



ECO1.1

Life cycle cost

Objective

Our objective is sensible and conscious use of economic resources throughout the entire life cycle of a building. In the conception and planning phases of implementation of a building, there are areas of significant optimisation potential for later economic management. The parties involved in the planning process should regularly focus on possible follow-up costs associated with their design and implementation variants from an early stage in the planning phases.

Benefits

In addition to yields from the production and exploitation costs, the economic viability of a building depends on cost-efficient operation. To this end, the life cycle cost calculation enables the medium-term to long-term costs of a building to be taken into account. Carrying out the life cycle cost calculations and communicating them to the parties involved in planning more regularly and earlier in the planning process increases the likelihood of achieving solutions optimised for cost-efficiency in the long term. This method can also serve as a basis for determining a transparent cost comparison for buildings with similar usage and functionality, which can be used as a guide for the performance of the project under development. For this step, the life cycle cost calculation is performed on the basis of fixed parameters in accordance with defined conventions, and can then be used comparative assessment using appropriate benchmarks.

Contribution to overriding sustainability goals



| | CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF THE UNITED NATIONS (UN) | | CONTRIBUTION TO THE GERMAN SUSTAINABILITY STRATEGY | |
|------------------------|---|----------------------------------|--|-----------------------|
| <p>Moderate</p> | 7.1 | Access to modern energy services | 7.1.a/b | Resource conservation |
| | 7.3 | Energy efficiency | 11.3 | Residential |
| | 12.2 | Use of natural resources | | |
| <p>Low</p> | 1.1 | Eliminating extreme poverty | 1.1.a/b | Poverty |
| | 1.2 | Halving poverty | | |



Outlook

The current version of the criterion emphasises the importance of continuous monitoring of life cycle costs and assessment of variants at various points during the planning process in order to achieve cost-efficient buildings, and new indicators have been introduced to that end. The comparison calculation for the life cycle costs continues to be an essential instrument for providing the project team with guidance concerning how well their project compares to others.

Share of total score

| | SHARE | WEIGHTING FACTOR |
|------------------------------------|-------|------------------|
| Office Education Residential Hotel | 10.0% | 4 |
| Consumer market Shopping centre | | |
| Business premises Logistics | | |
| Production | 12.9% | 4 |



EVALUATION

Regular checking of the life cycle costs for the current planning status throughout the entire planning process is acknowledged via indicator 1. The development and analysis of the life cycle costs of variants is evaluated via indicator 2. If the life cycle costs are determined in accordance with a fixed method and compared to a comparison value (benchmark), a result that moderately exceeds or, where appropriate, falls below the benchmark value can – depending on the level of deviation from the comparison value – be incorporated positively into the evaluation in indicator 3. A maximum of 80 points can be achieved in this indicator. A circular economy bonus can be incorporated into the evaluation with a maximum of 10 points (5 points per implemented solution). Without a bonus, a maximum of 100 points can be achieved, or a maximum of 110 points with bonuses (this also applies to consumer markets including possible additional points).

| NO. | INDICATOR | POINTS |
|----------|--|-----------------|
| 1 | Calculations of the life cycle costs in the planning process | |
| 1.1 | Integration of calculations of the life cycle costs into the planning process | Max. 10 |
| 1.1.1 | A life cycle costs system/an LCC model is drawn up for the project in an early planning phase. The building variants included in the planning phase are compared with regard to their production costs and relevant follow-up costs, at minimum including the expected energy costs. | +5 |
| 1.1.2 | The life cycle costs are determined at regular intervals during the planning process (adjusted to match the relevant planning status) and are communicated within the planning team. All relevant building-related follow-up costs are fully integrated into the calculations in work phase 4 at the latest. | +5 |
| 2 | Life cycle cost optimisation | |
| 2.1 | Life cycle cost optimisation during the planning process | Max. 10 |
| 2.1.1 | The effects of significant alternative decisions on the expected life cycle costs are determined for the building. This process is carried out as an extensive full consideration of the entire building. | + Max. 7 |
| | <ul style="list-style-type: none"> ■ Per alternative as part of a full consideration within the scope of work stage 2, work stage 3 or work stage 4 ■ Per alternative as part of a full consideration within the scope of work stage 5, work stage 6 or work stage 7 | +3 +2 |
| 2.1.2 | The effects of significant decisions on the expected life cycle costs are determined for the building. This process is carried out as a partial analysis (section) for the relevant cost groups and follow-up costs. | + Max. 3 |
| | <ul style="list-style-type: none"> ■ Per alternative as part of a partial analysis within the scope of work stage 2, work stage 3 or work stage 4 ■ Per alternative as part of a partial analysis within the scope of work stage 5, work stage 6 or work stage 7 | +2 +1 |

INNOVATION AREA

Re 2.1 Explanation: Alternative approaches that achieve optimisation of the life cycle costs can also be selected and credited.



Same as
2.1



2.2 CIRCULAR ECONOMY BONUS – REUSE



+ Max. 10
+5

Explanation: If a significant portion of the relevant reference value of components is demonstrably reused or implemented in or on the building via business models that conform to the circular/sharing economy concept and ensure or significantly support recyclability, the bonus can be awarded (e.g. performance contracting with recovery or reuse strategy). For each circular economy solution implemented, 5 bonus points can be awarded.

| NO. | CATEGORY 1 | CATEGORY 2 | CATEGORY 3 | POINTS | | | | |
|----------|--|---|--|------------------------|--------------------------------|------------------|--|------------------|
| 3 | Building-related life cycle costs | | | | | | | |
| 3.1 | Assessment and comparison of the building-related life cycle costs | | | | | | | |
| | Specification of the net life cycle costs in €/m ² GFA(RV) for selected components in CG 300 and CG 400 in accordance with DIN 276-1 and for selected building uses in accordance with DIN 18960 based on a reference period of 50 years (Logistics and Production = 20 years). All specifications (if not marked separately) in EUR/m ² GFA(RV). | | | | | | | |
| | Office | Education | Residential | Shopping centre | Business premises | Logistics | | 10–80 |
| | Production | Hotel | | | | | | 10–90 |
| | Consumer market | | | | | | | |
| 3.1.1 | Office | Office buildings – medium standard | Office buildings – buildings with increased representativeness requirements | | | | | 10–80 |
| | | ≤ 6447 | ≤ 6755 | | | | | 10 |
| | | ≤ 5033 | ≤ 5536 | | | | | 40 |
| | | ≤ 3661 | ≤ 4164 | | | | | 80 |
| 3.1.2 | Education | Day care facilities/kindergartens | Schools | | Institutional buildings | | | 10–80 |
| | | ≤ 6477 | ≤ 6700 | | ≤ 8255 | | | 10 |
| | | ≤ 4986 | ≤ 5164 | | ≤ 6578 | | | 40 |
| | | ≤ 3815 | ≤ 3992 | | ≤ 5406 | | | 80 |
| 3.1.3 | Residential | Residential buildings (at least 6 residential units) | | | | | | 10–80 |
| | | ≤ 5660 | | | | | | 10 |
| | | ≤ 4239 | | | | | | 40 |
| | | ≤ 3093 | | | | | | 80 |
| 3.1.4 | Consumer market | Retail/supermarket | | | | | | + (10–80) |
| | | ≤ 3606 | | | | | | 10 |
| | | ≤ 2923 | | | | | | 40 |
| | | ≤ 2289 | | | | | | 80 |



| NO. | CATEGORY 1 | CATEGORY 2 | CATEGORY 3 | POINTS |
|--|---|---|---|-----------------|
| Additional points that can be awarded when using refrigerated counters: | | | | |
| | Annual energy consumption per linear metre of refrigerated counter | | | + (1–10) |
| | | | ≤ 3000 kWh/linear metre | 1 |
| | | | ≤ 1200 kWh/linear metre | 10 |
| 3.1.5 | Shopping centre | | | 10–80 |
| | | | ≤ 7040 | 10 |
| | | | ≤ 5373 | 40 |
| | | | ≤ 3807 | 80 |
| 3.1.6 | Business premises | Retail parks | Business premises | 10–80 |
| | | | ≤ 5311 | 10 |
| | | | ≤ 4096 | 40 |
| | | | ≤ 3020 | 80 |
| | | | ≤ 6476 | 10 |
| | | | ≤ 5155 | 40 |
| | | | ≤ 4079 | 80 |
| 3.1.7 | Logistics Production | Warehouses/logistics/pr oduction facilities with low requirements | Production facilities with increased requirements | 10–80 |
| | | | ≤ 2577 | 10 |
| | | | ≤ 2004 | 40 |
| | | | ≤ 1629 | 80 |
| | | | ≤ 2718 | 10 |
| | | | ≤ 2121 | 40 |
| | | | ≤ 1747 | 80 |
| | Alternatively | | | |
| | : | | | |
| | | Warehouses/logistics/pr oduction facilities with low requirements in €/m²GV | Production facilities with increased requirements in €/m²GV | |
| | | | ≤ 258 | 10 |
| | | | ≤ 200 | 40 |
| | | | ≤ 163 | 80 |
| | | | ≤ 272 | 10 |
| | | | ≤ 212 | 40 |
| | | | ≤ 175 | 80 |
| 3.1.8 | Hotel | Hotel – standard (0–3 stars) | Hotel – upscale (4 or more stars) | 10–80 |
| | | | ≤ 9809 | 10 |
| | | | ≤ 7483 | 40 |
| | | | ≤ 4449 | 80 |
| | | | ≤ 12,041 | 10 |
| | | | ≤ 9156 | 40 |
| | | | ≤ 5477 | 80 |



SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

The life cycle cost value in accordance with the DGNB method can be communicated as key performance indicators (KPIs).

The LCC results and calculation basis can also be used for reporting in accordance with the "Level(s) – Common EU framework of core environmental indicators".

| NO. | KEY PERFORMANCE INDICATORS (KPIs) | UNIT |
|-------|---|-------------------------------|
| KPI 1 | <p>Building-related life cycle costs in accordance with the DGNB, corresponds to Level(s) indicator 6.1 "Life cycle costs" (simplified reporting option)</p> <p>Note 1: If the detailed assessment is carried out and the disposal costs are also calculated, the reporting corresponds to the "non-simplified" option.</p> <p>Note 2: In addition to the DGNB requirements, in accordance with Level(s), the expected servicing and repair costs must also be specified as irregular payments in addition to the regular payments.</p> <p>Note 3: The data sources must be specified in detail in accordance with Level(s) for all life cycle modules and elements in accordance with the defined method.</p> <p>Note 4: Information regarding the conventions for the calculation can be taken directly from the LCC method (e.g. discount rates, reference period)</p> | [EUR/m ² GFA*a] |

Synergies with DGNB system applications

- **DGNB OPERATION:** The result of indicator 3.1 can be used as a basis for comparison in criterion ECO9.1 of the Buildings in use (BIU) scheme.
- **DGNB RENOVATED BUILDINGS:** The calculation model and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 of scheme SBV16.
- **DGNB DISTRICT:** Certain input values and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 of schemes UD, IL and BD.
- **DGNB INTERIORS:** The calculation model and the result of indicator 3.1 can be used as a basis for comparison in criterion ECO1.1 of the Interiors scheme.



APPENDIX A – DETAILED DESCRIPTION

I. Relevance

In addition to yields on the manufacturing and exploitation costs, the economic viability of a building depends on cost-efficient operation. To this end, the life cycle cost calculation enables the medium-term to long-term costs of a building to be taken into account. These figures can be used as a basis for a transparent cost comparison for buildings with similar usage and functionality in order to carry out further analyses and optimisation. The calculation is carried out in accordance with fixed parameters and implements a comparative assessment on the basis of benchmarks.

II. Additional explanation

Life cycle cost planning carried out alongside the process can be used to identify cost drivers as well as win-win solutions (e.g. measures that are worthwhile for both environmental reasons and economic reasons). This enables a life cycle cost calculation to contribute to a balanced analysis of measures across various topics in the DGNB certification system. Options and alternatives are examined in terms of their short-term, medium-term and long-term cost-efficiency and thereby potentially contribute to strengthening the economic viability of the building.

The life cycle costs normally include all costs that arise throughout the lifetime of a building:

- Construction or (initial) investment costs: Costs incurred in the production phase (costs for planning and implementation).
- Follow-up costs or selected operation costs: Property management, operation and repair costs.
- Recovery costs: Costs for demolition, dismantling, recycling and disposal (due to use of the net present value method, these costs currently make up an insignificant portion of the life cycle costs and are therefore not taken into account in the comparison costs method (indicator 3)).

The life cycle costs are organised by cost groups, as this is the only way to enable replacement cycles for components and maintenance to be taken into account.



III. Method

Indicator 1: Calculations of the life cycle costs in the planning process

The objective of indicator 1.1 is to clearly present the complete life cycle costs from an early planning phase, tailored to the specific context or the point in time and planning scope.

An LCC model should be drawn up in an early planning phase (work stage 2–3). The most likely/preferred building variants included are compared with regard to their production costs and relevant follow-up costs, at minimum including the expected energy costs.

In addition, points can be included in the evaluation if an LCC model is created in work stage 4 and used for evaluation, containing the following follow-up costs at a minimum ("all relevant building-related follow-up costs"):

- Supply and disposal costs (water, fuels, energy, waste water)
- Cleaning costs
- Servicing and maintenance costs
- Repair costs

From work phase 4 onwards, the assessment of the life cycle costs should contain the scope of follow-up costs shown above. The DGNB offers an online tool suitable for this purpose. Additional building-related or use-related follow-up costs or expected yields can also be included in the assessment, such as recycling costs, conversion costs, revenues and personnel costs. This method can also take into account aspects that are not part of the DGNB calculation scope in accordance with indicator 3, such as the inclusion of exterior spaces or other cost groups. It is likewise possible to factor conventions into the assessments, such as interest rates.

For assessment during the planning process and communication of the life cycle costs to the planning team, target values (tailored to the planning status) must be defined that are compared to the achieved values in various planning phases.

In principle, the calculation method can be freely chosen, but it should fulfil the objectives of the sub-indicators. At the very beginning of the planning process, simple tools can be selected depending on their use, such as the multiple of yearly rents (the "Maklermethode" or "estate agent's method"), as a starting point for calculation of yield properties with a combination of the energy costs. In addition, the approaches from the Germany Property Valuation Ordinance (ImmoWertV) for calculating further values can be used.

Indicator 2: Life cycle cost optimisation

The objective of planning optimised for life cycle costs is to address the follow-up costs as early as possible in the planning process and to reduce or optimise them via variant calculations. Planning optimised for life cycle costs should be carried out at various suitable points in time.

Alternatively, full considerations (life cycle costs for the entire building in accordance with the scope of analysis of indicator 3 and the minimum scope of follow-up costs specified in indicator 1) or partial analyses (life cycle costs for a section of the scope of analysis) can be incorporated into the evaluation.

Optimisations should investigate the life cycle costs of significant alternatives for relevant decisions. Depending on the planning phase, these can vary greatly and affect aspects such as variants of the A/V ratio, duration of use of planned components or the use of operating materials.



Aspects that are not part of the scope of analysis of the "cost comparison" can also be taken into account for calculating variants in the life cycle costs (see indicator 3). This includes taking other cost groups (external installations or equipment), other energy consumers (such as lifts and user equipment), operating materials (such as refrigerants) or conversion, replacement or modernisation costs into account, for example. An expanded scope of analysis can also include the assessment of possible yields (including yields relating to personnel or customers) or cost reductions relating to personnel, such as intelligent planning of future conversion measures. Conventions that differ from the cost comparison defined below (see indicator 3), such as interest rates, rates of price increases, etc., can also be factored into the alternatives.

The findings of the planning optimised for life cycle costs should be incorporated into the decision-making process.

The number of alternatives for which comprehensive or partial calculations of the life cycle costs were carried out in early or later planning phases is evaluated.

Indicator 2.2: Circular economy bonus – reuse

If a significant portion of the relevant reference value (at least 80%, based on cost group level 3 in accordance with DIN 276) of components is demonstrably reused or implemented in or on the building via business models that conform to the circular/sharing economy concept and ensure or significantly support recyclability, a circular economy bonus can be awarded (e.g. performance contracting with recovery or reuse strategy). If more than one solution is implemented, these should, if possible, be in different cost groups (level 3) or be significantly different from one another.

Indicator 3: Building-related life cycle costs

The assessment method corresponds to the explanations of ISO 15686-5:2008. In order to establish a consistent method for the DGNB documentation, there are additional specifications based on the content of the standard.

The following cost groups are incorporated into the assessment of the life cycle costs and the evaluation in this criterion:

Selected production costs in accordance with DIN 276-1

- Cost group 300 Structure – construction works
- Cost group 400 Structure – services (in accordance with Appendix 3)

Selected operation costs in accordance with DIN 18960

- Cost groups 310 and 320 Supply and disposal costs
 - Cost group 311 Water
 - Cost groups 312 to 316 Fuels, energy
 - Cost group 321 Sewerage
- Cost group 330 Cleaning and maintenance of buildings
- Cost group 350 Operation, inspection, servicing
 - Cost group 352 Inspection and servicing of the structures
 - Cost group 353 Inspection and servicing of the installations
- Cost group 400 Repair costs
 - Cost group 410 Structural repairs
 - Cost group 420 Repair of the installations



Other cost groups, including the cost of the plot, planning costs, capital costs, taxes, insurance and costs for demolition and disposal of the building, are not currently included in the evaluation of the indicator.

Net present value method

The life cycle costs that occur as a result of the production and operation costs, distributed across a specified time frame, are capitalised over the year of certification and expressed as a net present value. The net present value method enables different cost/time progressions to be compared to one another. This makes it possible to weigh up initial expenditures and later follow-up costs or even savings. Application of the net present value method requires both the details of costs and information regarding the payment date. This method takes into account both price developments (price increases) and the effective interest rate.

The net present value represents the current capital value of the costs accumulated during the reference period.

The cost levels of the benchmarks are defined as a reference point for the certification.

The effective interest rate is specified by the DGNB. This expresses the expected returns for the capital invested, which incorporates inflation and the risk of the investment, among other aspects.

Conventions

The life cycle cost assessment is fundamentally open-ended and can be adjusted to suit the application situation in many places. However, a requirement for using the application as an indicator to evaluate the determined parameters as part of benchmarking is that the method is precisely defined and that a wide range of parameters are explicitly specified. This is the only way to ensure that the calculation results can be compared, which is an absolute requirement.

Conventions concern the following points:

- Reference period
- Life cycle phases
- Cost groups included
- Calculations included
- Price development for different cost groups
- Effective interest rate
- reference value
- Permitted simplifications and cut-off rules
- Partial results that are to be shown and associated descriptions
- Level of detail of the calculations and the documentation
- Timing of payments per period

These conventions are specified for indicator 3 of this criterion. In special cases or for particular schemes, deviations from these standard conventions may be appropriate. These deviating specifications are indicated depending on the scheme. The benchmarks to which the life cycle costs are compared have been determined on the basis of the same conventions.



Evaluation

Evaluation in the certificate requires an assessment based on the following documents:

- Production costs in accordance with the current cost levels at the time of submission with an estimate of the costs for the final invoice for the building under certification in accordance with the system boundaries (scope of cost groups 300 and 400 in accordance with DIN 276-1, in accordance with Appendix 3) as well as associated reference values (in accordance with DIN 277-1) and building specification (in accordance with DIN 276-1)
- Final energy demand of the building from the EnEV (energy certificate for the completed building)
- Clear assignment to energy sources (same as the life cycle assessment), possible details of infeed and feed-in tariff
- Values from the calculations regarding water demand and waste water from the specifications of criterion "ENV2.2 – Potable water demand and waste water volume"
- Details of the servicing, inspection and repair costs using the generalised percentages specified in Appendix 3, or alternatively based on accessible and documented reference values (such as in accordance with the German information centre for construction costs (BKI), contracts, manufacturer specifications or similar)
- Assessment of the cleaning costs on the basis of the areas and materials from the building elements catalogue for the life cycle assessment or alternatively based on accessible reference values (such as in accordance with the German information centre for construction costs (BKI), manufacturer specifications or similar)

In addition, the following documents are required for assessment in accordance with the detailed method:

- Building elements catalogue for the life cycle assessment (criterion "ENV1.1 – Building life cycle assessment")
- Durations of use of components in accordance with Appendix 3
- Detailed breakdown of production costs that can be assigned to the components in the building elements catalogue that clearly demonstrate assignment to the product-specific duration of use

Simplified method

In the simplified method, the costs for inspection, servicing and repair are shown as percentages in relation to the production costs. The production costs and the operating costs for energy demand, cleaning and water/waste water are recorded in detail.

The reference period for the cost groups that are to be taken into account and the calculation parameters are specified in the "Conventions" section (see usage-specific description) and the appendices.

The applicable percentages for the generalised representation must be taken from Appendix 3. This appendix depends on the scheme in question.

Detailed method

The detailed method expands the breakdown of the production costs from the simplified method on level 3 in accordance with DIN 276-1 (including reference values and building specification). The detailed method can only be applied in full, which means that if CG 320 is considered in detail, the entirety of CG 300 must be shown in detail. This is intended to prevent elements with a long duration of use being shown "in detail" while the generalised average from the simplified method is used for other elements.



The following applies for the analysis of the repair costs: Depending on the installation situation and usage situation of an element, either an appropriate and plausible assignment of the duration of use from Appendix 3 must be reached, or, as an alternative, accessible reference values (for instance in accordance with the German information centre for construction costs (BKI)), manufacturer specifications or similar must be used. In addition, a breakdown of the production costs that goes beyond level 3 in accordance with DIN 276-1 may be necessary.

For all other costs taken into account, the approaches used in the simplified method (including working with accessible reference values (for instance in accordance with the German information centre for construction costs (BKI)), manufacturer specifications or similar) continue to apply in exactly the same way.

The DGNB provides an online tool for submission of documentation that calculates the LCC data and transfers the results for the subsequent conformity check. When using this tool, the production costs must be entered as real costs (project-specific time of completion).

Adjustment to match the reference year using the price index in accordance with destatis (www.destatis.de) is calculated automatically. The corresponding information must be entered in the "Basic data" tab under reference values. The reference year and quarter for the current version is Q3 2017.

The following destatis table must be used:

- Code: 61261-0002
- Contents: Construction cost indices: Germany, quarters, measured figures with/without VAT, building types, construction work (building construction)

The following data must be determined in order to retrieve the construction cost index:

- Year: Project-specific
- Quarter: Project-specific
- Measured figures with/without VAT: Indices including VAT
- Building type: Project-specific
- Form: Construction work on the building

Appendices depending on scheme

- Appendix 1: Components to be included in accordance with DIN 276-1 cost groups
- Appendix 2: Cleaning
- Appendix 3: Parameters for servicing and maintenance
- Appendix 4: Applicable unit prices for energy sources, fresh water and waste water



IV. Usage-specific description

Conventions

Office **Education** **Residential** **Consumer market** **Shopping centre** **Business premises** **Hotel**

The following conventions must be assumed for assessment of the life cycle costs:

TABELLE 1 Conventions for the calculation of the life cycle costs (various schemes)

CONVENTIONS

| | |
|---|--|
| Reference period | 50 years |
| Life cycle phases | Construction, use |
| Cost groups | <p>Selected cost groups:</p> <p>Production costs in accordance with DIN 276-1 Cost group 300 Structure – construction works Cost group 400 Structure – installations (in accordance with Appendix 3)</p> <p>Operation costs in accordance with DIN 18960 Cost groups 310 and 320 Supply and disposal costs Cost group 311 Water Cost groups 312 to 316 Fuels, energy Cost group 321 Sewerage Cost group 330 Cleaning and maintenance of buildings Cost group 352 Inspection and servicing of the structures Cost group 353 Inspection and servicing of the installations Cost group 400 Repair costs Cost group 410 Structural repairs Cost group 420 Repair of the installations</p> |
| Calculations included | Final energy demand, water demand and waste water, cleaning areas |
| Price development for different cost groups | General construction price increase 2% Costs for water and waste water 2% Costs for energy 5% |
| Effective interest rate | 3% ¹ |
| reference value | m ² GFA(RV) / business premises : m ² GFA |
| Permitted simplifications, cut-off rules | Current cost level with an estimate of the costs for the final |

¹ Determination: On the one hand, the guide value used for Germany for determining the cost-optimal levels for energy efficiency calculations in accordance with "Guidelines accompanying Commission Delegated Regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings by establishing a comparative methodology framework for calculating cost-optimal levels of minimum energy performance requirements for buildings and building elements" was used for determining the effective interest rate. On the other hand, assessments carried out in-house in 2017 show that an effective interest rate of 3% constitutes a justified assumption.



invoice for completion of the building.

Representation of the entire building or, for partial buildings, in accordance with the system limits

Cost information on level 1 of cost group 300, on level 2 of cost group 400 in accordance with DIN 276 in the simplified method

For the detailed method, documentation of the components in the same way as for the simplified method of the life cycle assessment (criterion "ENV1.1 – Building life cycle assessment")

Partial results that are to be shown and associated descriptions

Net present value divided into:

- Cost group 300 production costs in accordance with DIN 276-1
- Cost group 400 production costs in accordance with DIN 276-1

Separate operating costs for:

- Water,
- Energy,
- Waste water,
- Cleaning and maintenance

Operation costs divided into:

- Inspection and servicing
- Repair (separately for cost groups 300 and 400 in accordance with DIN 276-1)

Level of detail of the calculations and the documentation See description for the simplified and detailed method

Timing of the payment per period

In arrears

Logistics Production

In contrast to the requirements of the other schemes, the final energy demand may be determined via a thermal simulation as an alternative to using EnEV documentation. See also criterion "ENV1.1 – Building life cycle assessment".

The reference period comprises 20 years.

For industrial buildings with a clear room height greater than 12 m, [m³ GV*a] must be selected as the unit of reference for the calculation of the evaluation points. For single-storey and multi-storey industrial buildings with a clear room height less than 12 m, the reference value [m² GFA (RV)* a] must be selected.



The following conventions must be assumed for assessment of the life cycle costs:

TABELLE 2 Conventions for the calculation of the life cycle costs (**Logistics** and **Production**)

CONVENTIONS

| | |
|---|--|
| Reference period | 20 years |
| Life cycle phases | Construction, use |
| Cost groups | <p>Selected cost groups:</p> <p>Production costs in accordance with DIN 276-1 Cost group 300 Structure – construction works Cost group 400 Structure – installations (in accordance with appendix 3)</p> <p>Operation costs in accordance with DIN 18960 Cost groups 310 and 320 Supply and disposal costs Cost group 311 Water Cost groups 312 to 316 Fuels, energy Cost group 321 Sewerage Cost group 330 Cleaning and maintenance of buildings Cost group 352 Inspection and servicing of the structures Cost group 353 Inspection and servicing of the installations Cost group 400 Repair costs Cost group 410 Structural repairs Cost group 420 Repair of the installations</p> |
| Calculations included | Final energy demand, water demand and waste water, cleaning areas |
| Price development for different cost groups | General construction price increase 2% Costs for water and waste water 2% Costs for energy 5% |
| Effective interest rate | 3% ² |
| reference value | m ² GFA (RV) or m ³ GV |
| Permitted simplifications, cut-off rules | <p>Current cost level with an estimate of the costs for the final invoice for completion of the building.</p> <p>Representation of the entire building or, for partial buildings, in accordance with the system limits</p> <p>Cost information on level 1 of cost group 300, on level 2 of cost group 400 in accordance with DIN 276 in the simplified method.</p> |

² See footnote 1



For the detailed method, documentation of the components in the same way as for the simplified method of the life cycle assessment (criterion ENV1.1)

| | |
|--|--|
| Partial results that are to be shown and associated descriptions | <p>Net present value divided into:</p> <ul style="list-style-type: none"> ■ Cost group 300 production costs in accordance with DIN 276-1 ■ Cost group 400 production costs in accordance with DIN 276-1 <p>Separate operating costs for:</p> <ul style="list-style-type: none"> ■ Water, ■ Energy, ■ Waste water, ■ Cleaning and maintenance <p>Operation costs divided into:</p> <ul style="list-style-type: none"> ■ Inspection and servicing ■ Repair (separately for cost groups 300 and 400 in accordance with DIN 276-1) |
| Level of detail of the calculations and the documentation | See description for the simplified and detailed method |
| Timing of the payment per period | In arrears |

Special conditions and additional expenses

In the event of justified additional expenses due to special requirements and conditions, these may be deducted from the statement of life cycle costs. A plausible, clear and justified statement of the additional expenses is required for this.

Typical cases where additional expenses are considered neutral for the evaluation include:

- Difficult foundation soil conditions
- Supporting adjacent structures
- Special requirements under construction law, such as historic preservation orders
- Innovations that are prototypical in nature

The additional expense associated with the special conditions must be quantified (e.g. documentation of the costs on level 3 in accordance with DIN 276-1 with associated reference values and building specification). The substantiated additional expense (not the overall costs) may be subtracted from the production costs.

If the additional expense is not documented, costs resulting directly from an innovation (cost groups in accordance with DIN 276-1 on level 3 or individual element) can be deducted and replaced by the cost parameter of the German information centre for construction costs (BKI) (average value of the medium and increased standard).

Alternatively, in the event of a significant discrepancy between the building evaluated as part of the certification process and the assumptions used as a basis for the production costs of the reference value, target value and limit value definition (benchmarks), the benchmarks for the "production costs" benchmark element can be adjusted on a project-specific basis following agreement with the DGNB. The underlying assumptions for calculation of the benchmarks are shown in Appendix 5. This project-specific adjustment is permitted for all uses and is recommended



for structures such as high-rise buildings and high-bay warehouses.

Categorisation

Office Residential

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following three categories:

Category 1: New buildings are generally evaluated in category 1.

Category 2: Buildings with above-average requirements in terms of representativeness are evaluated in category 2. The measures and features that help achieve the required level of representativeness must be described in order to justify classification into category 2.

Classification into category 2 must be justified in detail and verifiably documented. If this is not done, the building is categorised into category 1 as standard.

The following must be considered to constitute above-average requirements in terms of representativeness:

- High-quality, high-durability materials (in floors and walls) in terms of materiality and construction
- Requirements resulting from a location of category A (lucrative, high-traffic (business) location in the centre of a town or city)
- Advanced technical facilities

Education

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following three categories:

- Day care facilities, kindergartens
- Schools
- Institutional buildings

Consumer market

Consumer markets are evaluated in category 1. If the building contains refrigerated counters, additional points can be awarded if the associated annual energy consumption per linear metre of refrigeration units falls below the reference value of 3000 kWh/linear metre (in accordance with the study "Vergleichende Bewertung der Klimarelevanz von Kälteanlagen und -geräten für den Supermarkt" ("Comparative evaluation of the climate impact of refrigeration systems and refrigeration devices for supermarkets") published by the German Federal Office for the Environment (Umweltbundesamt), Dessau-Roßlau).

TABELLE 3 Energy consumption of refrigerated counters

| ANNUAL ENERGY CONSUMPTION PER LINEAR METRE OF REFRIGERATED COUNTER | POINTS |
|--|--------|
| ≤ 3000 kWh/linear metre | 1 |
| ≤ 1200 kWh/linear metre | 10 |



Linear interpolations can be carried out between the specified values.

Shopping centre

For shopping centres, fit-out carried out by the tenant in the rental areas is excluded from the analysis.

Shopping centres are evaluated in category 1.

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with DIN 277-12:2005-02 must be taken into account.

This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German information centre for construction costs (BKI).

TABELLE 4 Lump sum deduction for the costs for areas 7.4, 9.4 and 9.9 in accordance with DIN 277-12: 2005-02.

| TYPE OF CAR PARK | DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS (BKI) 2017 (NET) |
|------------------------|--|
| Underground garages | 673 €/m ² GFA(RV) |
| Multi-storey car parks | 543 €/m ² GFA |

Business premises

If the building includes underground garages or multi-storey car parks, the life cycle costs can be adjusted for the costs of these areas. Areas 7.4 (vehicle parking areas), 9.4 (vehicle circulation areas) and 9.9 (other circulation areas (such as driving lanes)) in accordance with DIN 277-12:2005-02 must be taken into account.

This deduction can be carried out using a detailed method via documentation of the actual costs incurred for these areas, or alternatively using cost parameters from the German information centre for construction costs (BKI).

TABELLE 5 Lump sum deduction for the costs for areas 7.4, 9.4 and 9.9 in accordance with DIN 277-12: 2005-02.

| TYPE OF CAR PARK | DEDUCTION IN ACCORDANCE WITH THE GERMAN INFORMATION CENTRE FOR CONSTRUCTION COSTS (BKI) 2017 (NET) |
|------------------------|--|
| Underground garages | 673 €/m ² GFA(RV) |
| Multi-storey car parks | 543 €/m ² GFA |

Logistics Production

For the purposes of evaluation, the building must be plausibly and clearly categorised into one of the following two categories:



- **Category 1:** Warehouses/logistics buildings as well as production facilities with low requirements are generally evaluated in category 1
- **Category 2:** Production facilities with increased requirements

In principle, logistics buildings and production facilities must be assigned to the following categories depending on the type of air conditioning they use:

- I: No air conditioning
- II: Heated; indoor air temperatures between 0 °C and 12 °C
- III: Heated; indoor air temperatures between 12 °C and 19 °C
- IV: Heated; indoor air temperatures > 19 °C
- V: Heated, cooled; indoor air temperatures > 19 °C
- VI: Air conditioned; indoor air temperatures > 19 °C
- VII: Refrigerated; indoor air temperatures < -5 °C

For properties of category VII, the building technology system components of the refrigeration technology including production costs and associated servicing, inspection, repair and disposal costs – must be taken into account in the LCC calculation.

The final energy demand for refrigeration must be determined separately and calculated over a reference period of 20 years, but is not incorporated into the LCC calculation.

Hotel

For the purposes of evaluation, the building must be clearly categorised into one of the following two categories depending on its designation in accordance with the German hotel classification system:

- **Category 1:** 0 to 3 stars
- **Category 2:** 4 or more stars or higher level of facilities (swimming pool, spa, etc.)

Appendix 1
Components to be included in accordance with DIN 276-1 cost groups

The following building elements and facilities as well as cost groups are included:

| PRODUCTION COSTS | RENOVATION | MAINTENANCE | ENERGY | WATER/STEAM | CLEANING | COST GROUPS | COMMENTS |
|------------------|------------|-------------|--------|-------------|----------|-------------|---------------------------------------|
| | | | | | | | |
| | | | | | | 100 | Site |
| | | | | | | 200 | Clearance and development |
| | | | | | | 300 | Structure – construction works |
| X | X | X | | | | 310 | Excavation |
| X | X | X | | | | 320 | Foundations |
| X | X | X | X | X | | 330 | External walls |
| X | X | X | | X | | 331 | Load-bearing external walls |
| X | X | X | | | | 332 | Non-load-bearing external walls |
| X | X | X | | | | 333 | External columns |
| X | X | X | X | X | | 334 | External doors and windows |
| X | X | X | | X | | 335 | Cladding units |
| X | X | X | | | | 336 | Internal linings (of external walls) |
| X | X | X | | X | | 337 | Prefabricated façade units |
| X | X | X | X | X | | 338 | Solar protection |
| X | X | X | | | | 339 | External walls, other items |
| X | X | X | | | | 340 | Internal walls |
| X | X | X | | | | 350 | Floors and ceilings |

| | | | | | |
|---|---|---|-----|--|--|
| X | X | X | 351 | 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 |
| X | X | X | 352 | Floorings | Coverings on floors, including screeds, damp-proof courses, insulating and protective layers, wearing surfaces; false floors for services and floating floors |
| X | X | X | 353 | Ceiling linings | Linings of ceilings, including plastering, damp-proof courses, insulating and protective layers; false ceilings for lighting and other services |
| X | X | X | 359 | Floors and ceilings, other items | Covers, manhole tops, gratings, railings, buffers, handrails, fixed ladders, foldaway ladders |
| X | X | X | 360 | Roofs | Flat or sloping roofs |
| X | X | X | 370 | Structural fitments | Costs of fitments permanently fixed to the building fabric, but exclusive of fitments designed for its particular function (cf. cost group 470). The principal criterion for distinguishing this cost group from cost group 610 is that the nature of the fitments and the method by which they are fixed require technical and planning measures (e.g. preparation of plant layout plans, structural analyses and other calculations, connection to services) |
| X | X | X | 390 | Other construction-related activities | Construction work and general types of construction work that cannot be assigned to individual cost groups relating to the building structure nor included in other cost groups |
| | | | 400 | Structure – services | Costs of all services or parts thereof installed in, connected or permanently fixed to the building fabric The individual services comprise the associated supports, fixings, valves, thermal insulation, provisions for noise control and fire protection, covers, cladding, paintwork, marking and measurement and control systems. |
| X | X | X | 410 | Sewerage, water and gas systems | Gullies, drains, sewers, sewage treatment systems, sewage lifting plants |
| X | X | X | 411 | Sewerage systems | Water extraction and conditioning plants, pressure boosters, pipework, water heaters, sanitary appliances |
| X | X | X | 412 | Water supply systems | Gas supply systems for industrial heating: Gas storage and generation plants, supply meter points, pressure control equipment and gas pipes, unless included in cost groups 420 or 470 |
| X | X | X | 413 | Gas supply systems | Sprinklers, gas extinguishing systems, extinguishing water pipes, wall hydrants, fire extinguishers |
| X | X | X | 414 | Fire-fighting installations | Plumbing units, sanitary blocks |
| X | X | X | 419 | Sewerage, water and gas systems, other items | |
| X | X | X | 420 | Heat supply systems | Fuel supply, heat supply meter point, heat generation based on fuel or on renewable energy sources, including chimney connections, central water heaters |
| X | X | X | 421 | Heat generators | |

| | | | | | | |
|---|---|---|---|------------|--|---|
| X | X | X | X | 422 | Heat distribution networks | Pumps, distributors; pipework for space heating, HVAC systems and other heat consumers |
| X | X | X | X | 423 | Space heating | Radiators, panel heating systems |
| X | X | X | X | 429 | Heat supply systems, other items | Chimneys, unless included in other cost groups |
| X | X | X | X | 430 | Air treatment systems | Systems with and without ventilation functions |
| X | X | X | X | 431 | Ventilation systems | Exhaust air systems, supply air systems, exhaust/supply air systems with or without a thermodynamic air treatment function, mechanical smoke extraction systems |
| X | X | X | X | 432 | Partial air conditioning systems | Systems with two or three thermodynamic air treatment functions |
| X | X | X | X | 433 | Air conditioning systems | Systems with four thermodynamic air treatment functions |
| X | X | X | X | 434 | Process air plants | Paint mist separation systems, process exhaust air systems, suction plants |
| X | X | X | X | 435 | Refrigerating plants | Refrigerating plants for air treatment systems: chilling and recooling plants, including pumps, distributors and pipework |
| X | X | X | X | 439 | Air treatment systems, other items | Ventilated ceilings, cooling ceilings, exhaust air windows; false floors for services, unless included in other cost groups |
| X | X | X | X | 440 | Power installations | |
| X | X | X | X | 441 | High and medium voltage plants | Switchboards, transformers |
| X | X | X | X | 442 | Independent power supply installations | Power generating units, including cooling, exhaust systems and fuel supply, central storage batteries and uninterruptible power supply systems, photo-voltaic systems |
| X | X | X | X | 443 | Low-voltage switchgears | Low voltage main distributors, reactive power compensators, peak reading indicators |
| X | X | X | X | 444 | Low voltage installation equipment | Cables, conduits, subdistributors, installation systems and appliances |
| X | X | X | X | 445 | Lighting systems | Fixed luminaires, safety lighting |
| X | X | X | X | 446 | Lightning protection and earthing systems | Lightning rods, lightning conductors, connections to earth, equipotential bonding |
| X | X | X | X | 449 | Power installations, other items | Frequency converters |
| X | X | X | X | 450 | Telecommunications and other communications systems | The individual systems comprise the associated distributors, cables and wiring. |
| X | X | X | X | 460 | Transport systems | |
| X | X | X | X | 461 | Lifts | Passenger lifts, goods lifts |
| X | X | X | X | 462 | Escalators, moving pavements | |
| X | X | X | X | 463 | Inspection and maintenance conveyors | Window-cleaning cradles and other inspection and maintenance conveyors |
| X | X | X | X | 464 | Conveying plants | Automatic goods transport systems, office dumbwaiters, pneumatic tube conveyors |
| X | X | X | X | 465 | Cranes | Including lifting appliances |
| X | X | X | X | 469 | Transport systems, other items | Lifting platforms |



| | | | | | |
|---|---|---|-----|---|--|
| X | X | X | 480 | Building automation | Costs of automation including associated distributors, cables and wiring |
| X | X | X | 490 | Other services-related work | Services and general measures in connection with services that cannot be assigned to separate cost groups for services or cannot be recorded in other cost groups |
| | | | 500 | External works | Costs of construction work and supplies relating to the construction of ground surfaces and circulation areas, structures and services outside of the building, unless included in cost group 200 The individual cost groups comprise the associated work such as earth-works, substructures and foundations. |
| | | | 600 | Furnishings, furniture and artistic appointments | Costs of all movable or easily fixed furnishings and appointments required for the commissioning of the structure, for general use, or for the decoration of the structure and the outdoor areas (cf. notes on cost groups 370 and 470) |
| | | | 700 | Incidental building costs | Costs arising during planning and execution based on fee structures, fee scales or in accordance with other contractual agreements |



Appendix 2

Cleaning

| COST GROUP | COMPONENT | €/M ² A |
|-----------------------|--|--------------------|
| Cost group 334 | External doors and windows | |
| | Easily accessible (without aids) | 2.25 |
| | Average value (e.g. façade inspection and maintenance conveyors and cleaning bridges) | 3.00 |
| | Difficult to access (e.g. cherry pickers or climbing harnesses) | 4.50 |
| Cost group 335 | Cladding units | |
| | Natural stone (soft) | 2.83 |
| | Aluminium, stainless steel, copper cladding, steel (corrosion-protected) | 1.42 |
| | Ceramics, artificial stone, ashlar, natural stone (hard) | 0.71 |
| | Solar protection | 2.13 |
| Cost group 344 | Internal doors and windows | |
| | Internal doors | 3.60 |
| | Internal windows | 2.25 |
| Cost group 352 | Floorings | |
| | Artificial stone, natural stone, screed, flexible floors or similar | 6.30 |



| | | |
|--|-------------------------|-------|
| | Textile or similar | 7.08 |
| | Wood or similar | 6.30 |
| | Sanitary areas | |
| | Up to 10 m ² | 89.25 |
| | Up to 30 m ² | 59.50 |
| | Up to 30 m ² | 44.63 |

Additional information

| | €/H (NET) |
|----------------------------------|-----------|
| Hourly charge for cleaning | 17.00 |
| Hourly charge for glass cleaning | 22.50 |



Appendix 3

Parameters for servicing and maintenance

The following table must be applied for the LCC statement in accordance with the simplified method. The detailed method can be used to represent cost groups of level 3 or beyond, and involves replacing the specifications from the simplified method with specific details that must be documented. These specific details must be selected to be consistent with the information from the life cycle assessment (see also explanations of durations of use in ENV1.1).

| COST GROUPS/ COMPONENTS | ASSUMED DURATION OF USE IN YEARS | EXPENDITURE FOR SERVICING/ INSPECTION IN % PER YEAR | EXPENDITURE FOR REPAIRS IN % PER YEAR |
|--|---|--|--|
| Cost group 300 | | | |
| | In accordance with the document "Duration of use of components for life cycle assessments in accordance with the BNB evaluation system" ("Nutzungsdauer von Bauteilen für Lebenszyklusanalysen nach Bewertungssystem Nachhaltiges Bauen (BNB)") | 0.1 | Irregular repair: Replacement investment after expiry of the duration of use or lump sum repair cost of 0.35% for all components of cost group 300 |
| Cost group 400 | | | |
| 410 – Sewerage, water and gas systems | 50 | 1.01 | 0.98 |
| 420 – Heat supply systems | 25 | 0.41 | 0.66 |
| 430 – Air treatment systems | 25 | 0.96 | 1.10 |
| 440 – Power installations | 25 | 0.60 | 0.70 |



| | | | |
|--|----|------|------|
| 450 – Telecommunications and other communications systems | 25 | 1.04 | 1.04 |
| 460 – Transport systems | 25 | 1.76 | 1.78 |
| 480 – Building automation | 25 | 1.16 | 0.76 |

On the basis of VDI 2067:2000 and supplement on the basis of the values for the duration of use for components as well as AMEV 2013, adjusted (without operation)

1. Information contained in VDI 2067 and AMEV

VDI 2067 contains the following proportions for individual components of the building services:

- Calculated duration of use in years
- Expenditure for repair in percentage of the investment total per year
- Expenditure for servicing and inspection in percentage of the investment total per year
- Time spent on operation in hours per year

AMEV contains the following proportions for the cost groups for the building services:

- Expenditure for repair in percentage of the investment total per year
- Expenditure for servicing and inspection in percentage of the investment total per year
- Time spent on operation in hours per year

For assessing costs (and the benchmarks) as part of the certification process, the costs for operation of services are not taken into account.

2. Requirements

A detailed assessment of construction costs in accordance with DIN 276 for cost group 400 is a requirement for application of VDI 2067. If possible, the services must be recorded as follows

- The heating system
 - Generation components (e.g. boilers)
 - Transfer components (e.g. radiators)
 - Distribution components (e.g. pipes)

Information is available for heat pumps, cogeneration units, solar collectors, house heat transfer stations, heating networks, tanks and structural installations.

- The HVAC systems
 - Transfer components



- Distribution components
- Generation components

Information is available for heat recovery, cooling ceilings, cooling sails, dehumidifiers, etc.

- Heating potable water
 - Transfer components
 - Distribution components
 - Generation components

A breakdown of the construction costs into the subgroups of the building technology is a requirement for application of AMEV.

The details regarding repair of the building technology (cost group 400) should be considered to refer to "ongoing repairs". A replacement investment after expiry of the duration of use must also be taken into account, but this currently does not include demolition and disposal.

Simplified method:

As an alternative to the simplified method, a detailed list can also be compiled.

For cost group 400, it is permissible to assume a replacement investment after 20 years across all components.



Appendix 4

Applicable unit prices for energy sources, fresh water and waste water

| MEDIUM | TYPE | NET PRICE/UNIT |
|---|-------------------|-----------------------|
| Electricity | German energy mix | 0.25 €/kWh |
| Oil | | 0.06 €/kWh |
| Natural gas | | 0.06 €/kWh |
| Wood pellets | | 0.05 €/kWh |
| Woodchips | | 0.03 €/kWh |
| Long-distance district heating/CHP | Fossil | 0.09 €/kWh |
| | Renewable | 0.07 €/kWh |
| Fresh water | | 2.01 €/m ³ |
| Waste water | Used water | 2.14 €/m ³ |
| | Precipitation | 1.10 €/m ³ |

Source for electricity price: BDEW 2017, approx. four-year average, net



Appendix 5

Basis of the LCC benchmarks

Production costs:

As a general rule, the target value and reference value of the production costs are assumed to be equal ("sustainable construction does not cost more than the present standard").

TABELLE 6 Basic data for establishing benchmarks for the schemes: Total of production costs for cost group 300 and cost group 400 (all data in EUR/m² GFA(RV) – net)

| Office | Buildings of medium standard | Buildings with increased representativeness requirements | |
|----------------------------|--|--|--|
| Reference and target value | 1723 Average value of medium and high standard for office buildings in accordance with the German information centre for construction costs (BKI) 2017 | 2052 High standard in accordance with the German information centre for construction costs (BKI) 2017 | |
| Limit value | 2052 High standard in accordance with the German information centre for construction costs (BKI) 2017 | 2258 10% above reference value | |
| Education | Day care facilities/kindergartens | Schools | Institutional buildings |
| Reference and target value | 1383 Average value of medium and high standard for day care facilities in accordance with the German information centre for construction costs (BKI) 2017 | 1447 General education schools in accordance with the German information centre for construction costs (BKI) 2017 | 2037 Institutional buildings in accordance with the German information centre for construction costs (BKI) 2017 |
| Limit value | 1494 High standard for day care facilities in accordance with the German information centre for construction costs (BKI) 2017 | 1592 10% above reference value | 2240 10% above reference value |
| Residential | Buildings of medium and | | |



| | | | | | |
|----------------------------|------|---|------|---|-----------------|
| | | higher standard | | | |
| Reference and target value | 939 | High standard for apartment buildings (6–19 residential units) in accordance with the German information centre for construction costs (BKI) 2017 * factor of 1.1 | | | |
| Limit value | 1024 | 10% above reference value | | | |
| Consumer market | | Retail/supermarket | | Shopping centre | |
| Shopping centre | | | | | |
| Reference and target value | 1094 | Consumer markets | 1152 | Business premises with no residential function in accordance with the German information centre for construction costs (BKI) 2017 | * factor of 1.2 |
| Limit value | 1204 | 10% above reference value | 1267 | 10% above reference value | |
| Business premises | | Retail parks | | Business premises | |
| Reference and target value | 922 | Consumer markets | 1547 | Business premises, in-house assessments (P75 value) | |
| Limit value | 1014 | 10% above reference value | 1701 | 10% above reference value | |
| Logistics | | Warehouses/logistics/production facilities with low requirements | | Production facilities with increased requirements | |
| Production | | | | | |
| Reference and target value | 908 | Average value for logistics buildings not intended for mixed use and skeleton construction of production | 1019 | Solid construction of production buildings in accordance with the German information | |



| | | buildings in accordance with the German information centre for construction costs (BKI) 2017 | | centre for construction costs (BKI) 2017 |
|----------------------------|------------------|--|------------------------|---|
| Limit value | 1089 | 20% above reference value | 1223 | 20% above reference value |
| Hotel | 0–3 stars | | 4 or more stars | |
| Reference and target value | 938 | In-house assessments for hotels (P75 value) | 1263 | In-house assessments for hotels (P75 value) |
| Limit value | 1031 | 10% above reference value | 1389 | 10% above reference value |

Water/waste water:

Office: A flat rate of 1.20 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Residential: A flat rate of 7.27 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Education: A flat rate of 1.11 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Hotel: A flat rate of 13.63 EUR/m²a is used for the reference value, derived from typical assumptions regarding potable water demand and costs. A reduction of 30% compared to the reference value is used for the target value, while an increase of 40% compared to the reference value is used for the limit value.

Business premises, shopping centres, consumer markets: Derived from the fm.benchmarking report 2016, 3.03 EUR/m²a is used for the reference value, the value for the first quantile is used for the target value, and the value for the third quantile is used for the limit value.

Logistics, production: Derived from the fm.benchmarking report 2016, 3.01 EUR/m²a is used for the reference value, the value for the first quantile is used for the target value, and the value for the third quantile is used for the limit value.

Rainwater:

All uses: The 0.81 EUR/m² floor area per year is used for the reference value, derived from 736 mm of precipitation per year, typical number of storeys = 4 (all uses except for production and logistics, where instead number of storeys = 1) and waste water costs for rainwater of 1.1 €/m³. 0 EUR/m² is used for the target value, and the limit value is equal to the reference value.

Operation costs (for cost group 300/400): Regular/irregular

All uses: The reference, target and limit values used are 0.35% of the production costs per year for cost group 300. For cost group 400, an individual value is determined and used for each scheme, derived from the AMEV values and the typical durations of use.



Cleaning

The average values typical for the use of the building from the fm.Benchmarking report 2016 are used for the reference values. The values from the first quartile are used for the target values and the values from the third quartile are used for the limit values (example for office: Target value of 5.04 EUR/m²GFAa, reference value of 8.08 EUR/m²GFAa, limit value of 12.41 EUR/m²GFAa).

Energy:

Determined and averaged final energy values from certified buildings, increased by a factor of 1.2, are used for the reference values for energy (see table below). For specific schemes, typical distributions of energy and heat are used, likewise derived from certifications. For calculation of the energy costs, typical combinations of energy sources are also used for each scheme, likewise derived from certified buildings. The target value for the final energy demand is determined by reducing the reference value by a factor of 0.6. The limit value is determined by increasing the final energy demand reference value by a factor of 1.4. The data used as a basis for calculation of the energy costs corresponds to the specifications above. 25 ct/kWh of electricity is used as the value for electricity, while the values for heat, derived from the combinations determined for the energy sources used, are 9 ct/kWh of heat (all uses other than logistics and production), or 7 ct/kWh of heat for logistics and production.

Table: Input variables for final energy values used for establishing benchmarks (in kWh/m² GFA/a)

| | Target value | Reference value | Limit value | Share of heat |
|-----------------------|--------------|-----------------|-------------|---------------|
| Office | 45 | 110 | 150 | 65% |
| Education | 50 | 120 | 170 | 65% |
| Consumer markets | 30 | 70 | 100 | 40% |
| Shopping centre | 55 | 130 | 180 | 65% |
| Business premises | 45 | 110 | 150 | 65% |
| Logistics | 45 | 110 | 150 | 80% |
| Production build-ings | 45 | 110 | 150 | 80% |
| Hotel | 100 | 240 | 330 | 80% |
| Residential | 30 | 70 | 100 | 95% |



APPENDIX B – DOCUMENTATION

I. Required documentation

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

Indicator 1: Calculations of the life cycle costs in planning

It must be proven that a life cycle cost model was drawn up for the building and used as part of the planning process.

Indicator 1.1.1: It must also be proven that the model was drawn up in work stage 3 at the latest and that the most likely/preferred building variants available were compared in terms of production costs and relevant follow-up costs, comprising at minimum the expected energy costs.

Indicator 1.1.2: It must also be proven that the scope of analysis contains all relevant building-related follow-up costs in accordance with the definition.

For this indicator, the target values used for the comparison and adequate documentation of the communication to the planning team must be produced.

Indicator 2: Life cycle cost optimisation

It must be proven that planning optimised for life cycle costs has been carried out. Proof regarding the following aspects must be provided:

- Type of analysis (full consideration or partial analysis),
- Time of analysis (specification of work phase(s))
- Number of alternatives
- Type of alternatives with documentation that significant decisions were investigated.

Indicator 2.2: Circular economy bonus – reuse

For the circular economy bonus, appropriate documentation must be produced proving the relevance of the implemented solution (share of the relevant reference value) and additionally proving either that the solution was reused or that it was not acquired via a leasing model or similar but that its use is instead an integral part of the contract.

Indicator 3: Building-related life cycle costs

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

- Table showing the production costs via cost calculation in accordance with DIN 276-1
- Table showing the operation costs via cost calculation in accordance with DIN 18960
- Documentation of the life cycle costs for the entire reference period with regard to m² SA, m² GFA and m³ GV
- Final energy demand of the building in accordance with EnEV calculation
- Data for the referenced energy sources (in order to take building systems that feed energy into the grid into account, documentation of the feed-in rate achieved must be enclosed).
- Water demand and waste water values taken from criterion ENV2.2
- Sources used for application of generalised values or reference values (such as in accordance with



the German information centre for construction costs (BKI))

- Values used for the detailed method for servicing and maintenance on the third level of cost groups 300 and 400 or beyond.

The justification and description of classification into category 1, 2 or 3 should be documented in accordance with the following specifications:

Category 1 / Special conditions and additional expenses:

- E.g. difficult foundation soil conditions: Via documentation from the expert report regarding the foundation soil
- E.g. supports: Suitable photo documentation or design plans
- Documents and/or specifications required under construction law
- Innovation: reference values and building specification, references from the German information centre for construction costs (BKI) used (where applicable)

Category 2:

- Materials or technical facilities used with installation location and quantities
- Expert report regarding the location/site

Category 3:

- Floor plan and cross-section with dimensioning



APPENDIX C – LITERATURE

I. Version

Change log based on version 2018

| PAGE | EXPLANATION | DATE |
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II. Literature

- DIN 277-1:2016-01: Areas and volumes of buildings – Part 1: Building construction, Berlin, January 2016
- DIN 276-1. Building costs – Part 1: Building construction. Berlin: Beuth Verlag. December 2008
- DIN 277-1:2016-01. Areas and volumes of buildings – Part 1: Building construction. Berlin: Beuth Verlag. January 2016
- DIN 18960. User costs of buildings. Berlin: Beuth Verlag. February 2008
- ISO 15686-5. Buildings and constructed assets – Service-life planning – Part 5: Life-cycle costing. Berlin: Beuth Verlag. June 2008
- DIN V 18599. Energy efficiency of buildings – Calculation of the energy needs, delivered energy and primary energy for heating, cooling, ventilation, domestic hot water and lighting – Part 1: General balancing procedures, terms and definitions, zoning and evaluation of energy carriers. Berlin: Beuth Verlag. December 2011
- EnEV 2014: Verordnung über energiesparenden Wärmeschutz und energiesparende Anlagentechnik bei Gebäuden [Ordinance on energy-saving thermal insulation and energy-saving installations in buildings]. Bonn: Bundesgesetzblatt [Federal Law Gazette].
- Nachhaltiges Bauen [Sustainable building] guide by the Federal Ministry of Transport, Building and Urban Development (Bundesministerium für Verkehr, Bau und Stadtentwicklung) (2013)
- German information centre for construction costs (BKI): BKI Baukosten 2017 Neubau – Statistische Kostenkennwerte für Gebäude [BKI construction costs 2017, new buildings – Statistical cost parameters for buildings]. Stuttgart 2017
- Sustainable Development Goals icons, United Nations/globalgoals.org
- fm.benchmarking report 2016: Published by Prof. Uwe Rotermund, Ingenieurgesellschaft mbH & Co KG. Höxter, 2016