future waste products.

The objective of increasing the ease of recovery and recycling is to conserve natural resources and reduce waste, specifically by reducing the quantity and harmfulness of waste. This criterion fundamentally considers the building or its relevant **component** elements in terms of design and materials. The materials level focusses the potential for resource efficiency. It is important here to pursue the objective of reducing the use of primary raw materials in the construction planning phase itself, and to prefer recyclable materials when selecting construction materials. It is important to ensure that recycled material can be extracted at a high level of quality and sorted into its containing material types as far as possible during demolition of a building. As part of a constructive approach, it is important to demonstrate that building components can be removed, and no distinction is made between doing so at the construction site or in the factory. In addition, the connections for building components on the support structure must be designed to enable the building components to be easily removed.

The end-of-life phase and obvious conversion phases must be taken into account in the planning of buildings.

When doing so, the following four aspects must be considered:

- **1. Materials level:** selection of easy-to-recycle construction materials.  
The objective is to enable recovery of demonstrably recyclable materials at the end-of-life of the construction materials used. In some circumstances, additives and coatings may adversely affect the recyclability.
- **2. Design level:** easy-to-recover building structure.  
The objective here is to plan the dismantling of building components and construction products. Easy dismantling of construction products or entire building components enables better reuse or continued use of building components  
– or the recycling of materials via recovery at the construction site or in the factory. Furthermore, an easy-to-recover building structure increases the ease of repair during the life stage of the building.



### ■ 3. Planning responsibility

Designers should take issues regarding dismantling and recycling into account and actively discuss these with their building owners early in the selection process for construction materials and construction products. This provides a huge benefit for the building in the operating phase. If the selection process for the solutions is not carried out with these issues in mind, the building owner should be proactively informed of this by the planning team.

A corresponding list of the "not easy-to-recycle" structural elements should be provided to the building owner, supplemented by a list of the structural elements installed that are easy to recycle, if applicable.

### ■ 4. Product responsibility

The manufacturers or companies contracted to provide services should supply adequate confirmation that their products, building components or services meet the requirements of the quality levels in the indicators defined below. For the "reuse" recycling path, take-back obligations or documentation of business models that provide for temporary transfer of products for fulfilling functions in the building (e.g. leasing of products "as a service") should be provided by manufacturers.

## III. Method

This criterion is divided into three indicators:

**Indicator 1: Selection of easy-to-recycle construction materials**

**Indicator 2: Easy-to-recover building structure**

**Indicator 3: Ease of recovery, conversion and recycling in the planning process**

In order to narrow the scope of verification, the evaluation should only be carried out for the relevant "Standard Building Components" (SBC).

- **Standard Building Components (SBC)** are, for the purposes of this criterion, building components with essentially identical structure or construction.
- **Scope of coverage** for Standard Building Components: for evaluation of a building component group, at least 60% of the relevant reference value for the building component group in question must be covered (see above detailed list under the chapter - Evaluation, where structural building components evaluated on main and the sub levels).
- **Relevance of a Standard Building Component for upgrading from QL1 to QL2** (only applicable to indicator 1): Standard Building Components that are evaluated in accordance with a higher quality level than the rest of the building component group can upgrade the evaluation of the building component group via awarding of extra points, up to the maximum possible number of evaluation points for quality level 2. The evaluation should only be upgraded if the Standard Building Components constitute at least a 10% share of the reference value of the corresponding building component group. Moderate downward deviations from this 10% rule are possible if it is confirmed that particularly innovative solutions or solutions that are particularly effective for fulfilling the intent of this criterion are implemented.

For evaluation purposes, the building component groups are divided into three general groups that – in accordance with their typical frequency of replacement and area relevance – are awarded points weighted accordingly:



- Primary construction/structure, frequency of replacement assessed once (assumed typical frequency of replacement = 0 x per 50 years)
- Enveloping surfaces, frequency of replacement assessed twice (assumed typical frequency of replacement = 1 x per 50 years)
- Fittings, frequency of replacement assessed five times (assumed typical frequency of replacement = 4 x per 50 years)

This assessment includes only the structural building components without building technical components (detailed list of structural components shown at the beginning of this document under the Evaluation chapter). An "essentially identical structure" exists where the materials and elements used and the composition of the building component are identical. The number, volume or mass of the material or element in question found within the building component can vary (examples: External wall structures with different insulation thicknesses but identical structure, or interior doors with identical construction but different opening dimensions, can each be evaluated collectively). All materials and elements in the structure of a Standard Building Component must always be taken into account, regardless of their number, volume or mass, i.e. paints, coatings and adhesives are also relevant. Connecting elements for other building components that are not part of the structure of the Standard Building Component (e.g. skirting boards) do not need to be taken into account. The "relevant reference value" is the assessment parameter normally used for the building components on the sub level (Appendix 1, of the criterion ECO1.1 is also provides a comprehensive list of the structural building components on the main and sub levels) for example: Base slabs, external walls, internal walls, ceilings and roofs in m<sup>2</sup>; supports, windows, internal doors in units, etc.. If relevant building component groups are not found in the building, the points are awarded with no documentation of content for QL2 – or can be awarded in accordance with the circular economy bonus – avoiding use of building components.

For guidance and facilitate purposes and also for the evaluation of this criterion, DGNB provides a "TEC1.6 calculation tool". This tool shows examples – for selected building component groups and will facilitate the calculation process to support DGNB Auditors and Consultants.

### **Indicator 1: Ease of recycling of selected construction materials**

The intended objective is for construction materials for building components to be selected with recycling in mind. Building component groups are defined as building components on the sub level of the structural building components in accordance with the list provided under the Evaluation chapter above, or Appendix 1 of the criterion ECO1.1. The relevant building component groups that can be evaluated separately (if available) and must be taken into account for this indicator are:

#### External walls

- Non-load-bearing or prefabricated external walls
  - Cladding units and internal linings of load-bearing and non-load-bearing external walls or prefabricated external walls
- External doors and windows

#### Internal walls:

- Non-load-bearing or prefabricated internal walls
  - Internal linings of load-bearing and non-load-bearing internal walls
- Internal doors and windows

#### Floors and ceilings:

- Floorings
- Ceiling linings

#### Roofs:

- Roof coverings and roof linings



#### Load-bearing structures:

- Load-bearing external walls
- External columns
- Load-bearing internal walls
- Internal columns
- Floor structures
- Roof structures

#### Foundations:

- Shallow foundations or deep foundations
- Subsoil and base slabs and sealing of buildings
- Floorings for subsoil and base slabs

### Evaluation of indicator 1

An evaluation of the specified building component groups on the sub level of the structural building components (without building technical components) can be carried out, if an identical quality level should be assigned to the Standard Building Components. Load-bearing building component groups must be evaluated in accordance with the structural element group, "Structure" or "Foundations", they are assigned to.

If 60% of the Standard Building Components within a building component group meet the requirements, the building component group can be assigned a quality level in accordance with the table below. The construction material with the lowest recycling potential must always be used for the evaluation of each Standard Building Component.

Insignificant proportions of elements not included in the building component group such as **connections or connectors** do not need to be evaluated here, unless they significantly reduce the recyclability of the building component under evaluation in accordance with its categorisation into "quality level 2" or "circular economy bonus – reuse or material recovery" or the materials ingredients used in the elements present a justified potential risk for subsequent recovery. The connector should be taken into account in the evaluation of the building component whose recyclability is more heavily reduced by the use of the connector. If the reduction in recyclability is equal across the two building components, the connector should be taken into account in the evaluation of both building components. The use of any harmful or hazardous substances can result in severe reductions in recyclability, even if they are found in the insignificant proportions of elements not included in the building component group. For this reason, the following connections or connectors can only be excluded from the evaluation if it is documented that their implementation meets the requirements for "quality level 3" or the highest content requirements in accordance with the DGNB criterion ENV1.2 "Local environmental impact" (the line numbers correspond to the ENV1.2 criteria matrix):

- Wet-coated steel building components (line 15): use of fire protection coatings free of halogens
- Interior load-bearing wood constructions together with outward overhangs (line 28): with no chemical wood preservative
- Profiles and coverings made of aluminium and stainless steel (lines 32 and 33): without using chromium trioxide (chromium(VI)) for passivation and no lead, cadmium or chromium trioxide compounds used in the cover coating (manufacturer declaration: Lead, cadmium and chromium trioxide content < 0.1% each)
- Plastics used for surface coverings (floor and wall) as well as building components on the building envelope (resilient floor coverings made from vinyl/PVC/rubber, wall coverings such as vinyl wallpaper/laminates, skylights, plastic windows, sound insulation linings, line 35): not containing organolead, organocadmium or organostannic compounds (manufacturer declaration: content < 0.1%)
- Plastic films on roof and foundations (line 36): not containing organolead, organocadmium or



- organostannic compounds (manufacturer declaration: content < 0.1%)
- Construction products equipped with flame retardants (building services insulating materials made of EPDM/rubber/PE and wall coverings such as fibreglass wallpapers, non-woven paint substrates, non-woven decorative fabrics, etc., line 43): no chlorinated paraffins, no polybrominated biphenyls, no polybrominated biphenyl ethers and no TCEP (manufacturer declaration: content < 0.1%)
- Plastic products (plastic films for sealing external walls and roofs, wall coverings such as vinyl wallpapers/laminates, plastic windows, electrical cables, line 44): no SVHCs (manufacturer declaration: content < 0.1%)
- Construction products (products) equipped with biocides and flame retardants: chemical wood preservative on load-bearing wood constructions, wood fibre insulation boards, organic insulating materials (line 45): no boron compounds (manufacturer declaration: content < 0.1%)

It should be noted that **coatings, adhesions or additives** can also reduce or impede recyclability in accordance with "quality level 2" or the "circular economy bonus – reuse or material recovery" or present a justified potential risk for subsequent recovery. For this reason, a declaration from the manufacturer or a disposal company is always required, stating that the coatings, adhesions or additives used will not result in any reduction in the recyclability of the building component/ building sub-component/product and do not contain the harmful or hazardous substances listed below. For this reason, for the product groups specified under "connections/connectors" and, in addition, the product groups listed below, if they are included in the building component/product under evaluation as coatings, adhesions or additives, it must be documented that their implementation meets the requirements for "quality level 3" as a minimum or the highest content requirements in accordance with DGNB criterion ENV1.2 "Local environmental impact" (the line numbers correspond to the ENV1.2 criteria matrix):

- Additives in textiles and resilient floor coverings (line 6): biocidal products in accordance with 528/2012/EC, (line 7): SVHC and no chlorinated paraffins and phthalates that are toxic to reproduction (manufacturer declaration: Content < 0.1%)
- Wooden windows and internal and external non-load-bearing wood building components (e.g. façade and patio, line 30): No chemical wood preservative or only with marketable biocidal products in accordance with 528/2012/EC

In cases where further (e.g. technical) development of the normal recycling path counteracts the reduction in recyclability specified above and a manufacturer can demonstrate this to the DGNB accordingly for its products, this requirement does not apply for that specific case.

### Definitions and quality levels for indicator 1

- Structural element group: the sum of all elements that can be summarised in a building component group on the main level  
(e.g. all external walls)
- Structural element: An assembled element that can be specified in a building component group on the main level  
(e.g. an external wall type)
- Building component group: the sum of all elements that can be summarised in a building component group on the sub level  
(e.g. all cladding units)
- Building component: an assembled (where applicable) element that can be specified in a building component group on the sub level  
(e.g. a cladding unit type)



- Building sub-component: a sub-element of a building component  
(Construction) product: any product that is permanently installed into the building or parts thereof

**TABLE 1:** RECYCLING AND DISPOSAL PATHS

NO.	RECYCLING AND DISPOSAL PATHS	DESCRIPTION	QUALITY LEVEL
1	<b>Avoidance</b>	Parts that are normally used as standard in a structural element are not used, or significantly fewer structural elements are used for an entire building component group than is normally considered to be standard for the specific use. Example: no ceiling covering, no upper surface covering.	<b>CE bonus – avoiding use of building components</b>
2	<b>Reuse</b>	The building component/building sub-component/construction product remains unchanged in the building (for the Renovated buildings scheme) or is (after minimal retrofitting) already reused. Alternatively: a take-back guarantee or leasing system exists for the building component/building sub-component/construction product.	<b>CE bonus – reuse or material recovery</b>
3	<b>Material recovery to create a comparable product</b>	With currently available technology, the material in the building component/ building sub-component/construction product can predominantly be reused, providing an equivalent building component/ building sub-component/construction product. Alternatively: a take-back guarantee or leasing system exists for the building component/ building sub-component/construction product.	<b>CE bonus – reuse or material recovery</b>
4	<b>Material recovery in building construction</b>	With currently available technology, the material of the building component/ building sub-component/construction product can predominantly be recovered, enabling it to be used for production of a new building component/ building sub-component/construction product for building construction.	<b>QL 2</b>
5	<b>Material recovery</b>	With currently available technology, the building component/ building sub-component/construction product can predominantly be used as a secondary raw material for use outside of building construction.	<b>QL 2</b>
6	<b>Energy recovery</b>	With currently available technology, the building component/ building sub-component/construction product is predominantly used as a substitute fuel in a production building (e.g. a cement plant or an in-house cogeneration plant) or in a waste incineration plant, enabling recovery of its energy.	<b>QL 1</b>
7	<b>Backfilling</b>	With currently available technology, the building component/ building sub-component/construction product is predominantly used as a substitute for other	<b>QL 1</b>



8	<b>Disposal in landfill</b>	backfill materials for backfilling (residual) cavities. With currently available technology, the building component/ building sub-component/construction product is predominantly disposed of in landfills (landfill class 1, in accordance with ENV2.3 soil contamination classes).	QL 0
9	<b>Disposal as "hazardous waste"</b>	With currently available technology, the building component/ building sub-component/construction product is predominantly disposed of in class 2–3 landfills or in separate disposal facilities (in accordance with ENV2.3 soil contamination classes).	QL 0

For quality level 1 (recycling path 6 and 7) and quality level 0 (disposal path 8 and 9), the building owner must always be presented with a list of all Standard Building Components in the building allocated to these recovery and/or disposal paths. Confirmation by the building owner/client that they have received and understood this list is required.

#### **Circular economy bonus – reuse or material recovery**

If the recycling paths "reuse" or "material recovery to create a comparable product" are documented for Standard Building Components, a circular economy bonus – reuse or material recovery can be awarded for the building components in question. A maximum of 20 points can be awarded for the building for circular economy bonuses – reuse or material recovery. Every building component must meet the requirements for definition as a "Standard Building Component" in order for the bonus to be awarded.

#### **Circular economy bonus – avoiding use of building components**

If the recycling path "avoidance" is documented for Standard Building Components, specifying a plausible and clear reference scenario (standard), a circular economy bonus – avoiding use of building components can be awarded for the building components in question. A maximum of 10 points can be awarded for the building for circular economy bonus – avoiding use of building components. Every building component must meet the requirements for definition as a "Standard Building Component" in order for the bonus to be awarded.

#### **Indicator 2: Easy-to-recover building structure**

Ease of dismantling of building components is a fundamental requirement for subsequent ease of recycling. The intended objective is therefore to create a structure that can be easily dismantled. In order for the evaluation to be upgraded to a level higher than "standard", it must be documented that the Standard Building Components can be removed from the building using non-destructive methods and their layers can be separated into specific and distinct types.

The relevant building component groups that are to be taken into account for this indicator are<sup>2</sup>:

External walls:

- Non-load-bearing or prefabricated external walls
- Cladding units and internal linings of load-bearing and non-load-bearing external walls or prefabricated external walls
- External doors and windows

Internal walls:

<sup>2</sup> Detailed list of building components on the sub level available under the chapter "Evaluation" in this document



- Non-load-bearing or prefabricated internal walls
- Internal linings of load-bearing and non-load-bearing internal walls
- Internal doors and windows

Floors and ceilings:

- Floorings
- Ceiling linings

Roofs:

- Roof lights, roof openings
- Roof coverings and roof linings

A joint evaluation of the specified building component groups that comprise more than one building component group (sub level) should be carried out if an identical quality level should be assigned to them (example: Joint evaluation of non-load-bearing external walls and their internal linings and cladding units).

### Evaluation

If 60% of the Standard Building Components within a building component group meet the requirements for quality level 2, the quality level of the building component group can be upgraded in comparison to a building structure that is not explicitly easy to recover (quality level 1). The lowest quality level must be used for the evaluation of a Standard Building Component. Insignificant proportions of elements not included in the building component group (such as connections or connectors) do not need to be evaluated here.

### Definitions and evaluation levels for indicator 2

- For the purposes of this criterion, quality level 2 "easy-to-recover building structure" has been achieved if it is possible to remove the building components using non-destructive methods and the component layers can be separated into specific and distinct types or separation of the layers is not required because the individual layers/elements belong to the same (raw) material group.
- Quality level 1: Building structure that is not explicitly implemented with consideration to ensuring an easy-to-recover building structure as described above (quality level 2 – "easy-to-recover building structure"), but the building owner is aware of the possibility of recovery.
- For the purposes of this indicator, removal of building components using non-destructive methods means that it is possible to make the building component available for loss-free reuse or continued use (preparation for recycling path 2 in indicator 1). For this purpose, it must be possible to release the connections between the component and the building or adjacent building components without destroying remaining building components or building component layers.
- For the purposes of this indicator, ease of separation of building component layers into specific and separate types means that recovery of the materials is possible without limitation.

For quality level 1, the building owner/client must always be presented with a list of all relevant Standard Building Components in the building that are covered by this evaluation of ease of recovery, resulting in reduced ease of conversion/flexibility. Confirmation by the building owner/client that they have received and understood this list is required.

### Indicator 3: Ease of recovery, conversion and recycling in the planning process

The intended objective is for the planning team to tackle the issue of ease of recovery and recycling of the building structure early in the planning process. To this end, evaluation methods for the ease of recovery and recycling should be used in early planning phases and in the detailed design process to optimise the resource efficiency (including for possible conversion work).





The type of evaluation method is not specified. However, the content of the method used should support the intended objective of the criterion. The use of adequate evaluation methods in the (preliminary) draft planning phase and/or in the detailed design process must be documented for a relevant scope but not necessarily the complete scope of the building structure (e.g. definable via mass share or share of Standard Building Components, etc.).

The key criterion for assessment of this indicator is not the scope so much as documentation of the time building component.



## APPENDIX B – DOCUMENTATION

### I. Required documentation

A range of different forms of documentation is listed below. The documentation submitted must clearly demonstrate compliance with the requirements for the target evaluation for the individual indicators.

#### Indicator 1: Selection of easy-to-recycle construction materials

- As an overarching requirement, a list must be presented classifying all relevant building component groups and specifying building component layers, taking into account the definition of Standard Building Components. The "TEC1.6 calculation tool" should be used for this. The building component groups should be listed in the same way as the building components for the life cycle assessment (same as for criterion ENV1.1), including the building component layers. Accepted forms of documentation for the classification of the quality levels are appropriate declarations by the manufacturers, designers or companies contracted to provide services. In general, one declaration per Standard Building Component is sufficient.

#### Documentation for quality levels 0 and 1:

- Declaration by the/a manufacturer or a disposal company, or plausible statement by the auditor specifying a reliable external source indicating that material recovery is normal for the building component/building sub-component/product and can be carried out with currently available technology.

#### Documentation for quality level 2:

- Declaration by the/a manufacturer or a disposal company, or plausible statement by the auditor specifying a reliable external source (e.g. EPD) indicating that material recovery is normal for the building component/building sub-component/product and can be carried out with currently available technology.
- Alternatively: Certificates/labels from recognised organisations responsible for issuing standards that confirm the content requirements of the indicator (see "DGNB label recognition" on the DGNB website)

#### Documentation for the circular economy bonus – reuse or material recovery:

- For "recovery to create a comparable product", documentation is not required if an adequate recycling path is usually available in the industry. Alternatively, if it is confirmed that a take-back guarantee for building components/building sub-components/products – for the purposes of reuse or recovery to create a comparable product – is provided by the manufacturer, manufacturer documentation to that effect must be presented. For "product leasing", manufacturer documentation must likewise be presented, confirming the planned recovery or reuse of the product. Alternatively, a declaration by a "component exchange" can be presented, which confirms that the construction product will retain a high resale value in future, and that the component exchange in question would accept resale of the product at the present time.



#### **Documentation for circular economy bonus – avoiding use of building components:**

- A plausible demonstration of a standard implementation of the building component for the use (building type) must be presented. A statement by the auditor based on this demonstration is required, explaining the rationale for avoiding/not using building components.

#### **Additional documentation for quality level 2 or circular economy bonus – reuse or material recovery for building components/building sub-components/construction products with connections, coatings, adhesions or additives:**

- Proportions of elements not included in the building component group (such as connections or connectors) do not need to be described or evaluated if it is confirmed that they do not significantly reduce the ease of recycling of the building component. Compliance with the highest content requirement in accordance with DGNB criterion ENV1.2 for the product groups specified in the method can be used to provide guidance here.
- Any coatings, adhesions or additives used always require a declaration from the manufacturer or a disposal company to the effect that they do not reduce the ease of recycling of the building component/building sub-component/product via the normal recycling path, or are not included in the building component. Compliance with the highest content requirement in accordance with DGNB criterion ENV1.2 for the product groups specified in the method can be used to provide guidance here.

Examples for indicator 1 "Selection of easy-to-recycle construction materials" for quality levels 0, 1 and 2 as well as for circular economy bonuses 1 and 2 can be found in the "TEC1.6 calculation tool".

#### **Indicator 2: Easy-to-recover building structure**

- As an overarching requirement, a list must be presented classifying all relevant building component groups and specifying component layers, taking into account the definition of Standard Building Components. The "TEC1.6 calculation tool" should be used for this. The building component groups should be listed in the same way as the building components for the life cycle assessment (same as for criterion ENV1.1), including the component layers.

#### **Documentation for quality level 1:**

- No manufacturer-specific, component-specific or product-specific documentation of ease of recovery is required. However, the building owner/client must present confirmation that they have received and understood a list of all Standard Building Components in the building that are covered by this evaluation of ease of recovery, resulting in reduced ease of conversion/flexibility, and are assigned to the quality level.

#### **Documentation for quality level 2:**

- Accepted forms of documentation that the building components can be removed using non-destructive methods are appropriate declarations by the architect/structural planner, product manufacturer or company responsible for providing services. In general, one declaration per Standard Building Component is sufficient.
- Alternatively: Certificates/labels from recognised organisations responsible for issuing standards that confirm the content requirements of the indicator (see "DGNB label recognition" on the DGNB website)



Examples for quality level 2 "easy-to-recover building structure" and quality level 1 can be found in the "TEC1.6 calculation tool".

**Indicator 3: Ease of recovery, conversion and recycling in the planning process**

- Statement declaring project-specific application of evaluation methods for the ease of recovery and recycling in early planning phases to optimise the resource efficiency, including a confirmation by the auditor that the optimisation was actually carried out in the (preliminary) draft planning phase.
- Statement declaring project-specific application of evaluation methods for the ease of recovery and recycling in the detailed design phase – to optimise the resource efficiency, including a confirmation by the auditor that the optimisation was actually carried out in the detailed design phase.
- Statement declaring that the type of evaluation method used supports the intended objective of the criterion.
- Optimisations for a relevant scope but not necessarily the complete scope of the building structure must be documented (e.g. definable via mass share or share of Standard Building Components, etc.).



## APPENDIX C – LITERATURE

### I. Version

#### Change log based on version 2020

PAGE	EXPLANATION	DATE
536	General: scheme “Assembly buildings” has been added	16.09.2021
536	Shares of total score have been corrected	16.09.2021
all	Evaluation indicator 1 and 2: standard building component “external wall” has been modified / divided into the external cladding and internal lining	16.09.2021
all	Evaluation indicator 1 and 2: standard building component “Roof” has been modified / divided into the roof coverings and roof linings	16.09.2021

### II. Literature

Fundamental sources chosen from the available lists of substances and material data:

- Waste Framework Directive (2008/98/EC) revision, April 2008
- [www.wecobis.de/service/lexikon/recycling-lex.html](http://www.wecobis.de/service/lexikon/recycling-lex.html)
- Sustainable Development Goals icons, United Nations/globalgoals.org
- The need for soil protection, legislation at EU level Position paper of the German Environment Agency, October 2018
- Biocidal Products Directive (528/2012/EC) <https://echa.europa.eu/information-on-chemicals/biocidal-active-substances>