TEC1.4

Use and integration of building technology

Objective

Our objective is to create a building concept plan with the best possible use of passive systems and incorporation of renewable energy sources for the required technical systems. In addition, the concept plan intends to ensure that the building can be adjusted to suit changing conditions of use or technical developments with the lowest possible effort, and that the technical systems used are integrated into the district.

Benefits

Reduced use of technical systems in the building can result in a reduction of faults during building operation. The use of resilient building technology and renewable energy sources reduces the risk of increased costs and external dependencies, and is generally engineered towards long-term durability.

Contribution to overriding sustainability goals

	CONTRIBUTION TO SUSTAINABLE DEVELOPMENT GOALS (SDGS) OF UNITED NATIONS (UN)		CONTRIBUTION TO GERMAN SUSTAINABILITY STRATEGY	
Significant	12.2	Sustainable management and use of natural resources	7.1.b	Resource conservation
			7.2.a/b	Renewable energy
Moderate	7.1	Universal access to modern energy	7.1.a	Resource conservation
	7.3	Double the improvement in energy efficiency	8.1	Resource conservation
	8.4	Improve resource efficiency in consumption and production		
	9.4	Upgrade all industries and infrastructures for sustainability		

Outlook

This criterion is applied for the first time in version 2020. Revision of the content of this criterion in the near future may be possible.

Share of total score

	SHARE	WEIGHTING FACTOR
Office **Education** **Residential** **Hotel**	**1.9%**	**3**
Consumer market **Shopping centre** **Department stores**	**2.1%**	**3**
Logistics **Production** **Assembly buildings**	**2.0%**	**3**

EVALUATION

In order to encourage a reduction in the primary energy demand required for the technical systems, points are awarded for the use of passive systems via indicator 1. The systems for heat and cooling distribution are evaluated in indicator 2. The indicators for accessibility of the building technology (indicator 3) and integrated systems (indicator 4) exist to enable assessment of the requirements for future adjustment of the technical systems with the lowest possible effort. The latter indicator evaluates the extent to which the existing systems can be removed and integrated into higher-level systems and into the district. 10 points can be awarded in each case via two circular economy bonuses for the use of renewable energy sources from the district and for the provision of storage capacity.
A maximum of 100 points, or 120 points with bonuses, can be awarded for this criterion.

NO.	INDICATOR	POINTS
1	**Passive systems**	
1.1	**Planning for a passive building concept** Planning for a passive building concept designed to reduce the primary energy demand caused by the technical systems in building operation, containing at least five of the following aspects: ■ Arrangement and compactness of the building structure, proportion of window area, ■ Use of daylight (light redirection), ■ Use of solar output (passive), ■ Solar radiation protection, ■ Storage mass and insulation standard, ■ Natural ventilation, ■ Passive heating, ■ Passive cooling	**10**
1.2	**Implementation of a passive building concept** Implementation of a passive building concept designed to reduce the primary energy demand caused by the technical systems during building operation. ■ For every aspect specified in 1.1	**Max. 20** +2.5 each
2	**Adaptability of the distribution system to suit operating temperatures to enable the use of renewable energy**	
2.1	**Heat distribution and transfer system** ■ Design of the heat transfer system for an average hot water temperature of ≥ 60 °C ■ Design of the heat transfer system for an average hot water temperature of > 45 °C, < 60 °C ■ Design of the heat transfer system for an average hot water temperature of ≤ 45 °C Please note: If the total demand of thermal energy (heating and cooling) is fully covered using renewable energy (in accordance with German Renewable Energies Heat Act (EEWärmeG)), the maximum total evaluation points can be awarded in this indicator, once a verification check on the approach has been carried out (see "Innovation area").	**1–7.5** 1 4 7.5

2.2	**Cooling distribution and transfer system**	**1–7.5**
	■ Design of the cooling transfer system for an average cold water temperature of ≤ 14 °C	1
	■ Design of the cooling transfer system for an average cold water temperature of > 14 °C, < 19 °C	4
	■ Design of the cooling transfer system for an average cold water temperature of ≥ 19 °C	7.5

Please note: If the total demand of thermal energy (heating and cooling) is fully covered using renewable energy (in accordance with the German Renewable Energies Heat Act (EEWärmeG)), the maximum total evaluation points can be awarded in this indicator once a verification check on the approach has been carried out (see "Innovation area").

Re 2 **INNOVATION AREA**

Explanation: If the systems used are supplied with 100% of their energy from renewable energy sources, the requirements of indicators 2.1 and 2.2 are considered to have been met. If there is no heating or cooling system in the building, the requirements of the corresponding indicator (2.1 or 2.2) are considered to have been met.

As in 2

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3 Accessibility of the building technology

3.1	**Technical facilities/generation**	**10**

All components of the technical facilities are easily accessible for retrofitting and subsequent replacement. The technical facilities include an adequate number of sufficiently large installation openings, doors and corridors. Components can be transported and replaced without needing to make structural changes.

3.2	**Shafts/routes/distribution**	**Max. 10**
	■ Vertical shafts/routes for all construction tasks are adequately accessible.	5
	■ Vertical shafts/routes for all construction tasks are adequately accessible and conversion work can be carried out without significant disruption to the building operation.	10

Re 3 **INNOVATION AREA**

Explanation: If energy storage is incorporated into the building and particular care is taken to ensure that it is easily accessible and can be easily adapted to future requirements, points can be awarded as appropriate for 3.1. Likewise, points can be awarded in accordance with 3.2 if particular care is taken to ensure that the transfer of energy to the rooms is easily accessible and can be easily adapted to future requirements.

As in 3

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4 Integrated systems

4.1	**Condition and expandability of system integration**	**Max. 15**
4.1.1	Open and standardised protocols in existing networks	+10
4.1.2	Planning/implementation in accordance with DIN EN ISO 16484-1	+5

4.2	**Integrated functions in a higher-level system**	**Max. 10**
	Possible functions include (points per integrated element)	+1 each

- Access control, burglar alarm system, presence detection, weather station, solar radiation protection, glare protection, lighting, heating, ventilation, cooling, lift systems, energy management, sanitary systems, window contact.

The list of possible functions may be expanded.

4.3	**Integration of technical systems/media into the district/the immediate surroundings**	**Max. 10**
4.3.1	**Planning of integration of the technical systems/media into the district/the immediate surroundings**	+5

An integrated district-based energy concept has been planned with the objective of using synergies in relation to the district/the immediate surroundings. This concept contains at least three of the following elements:

- Analysis of the existing energy potential and possible interlinking with existing energy infrastructure in the surrounding area
- Creation of district-based energy balances for the building for heating, cooling and electricity
- Comparison and environmental evaluation of the emissions of at least three decentralised and/or centralised heat supply variants
- Economic evaluation (investments and operating costs) of different heat supply variants
- Analysis of the supply of renewable energy to the district/the immediate surroundings, taking into account possible consumers

4.3.2	**Implementation of integration of the technical systems/media into the district/the immediate surroundings**	+5

An integrated district-based energy concept has been implemented with the objective of using synergies in relation to the district/the immediate surroundings.

4.4	**Integration of the energy infrastructure into the district/the immediate surroundings**	
4.4.1	**CIRCULAR ECONOMY BONUS – DISTRICT SOLUTION FOR RENEWABLE ENERGY**	**+ 10**

Explanation: Energy generated from renewable energy sources in the surrounding district/the immediate surroundings is consistently used in the building to cover the building-related or user-related energy demand (at least 10% of the building-related final energy demand). Alternatively, energy generated in the building or on the premises using renewable energy sources is transferred to the district/the immediate surroundings (at least 10% more than the building-related final energy demand).

4.4.2	**CIRCULAR ECONOMY BONUS – GRID-COMPATIBLE ENERGY SYSTEM**	**+ 10**

Explanation: The building provides a significant amount of storage capacity (approximately 10% in terms of the final energy demand of the building) for the purposes of grid compatibility or uses integrated energy and load management.

SUSTAINABILITY REPORTING AND SYNERGIES

Sustainability reporting

Appropriate key performance indicators (KPI) include communicating the design temperatures, the proportion of energy demand covered by renewable energy from the district and the storage capacities.

NO.	KEY PERFORMANCE INDICATORS (KPIS)	UNIT
KPI 1	Hot water/cold water design temperature	[°C]
KPI 2	Proportion of the building-related final energy demand covered by renewable sources from the district	[%]
KPI 3	Storage capacities of the building (grid compatibility)	[kWh/ time]

Synergies with DGNB system applications

- **DGNB RENOVATED BUILDINGS:** This criterion has similarities with the criterion TEC1.4 in the renovated buildings scheme.
- **DGNB DISTRICT:** This criterion has similarities with the criterion TEC2.1 in the UD and BD schemes.

APPENDIX A – DETAILED DESCRIPTION

I. Relevance

Technical systems are some of the components of a building that are most rapidly affected by change; at the same time, they have a significant effect on the functional ability of a building. The basic use of technology and selection of the appropriate building technology – particularly in terms of the building technology – therefore plays an important role in the sustainability of a building.

System integration, high adaptability of technical systems (i.e. enabling them to be easily adjusted to suit changing conditions) and district integration are crucial criteria, and can significantly affect the user's acceptability of a building during its lifetime, as well as the operating costs. The objective must therefore be to plan and construct current buildings in such a way as to allow for easy adjustments in the future.

II. Additional explanation

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III. Method

The technical systems should be assessed for the following elements of cost Structure – services

- Sewerage, water and gas systems
- Heat supply systems
- Air treatment systems
- Power installations
- Telecommunications and other communications systems
- Transport systems
- Building automation

In general, indicators that cannot be evaluated due to the circumstances of the technical systems in the building are considered to have been complied with. Exceptions may be possible in individual cases and are indicated.

The factors that fundamentally denote the use and integration of the building technology in the building, the adaptability of technical systems and the integration of the building technology into the district are assessed.

Indicator 1: Passive systems

For new buildings, the site selected and the arrangement of the building structures form the basis for almost all passive measures for reducing the primary energy demand during building operation. They also create the conditions for using renewable energy sources such as solar thermal energy, photovoltaics and geothermal energy as well as for designing local heating systems.

The objective is to reduce the total energy demand of buildings via architectural, structural and services-based measures. First and foremost, measures concerning energy use are to be implemented in the building and building envelope to minimise transmission and ventilation heat losses. Such measures pertain to the arrangement and compactness of the building structure, the proportion of window area, use of daylight, solar radiation protection, the storage mass and the insulation standard.

Indicator 2: Adaptability of the distribution system to suit operating temperatures to enable the use of renewable energy

- Heat distribution and transfer system
- Cooling distribution and transfer system

The possibility of integrating renewable energy sources is evaluated positively. The building can be divided into different areas if required, to address issues regarding heat and cooling distribution. This enables such issues to be addressed separately in each area. If multiple different systems are installed in different areas, the results must be determined for each area in accordance with the energy demand. The overall result can be determined on an area-weighted basis. The calculation must be clearly shown.
The objective is to implement operating temperatures that can be achieved using renewable sources of heating/cooling. If the networks used here are separate, the output weighting (by energy demand) is the crucial factor for the evaluation.

The following example is intended to clarify the above situation:

System 1 cooling ceiling (VL 16 °C/RL 19 °C): 30 kWh/(m²*a) -> average operating temperature = 17.5 °C
System 2 recirculation cooler (VL 8 °C/RL 14 °C): 10 kWh/(m²*a) -> average operating temperature = 11.0 °C

Total output: 40 kWh/(m²*a)

Does the building use separate cold water networks?

If yes → evaluation weighted by output: 3/4 system 1 + 1/4 system 2
This results in the following evaluation: 4 points * 0.75 + 1 point * 0.25 = 3.25 points

If no → overall evaluation using system 2

If the building is not equipped with a cooling transfer system, 0 points are awarded. If documentation of retrofitting for a cooling system is available, this is evaluated in accordance with the temperature levels.

Cooling systems required for dehumidification are not taken into account.

Indicator 3: Accessibility of the building technology

The ease of accessibility of all components of the technical facilities for retrofitting and subsequent replacement is evaluated.

For replacement, the dimensions and weight of the largest and heaviest component in each case, including the means of transport, is used for the evaluation. The height and width of the passages and doors and, if applicable, the dimensions of the staircase or the dimensions and load-bearing capacity of the lift must be taken into account.

Details regarding the space requirements of technical equipment rooms can be specified in the VDI 2050 series of guidelines and/or DIN EN ISO 16484 Building automation and control systems (BACS) and/or EN 13321-1 Open data communication in building automation, controls and building management and/ or EN 13779 Performance requirements for ventilation and air-conditioning systems.

At least 80% of the net room area of all technical equipment rooms must be taken into account.

Indicator 4: Integrated systems

Indicator 4.1: Condition and expandability of system integration
Integration of existing systems into a building automation system is evaluated positively. Open and standardised protocols should be used in existing networks to ensure cross-system, interdisciplinary communication.

Indicator 4.2: Integrated functions in a higher-level system
This indicator evaluates specific, pre-existing functions integrated into a higher-level system is evaluated.

Indicator 4.3: Integration of the technical systems/media into the district/the immediate surroundings
This indicator evaluates whether an energy concept is in place that analyses integration into the district/surroundings. Points are awarded depending on the scope of the concept and the heat supply variants analysed. In addition, the actual implementation of elements of this concept is evaluated positively.

Indicator 4.4: Integration of the energy infrastructure into the district/the immediate surroundings
Circular economy bonus – district solution for renewable energy:
The consistent use of energy generated from renewable energy sources in the surrounding district/the immediate surroundings in the building to cover the building-related or user-related energy demand (at least 10% of the building-related final energy demand) is evaluated positively. As an alternative, transfer of energy generated in the building or on the premises using renewable energy sources to the district/the immediate surroundings (at least 10% more than the building-related final energy demand) is evaluated positively.

Circular economy bonus – grid-compatible energy system:
If the building provides a significant amount of storage capacity (approx. 10% in terms of the final energy demand of the building) for the purposes of grid compatibility or uses integrated energy and load management, this is evaluated positively.

APPENDIX B – DOCUMENTATION

I. Required documentation

Examples of possible documentation include the following items. The documentation submitted for the evaluation of individual indicators should comprehensively and clearly demonstrate compliance with the relevant requirements

Indicator 1. Passive systems

- Description of the energy concept with details indicating that it is primarily implemented via passive solutions.
- Verification check on the selected evaluation approach

Indicator 2. Adaptability of the distribution system to suit operating temperatures to enable the use of renewable energy

- Design of the heat and cooling transfer system (e.g. planned supply and return temperatures) via relevant excerpts from the planning documents
- Verification check of the selected evaluation approach

Indicator 3. Accessibility of the building technology

- Height and width of the passages and doors and, if applicable, dimensions of the staircase, e.g. via excerpts from the plans.
- Dimensions and load-bearing capacity of the lift, e.g. via excerpts from the data sheet.
- Photo documentation of the installation openings.
- Verifiable plans for reserves in the technical equipment rooms, e.g. via planning documents.
- Documentation of the accessibility of the vertical shafts/routes, e.g. via photo documentation.
- Documentation of the space reserved for the vertical shafts/routes, e.g. via planning documents or photo documentation.

Indicator 4. Integrated systems

- Commissioned system integration work, e.g. via excerpts from the contracts.
- Excerpts from the formulated overall concept for the building technology
- Verification check of the selected evaluation approach

APPENDIX C – LITERATURE

I. Version

Change log based on 2020 version

PAGE	EXPLANATION	DATE
514	General: scheme “Assembly buildings” has been added	16.09.2021
514	Shares of total score have been corrected	16.09.2021
517	Indicator 4.2: requirement list has been expanded	16.06.2021

II. Literature

- Sustainable Development Goals icons, United Nations/globalgoals.org
- VDI guideline VDI 2050: Requirements for technical equipment rooms. Verein Deutscher Ingenieure e.V.
- DIN EN ISO 16484 Building automation and control systems (BACS)
- EN 13321-1 Open data communication in building automation, controls and building management
- EN 13779 Performance requirements for ventilation and air-conditioning systems.