U-CERT
User-Centred Energy Performance Assessment and Certification

Annex 2, U-CERT converged set of national datasheets for the main EPB standards

(Annex 2 of the report U-CERT D3.1, Development of a converged set of national data sheets (towards a U-CERT calculation methodology using the set of EPB standards), version 2.0, February 28, 2023)

This Annex is intended exclusively to prepare a set of national datasheets based on the template of Annex A of specific EPB standards.

This Annex does not replace any EPB standard, but shall be used along with the set of EPB standards.

EPB CENTER

@Content: Page:

Introduction

See also the **EPB Center Excel tool** [10] with the categorized overview of all Annex A/B choices in the 10 EPB standards selected for this document.

The EPB standards included in this Annex

The EPB standards included in this Annex are the 10 EPB calculation and pre- or post-processing standards selected in Table 5 of the core of the report:

M#	Number	Title	Number of Annex A choices [1)]
M1	EN ISO 52000-1	Energy Performance of Buildings – Overarching EPB assessment – Part 1: General framework and procedures	32
M1	EN ISO 52003-1	Energy performance of buildings – Indicators, requirements, ratings and certificates – Part 1: General aspects and application to the overall energy performance	7
M1	EN ISO 52010-1	Energy performance of buildings - External climatic conditions - Part 1: Conversion of climatic data for energy calculations	9
M1	EN 16798-1 ISO 17772-1) (revisions in prep. since 2023)	Energy performance of buildings – Ventilation of buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1–6)	25
M2	EN ISO 52016-1	Energy performance of buildings – Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads - Part 1: Calculation Procedures	48
M2	EN ISO 52018-1	Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features — Part 1: Overview of options	14
M3	ISO 52032-1	Energy performance of buildings — Energy requirements and efficiencies of heating, cooling and DHW distribution systems — Part 1: Calculation procedures	19

M#	Number	Title	Number of Annex A choices [1)]
M3	EN 15316-4-2:2017	Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–2: Space heating generation systems, heat pump systems, Module M3–8-2, M8–8-2	20
M3	prEN 15316-4-2:2022	Energy performance of buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-2: Space heating generation systems, heat pump systems, Module M3-8-2, M8-8-2	39
M5+ M6	EN 16798-7	Energy performance of buildings – Ventilation for buildings – Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration (Module M5–5)	27
M5+ M7	EN 16798-5-1	Energy performance of buildings – Ventilation for buildings – Part 5–1: Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5–6, M5–8, M6–5, M6–8, M7–5, M7–8) – Method 1: Distribution and generation	17
		Sum (excl. EN 15316-4-2:2017 that has been replaced by prEN 15316-4-2:2022):	**237**

[1)]: *The number of choices is the number of Tables in Annex A of the EPB standard, plus (for some EPB standards) choices in Annex A that are not tabulated; these have the subclause number as identification.*

1 For ISO 52000-1

Annex UU of ISO 52000-1:2017, Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures

Annex UU
(informative)

Input and method selection data sheet — ~~Default~~ U-CERT choices

UU.1 General

The template in Annex A of this document shall be used to specify the choices between methods, the required input data and references to other documents.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations. If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a national annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g., the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g., small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b;

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, …).

NOTE 4 In the section “Introduction” of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

UU.2 References

The references, identified by the module code number, are given in a table complying with the format given in Table UU.1 (a template).

Table UU.1:
Type: References

In principle this table shall be adopted without changes. It means: the full set of EPB standards is adopted, because the U-CERT methodology is based on the whole set of EPB standards.

However:
(1): In practice we also may need, for the time being, to replace some standards by a simpler calculation/estimation; but we need to keep in mind that several EPB standards offer the option of a simplified approach and/or the use of default values.

(2): In the D3.1 report different themes are distinguished and only the themes typed in black bold font are relevant for the EP calculation procedures:

A. (EP) Calculation procedures
B. EP pre- processsing (indoor and outdoor conditions)
C. EP post-processing (EP indicators, requirements or ratings)
D. (EP) Measurement procedures
E. Building, system or component design procedures*)
F. Inspection procedures
G. Certification procedures
H. Other

*) *Not included: standards on system requirements*

For a complete overview of all EPB standards and themes, see Annex 1 of the D3.1 report

Table UU.1 — References (See Clause 2)

Reference	Reference document	
	Number	Title
M1–1	ISO 52000-1	This document
M1–2		See M1–1
M1–3		See M1–1
M1–4		*Energy performance of buildings – Indicators, requirements, ratings and certificates – Part 1: General aspects and application to the overall energy performance*
M1–5, M1–7		See M1–1
M1–8, M1–9		See M1–1
M1–10		
M1–6, M2–7	~~ISO 17772-1~~	~~*Energy performance of buildings – Indoor environmental quality – Part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings*~~
	EN 16798-1 ~~(Under preparation)~~	*Energy performance of buildings – Ventilation of buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics* (Module M1–6)
M1–11		See M1–6
M1–13	ISO 52010-1	*Energy performance of buildings – External climatic conditions – Part 1: Conversion of climatic data for energy calculations*

Reference	Reference document	
	Number	Title
M1–14	EN 15459-1	*Energy performance of buildings – Economic evaluation procedure for energy systems in buildings – Part 1: Calculation procedures, Module M1–14* *[Theme: "other" → not relevant for EP calculation procedure]*
M2–2	ISO 52016-1	*Energy performance of buildings – Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads – Part 1: Calculation procedures*
M2–3	ISO 52017-1	*Energy performance of buildings – Sensible and latent heat loads and internal temperatures – Part 1: Generic calculation procedures* *[Theme: Other (reference calculation procedures) → not relevant for EP calculation procedure]*
M2–4	ISO 52018-1	*Energy performance of buildings – Indicators for partial EPB requirements related to thermal energy balance and fabric features – Part 1: Overview of options*
M2–5.1	ISO 13789	*Thermal performance of buildings – Transmission and ventilation heat transfer coefficients – Calculation method*
M2–5.2	ISO 13370	*Thermal performance of buildings – Heat transfer via the ground – Calculation methods*
M2–5.3	ISO 6946	*Building components and building elements – Thermal resistance and thermal transmittance – Calculation methods*
M2–5.4	ISO 10211	*Thermal bridges in building construction – Heat flows and surface temperatures – Detailed calculations*
M2–5.5	ISO 14683	*Thermal bridges in building construction – Linear thermal transmittance – Simplified methods and default values*
M2–5.6	ISO 10077-1	*Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: General*
M2–5.7	ISO 10077-2	*Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 2: Numerical method for frames*
M2–5.8	ISO 12631	*Thermal performance of curtain walling – Calculation of thermal transmittance*
M2–9	ISO 13786	*Thermal performance of building components – Dynamic thermal characteristics – Calculation methods*
M2–7		See M2–5
M2–8	ISO 52022-3	*Energy performance of buildings – Thermal, solar and daylight properties of building components and elements – Part 3: Detailed calculation method of the solar and daylight characteristics for solar protection devices combined with glazing*
	ISO 52022-1	*Energy performance of buildings – Thermal, solar and daylight properties of building components and elements – Part 1: Simplified calculation method of the solar and daylight characteristics for solar protection devices combined with glazing*

Reference	Reference document	
	Number	Title
M3–1	EN 15316–1	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 1: General and Energy performance expression, Module M3–1, M3–4, M3–9, M8–1, M8–4*
M3–2		
M3–3	EN 12831–1	*Energy performance of buildings – Method for calculation of the design heat load – Part 1: Space heating load, Module M3–3*
M3–4	EN 15316–1	See M3–1
M3–5	EN 15316–2	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 2: Space emission systems (heating and cooling), Module M3–5, M4–5*
M3–6	EN 15316–3	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 3: Space distribution systems (DHW, heating and cooling), Module M3–6, M4–6, M8–6*
M3–7	EN 15316–5	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 5: Space heating and DHW storage systems (not cooling), Module M3–7, M8–7*
M3–8	EN 15316–4-1	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–1: Space heating and DHW generation systems, combustion systems (boilers, biomass), Module M3–8-1 and M 8–8-1*
	EN 15316–4-2	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–2: Space heating generation systems, heat pump systems, Module M3–8-2, M8–8-2*
	EN 15316–4-3	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–3: Heat generation systems, thermal solar and photovoltaic systems, Module M3–8-3, M8–8-3, M11–8-3*
	EN 15316–4-4	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–4: Heat generation systems, building-integrated cogeneration systems, Module M8–3-4, M8–8-4, M8–11-4*
	EN 15316–4-5	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–5: District heating and cooling, Module M3–8-5, M4–8-5, M8–8-5, M11–8-5*
	EN 15316–4-8	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–8: Space heating generation systems, air heating and overhead radiant heating systems, including stoves (local), Module M3–8-8*
M3–9		
M3–10	EN 15378–3	*Energy performance of buildings –Heating and DHW systems in*

Reference	Reference document	
	Number	Title
		buildings – Part 3: Measured energy performance, Module M3–10 and M8–10 *[Theme: (EP) Measurement procedures → not relevant for EP calculation procedure]*
M3–11	EN 15378–1	*Energy performance of buildings – Heating systems and DHW in buildings – Inspection of boilers, heating systems and DHW, Module M3–11, M8–11* *[Theme: Inspection procedures → not relevant for EP calculation procedure]*
M3–12		
M4–1	EN 16798–9	*Energy performance of buildings –Ventilation for buildings – Part 9: Calculation methods for energy requirements of cooling systems (Modules M4-1, M4-4, M4-9) – General*
M4–2		
M4–3	ISO 52016–1	See M2-2
M4–4	EN 16798–9	See M4–1
M4–5	EN 15316–2	See M3–5
M4–6	EN 15316–3	See M3–6
M4–7	EN 16798–15	*Energy performance of buildings – Ventilation for buildings – Part 15: Calculation of cooling systems (Module M4–7) – Storage*
M4–8	EN 16798–13	*Energy performance of buildings – Ventilation for buildings – Part 13: Calculation of cooling systems (Module M4–8) – Generation*
	EN 15316–4-5	See M3–8
M4–9		
M4–10		
M4–11	EN 16798–17	*Energy performance of buildings – Ventilation for buildings – Part 17: Guidelines for inspection of ventilation and air conditioning systems (Module M4–11, M5–11, M6–11, M7–11)*
M4–12		
M5–1	EN 16798–3	*Energy performance of buildings – Ventilation for buildings – Part 3: For non-residential buildings – Performance requirements for ventilation and room-conditioning systems (Modules M5–1, M5–4)*
M5–2		
M5–3		
M5–4	EN 16798–3	See M5–1
M5–5	EN 16798–7	*Energy performance of buildings – Ventilation for buildings – Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration (Module M5–5)*
M5–6	EN 16798–5–1 and EN 16798–5–2	*Energy performance of buildings – Ventilation for buildings – Part 5–1: Calculation methods for energy requirements of ventilation and air*

Reference	Reference document	
	Number	**Title**
		conditioning systems (Modules M5–6, M5–8, M6–5, M6–8, M7–5, M7–8) – Method 1: Distribution and generation *Energy performance of buildings – Ventilation for buildings – Part 5–2: Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5–6, M5–8, M6–5, M6–8, M7–5, M7–8) – Method 2: Distribution and generation*
M5–7		
M5–8	EN 16798–5–1 and EN 16798–5–2	See M5–6
M5–9		
M5–10		
M5–11	EN 16798–17	See M4–11
M6–1		See M5–1
M6–2		See M5–2
M6–3		See M5–3
M6–4		See M5–4
M6–5	EN 16798–5–1 and EN 16798–5–2	See M5–6
M6–6		See M5–6
M6–7		See M5–7
M6–8	EN 16798–5–1 and EN 16798–5–2	See M5–6
M6–9		See M5–9
M6–10		See M5–10
M6–11	EN 16798–17	See M5–11
M7–1		See M5–1
M7–2		See M5–2
M7–3		See M5–3
M7–4		See M5–4
M7–5	EN 16798–5–1 and EN 16798–5–2	See M5–6
M7–6		See M5–6
M7–7		See M5–7
M7–8	EN 16798–5–1 and EN 16798–5–2	See M5–6
M7–9		See M5–9
M7–10		See M5–10

Reference	Reference document	
	Number	Title
M7–11	EN 16798–17	See M5–11
M8–1	EN 15316–1	See M3–1
M8–2	EN 12831–3	*Energy performance of buildings – Method for calculation of the design heat load – Domestic hot water systems heat load and characterization of needs, Module M8–2, M8–3*
M8–3	EN 12831–3	See M8–2
M8–4	EN 15316–1	See M8–1
M8–5		
M8–6	EN 15316–3	See M3–6
M8–7	EN 15316–5	See M3–7
M8–8	EN 15316–4-1	See M3–8
	EN 15316–4-3	See M3–8
	EN 15316–4-4	See M3–8
	EN 15316–4-5	See M3–8
	EN 15316–4-8	See M3–8
M8–9		
M8–10	EN 15378–3	See M3–10
M8–11	EN 15378–1	See M3–11
M9–1	EN 15193–1	*Energy performance of buildings – Energy requirements for lighting – Part 1: Specifications, Module M9*
M9–2	EN 15193–1	See M9–1
M9–3		
M9–4	EN 15193–1	See M9–1
M9–5		
M9–6		
M9–8		
M9–10	EN 15193–1	See M9–1
M9–11	EN 15193–1	See M9–1
M10–1	~~EN 15232–1~~ EN ISO 52120-1	~~*Energy performance of buildings – Part 1: Impact of Building Automation, Controls and Building Management – Modules M10-4,5,6,7,8,9,10*~~ *Energy performance of buildings -- Contribution of building automation, controls and building management -- Part 1: General framework and procedures*
M10–2		
M10–3		

Reference	Reference document	
	Number	Title
M10–4		
M10–5	EN 15232–1	See M10–1
M10–6	EN 15232–1	See M10–1
M10–7	EN 15232–1	See M10–1
M10–8	EN 15232–1	See M10–1
M10–11	EN 16946-1	*Energy Performance of Buildings – Inspection of Automation, Controls and Technical Building Management – Part 1: Module M10–11* *[Theme: Inspection procedures → not relevant for EP calculation procedure]*
M10–12	EN 16947-1	*Energy Performance of Buildings – Building Management System – Part 1: Module M10–12*
M11–1		
M11–4		
M11–8	EN 15316–4-3	See M3–8
	EN 15316–4-4	See M3–8
	EN 15316–4-5	See M3–8
	EN 15316–4-10	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 4–10: Wind power generation systems, Module M11–8-3*

Table UU.2:
Type: Categorization. Policy choice

Evidently this choice has a large impact on the input data, but less on the calculation methodology itself.

Note: the user aspects and IEQ are covered in EN 16798-1 (see further on).
For the EP Certificate only the first row is relevant.

U-CERT Choice: Adopt Table B.2 without changes.

Table UU.2 — Energy performance assessment types according to building category and application (See 5.3)

Application	Building category	Assessment type	Conditions
Energy performance certificate	All categories	As built type	-
Building permit	All categories	Design type	-
Permit to use	All categories	As built type	-
Energy audit	All categories	Tailored type	-
NOTE Add rows in case of more assessment purposes.			

Table UU.3:
Type: Categorization. Policy choice

The subsets in this Table aim to make clear that there are different types of subdivision: within each subset only one of the types can be selected. This is not very clear. Actually, each subset should be a separate Table. Therefore extra rows are introduced, to separate the subsets.

Each of the types and subtypes serves a specific purpose. If the purpose for some of the types or subtypes is not clear, we should add an explanation.

See EPBD:2018:
e.g. related to Subsets 1 and 2:
"… buildings or building units which are constructed, sold or rented out…."
"…. Where a building is sold or rented out in advance of construction …"
e.g. related to Subset 3:
"…. residential and commercial buildings, both public and private …"

U-CERT Choice: Adopt Table B.3, with only change: "split up" the Table per subtype

Table UU.3 — Object types (See Clause 6 and 10.1)

EPB_OBJECT_TYPE			
Type [a]	**Description**	**Subset** [b]	**Comments**
Subset: Boundary:			
EPB_OBJECT_BLDNG_TOT	Whole building	1	
EPB_OBJECT_BLDNG_UNIT	Building unit	1	
EPB_OBJECT_BLDNG_PART	Part of a building (lacking one or more features of a complete building or building unit)	1	
Subset: Status in lifecycle:			
EPB_OBJECT_ LCYCLE_NEW.DESIGN	New building design	2	
EPB_OBJECT_ LCYCLE_AS.BUILT	Existing building as built (without long term use data)	2	
EPB_OBJECT_ LCYCLE_EXIST.RENOV	Existing building after renovation (without long term use data)	2	
EPB_OBJECT_ LCYCLE_EXIST.EXTENS	Existing building extension (without long term use data)	2	
EPB_OBJECT_ LCYCLE_EXIST.IN.USE	Existing building in use	2	
Subset: Main use category:			
EPB_OBJECT_CAT_RES	Residential building	3	
EPB_OBJECT_CAT_NRES	Non-residential building	3	
Subset: Main user category:			

EPB_OBJECT_USER_L.PUBL	Large public building	4	
EPB_OBJECT_USER_OTHER	Other	4	

NOTE The type of object may have an effect on the choices in this overarching document and in the other EPB standards. This property is therefore inherited by the other EPB standards, where relevant.

[a] One choice is possible per subset.

[b] Definition of the calculation case, one selection shall be done for each subset.

Table UU.4:
Type: Categorization. Policy choice

NOTE: The building categories in Table B.4 are consistent with EPBD:2018, Annex i:

For the purpose of the calculation buildings should be adequately classified into the following categories:

(a) single-family houses of different types;
(b) apartment blocks;
(c) offices;
(d) educational buildings;
(e) hospitals;
(f) hotels and restaurants;
(g) sports facilities;
(h) wholesale and retail trade services buildings;
(i) other types of energy-consuming buildings.

Watch the chain (1):
Different building category = different calculated EP = different benchmarks?!
Any refinement makes only sense if -with basically the same set of measures and provisions- the energy performance is different between building categories.
Such differences occur if for different building categories the assumed conditions of use are different: levels and schedules of operative temperature, occupation density, internal heat gains, domestic hot water needs, IEQ, ventilation rate, illumination;
and/or if the typical building sizes or shape or types of construction or types of systems (for one reason or another) are different for different building categories.
If the energy performance is basically different, then also the cost-optimum energy performance will be different.
So different building categories give different values for the EP indicator(s), in which case also the benchmarks (expressed by the same indicator) are (should be!) different, including the reference values for the energy label classes and the minimum EP requirements. In this case the energy performances of buildings with different building categories cannot be compared.
An alternative is to neutralize these differences by “tailoring” the EP indicator(s), in which case also the benchmarks (expressed by the same indicator) are “tailored”, including the reference values for the energy label classes and the minimum EP requirements.

The building or space categories for the specification of use profiles in **EN 16798-1, Annex C** need to be consistent.
Use profiles in EN 16798-1, Annex C are specified for:
School, Classroom
Daycare, kindergarten
Department store
Meeting room
Office, Landscaped
Office, Single
Restaurant
Residential, Apartment, Retired

Residential, Apartment
Residential, Detached house
So: missing in EN 16798-1, Annex C, compared to Table B.4 in EN ISO 52000-1:
Hotel
Holiday home
Hospitals
Sports facilities
Wholesale and retail trade services buildings

Mixed use buildings"
See the discussion in the explanation box on **Table UU.6**.

➔ LINKED CHOICES:
The building categories listed in **Table UU.5** have to be consistent with the list of building categories in this Table UU.4.
Table UU.6: if ***space*** categories are differentiated: See discussion above in this explanation box
Table UU.7: *Space* category differentiation
EN 16798-1, Annex C: conditions of use per space category (see discussion above in this explanation box)

U-CERT Choice: adopt the building categories of Table B.4. This implies that in EN 16798-1, Annex C it needs to be clarified which occupant schedules apply to the building categories missing in that Annex. But see also the explanation on the other linked tables.

Table UU.4 — Building categories (See Clauses 6 and 9)

BLDNGCAT_TYPE		
Type	**Description**	**Comments**
BLDNGCAT_RES_SINGLE	Single-family houses of different types	[a]
BLDNGCAT_RES_APPBLOCK	Apartment blocks	
BLDNGCAT_RES_ELDER	Homes for elderly and disabled people	
BLDNGCAT_RES_COLL	Residence for collective use	
BLDNGCAT_RES_MOBIL	Mobile home	
BLDNGCAT_RES_HOL	Holiday home	
BLDNGCAT_OFF	Offices	
BLDNGCAT_EDUC	Educational buildings	
BLDNGCAT_HOSP	Hospitals	
BLDNGCAT_HOTEL	Hotels and restaurants	
BLDNGCAT_SPORT	Sports facilities	
BLDNGCAT_RETAIL	Wholesale and retail trade services buildings	
BLDNGCAT_DATA_CENTER	Data centre	
BLDNGCAT_INDUS	Industrial sites	
BLDNGCAT_WORKS	Workshops	
BLDNGCAT_AGRIC	Non-residential agricultural buildings	

a List copied from ISO 13675, Annex 1.5[12], but residential sector more differentiated and other buildings use energy more differentiated.

NOTE The building category may have an effect on the choices in this overarching document and in the other EPB standards. This property is therefore inherited by the other EPB standards, where relevant.

Table UU.5:
Type: Categorization. Policy choice

➔ **LINKED CHOICES:**
Table UU.4: See explanation box on Table UU.4

In any case the choice should be:
- Industrial sites = No
- Workshops= No
- Non-residential agricultural buildings = No

because in these building categories the technical building services are primarily focused on an (industrial) process and not on human occupation.

U-CERT Choice: adopt Table B.5 without changes

Table UU.5 — Which building categories are included in EPB assessment (See 6.2.2)

Building categories	**Identifier**	**Included in EPB assessment** [a] **Yes/No**
Residential buildings:		
Single family houses of different types	*BLDNGCAT_RES_SINGLE*	YES
Apartment block	*BLDNGCAT_RES_APPBLOCK*	YES
Homes for elderly and disabled people	*BLDNGCAT_RES_ELDER*	YES
Residence for collective use	*BLDNGCAT_RES_COLL*	YES
Mobile home	*BLDNGCAT_RES_MOBIL*	YES
Holiday home	*BLDNGCAT_RES_HOL*	YES
Non-residential buildings:		
Office buildings	*BLDNGCAT_OFF*	YES
Educational buildings	*BLDNGCAT_EDUC*	YES
Hospitals	*BLDNGCAT_HOSP*	YES
Hotels and restaurants	*BLDNGCAT_HOTEL*	YES
Sport facilities	*BLDNGCAT_SPORT*	YES
Wholesale and retail trade services buildings	*BLDNGCAT_RETAIL*	YES
Industrial sites	*BLDNGCAT_INDUS*	NO
Workshops	*BLDNGCAT_WORKS*	NO
Non-residential agricultural buildings	*BLDNGCAT_AGRIC*	NO

[a] Building category for which this document applies, e.g. because there is an EPB requirement for this building category.

Table UU.6:
Type: Categorization. Policy choice. Important factor for the calculated energy performance.
Critical for calculation tool development.

Important, because it implies different conditions of use within a building ("*mixed [use] building*"), as discussed below.

The choice is critical for tool development, because of the different conditions of use that have to be taken into account in the configuration of the tool.

Watch the chain (2):
As discussed in the explanation box on **Table UU.4** ("**Watch the chain (1)"):** different building categories may lead to different energy performances, which also has an impact on the EP indicator(s) and benchmarks, including the reference values for the energy label classes and the minimum EP requirements.
In case of different space categories within a building ("Mixed use building") , this becomes even more complicated.

Mixed use building?
One of the key questions is: how, in each country, is the assessed energy performance checked for compliance with minimum EP requirements or compared with benchmarks (including the reference values for the energy label classes) in case of a "mixed [use] building" (building with e.g. office spaces, hospital beds, meeting room, class rooms, …)?
NOTE: see also Table UU.7 and Table UU.8 on Space categories!

Three of the possible solutions:
1) The calculation shall be done for only one set of conditions (for the dominant use category).
2) The calculation is done for different sets of conditions (per group of spaces of the same category), but the benchmark is for the dominant category.
3) The calculation is done for different sets of conditions (per group of spaces of the same category), and the minimum EP requirements and other benchmarks are obtained as the floor-weighted average of the for each category.
See recommendation in **U-CERT report D3.2** [5], section *Energy Performance Certificate/Scales/Energy Performance Scale/The reference value/mixed buildings*:
The last option seems quite elegant, but information needs to be gathered on the choices made in this respect in the EU Member States, which is directly linked to the way the national or regional energy performance requirements are set.

➔ LINKED CHOICES:
Table UU.4: Differentiation of building categories.
Table UU.2 of EN ISO 52003-1: Choices of features for main requirements or key information
Table UU.3 of EN ISO 52016-1: Thermal zoning rules
Table UU.7 of EN ISO 52016-1: Calculation with coupled or uncoupled thermal zones

U-CERT Choice: adopt Table B.6 without changes

Table UU.6 — Differentiation of space categories (See Clauses 6, 9 and 10.1)

Choice

Type	Choice	Comments
Differentiation of space categories in a building	Yes	

In case of differentiation Table UU.7 has to be completed. Otherwise the list of space categories is equal to the list of building categories: (SPACECAT_X = BLDNGCAT_X).

Table UU.7:
Type: Categorization. Policy choice. Important factor for the calculated energy performance

If the ***spaces*** are differentiated, also in the benchmarks (including the reference values for the energy label classes and the minimum EP requirements), then the ***building*** category (see **Table UU.4**) does not matter: only the ***space*** categories matter.

The refinement makes only sense if the assumed conditions of use differ per space category.

Mixed use buildings"
See the discussion in the explanation box on **Table UU.6**.

Watch the chain:
See the discussion in the explanation box on **Table UU.4**

➔ LINKED CHOICES:
(1) Check consistency with **Table UU.4**.
(2) The space categories in this Table UU.7 comprise much more space types than the space types for which occupant schedules are provided in **EN 16798-1, Annex C.**

NOTE: Use profiles in EN 16798-1, Annex C:

School, Classroom	Office, Single
Daycare, kindergarten	Restaurant
Department store	Residential, Apartment, Retired
Meeting room	Residential, Apartment
Office, Landscaped	Residential, Detached house

U-CERT Choice: adopt the space categories of Table B.7. This implies that in EN 16798-1, Annex C it needs to be clarified which occupant schedules apply to the space categories missing in that Annex.

Table UU.7 — Space categories (See Clauses 6 and 9)

SPACECAT_TYPE		
Type	**Description**	**Comments**
SPACECAT_RES_LIV	Residential living space, kitchen, bed room, study, bath room or toilet	
SPACECAT_RES_INDIV_OTHER	Residential individual: hall, corridor, staircase inside thermal envelope, attic inside thermal envelope	
SPACECAT _RES_COLL	Residential collective or non-residential: hall, corridor, staircase inside thermal envelope	
SPACECAT_TH.UNCOND_OTHER	Thermally unconditioned adjacent space, such as storage room or unconditioned	

	attic	
SPACECAT_TH.UNCOND_SUN	Thermally unconditioned sunspace or atrium	
SPACECAT_HALL	Entrance hall/foyer	
SPACECAT_CORR	Corridor	
SPACECAT_TH.UNCOND_CORR	Hall, corridor outside thermal envelope	
SPACECAT_OFF	Office space	
SPACECAT_EDUC	Educational space	
SPACECAT_HOSP_BED	Hospital bed room	
SPACECAT_HOSP_OTHER	Hospital other room	
SPACECAT_HOTEL	Hotels room	
SPACECAT_REST	Restaurant space	
SPACECAT_REST_KITCH	Restaurant kitchen	
SPACECAT_MEET	Meeting or seminar space	
SPACECAT_AUDIT	Auditorium, lecture room	
SPACECAT_THEAT	Theatre or cinema space	
SPACECAT_SERVER	Server or computer room	
SPACECAT_SPORT_TH.COND	Sport facilities, thermally conditioned	
SPACECAT_SPORT_TH.UNCOND	Sport facilities, thermally unconditioned	
SPACECAT_RETAIL	Wholesale and retail trade services space (shop)	
SPACECAT_NONRES_BATH	Non-residential bath room, shower, toilet, if inside thermal envelope	
SPACECAT_SPA	Spa area with sauna shower and/or relaxing area	
SPACECAT_SWIMM	Space with indoor swimming pool	
SPACECAT_STOR_HEAT	Heated storage space	
SPACECAT_STOR_COOL	Cooled storage space	
SPACECAT_STOR_NOCON	Non conditioned storage space	
SPACECAT ENGINE	Engine room	
SPACECAT_CAR	Individual garage or collective indoor car park	
SPACECAT _BARN	Barn	
NOTE 1 Each space category requires a set of conditions of use (temperature settings, ventilation, and lighting requirements, domestic hot water needs, etc.), to be specified in M1–6. NOTE 2 The space category may have an effect on the choices in this overarching document and in the other EPB standards. This property is therefore inherited by the other EPB standards, where relevant.		

Table UU.8:
Type: Categorization. Policy choice

The distinction in application types only means that we can, where needed in the set of EPB standards, make different choices for different applications, chosen from this list of applications.

U-CERT Choice: adopt Table B.8 without changes.

Table UU.8 — Application types (See Clauses 6, 9 and 10.1)

EPB_APPLIC_TYPE		
Type	**Description**	**Comments**
EPB_APPLIC_REQ	To check compliance with energy performance requirements	
EPB_APPLIC_CERTIF	Energy performance certification	
EPB_APPLIC_PERMIT_BLD	To obtain building permit	
EPB_APPLIC_PERMIT_USE	To obtain permit to use	
EPB_APPLIC_AUDIT	Energy audit (tailored)	
EPB_APPLIC_INSP	Energy performance inspection	
NOTE The type of application may have an effect on the choices in this overarching document and in the other EPB standards. This property is therefore inherited by the other EPB standards, where relevant.		

Table UU.9:
Type: Categorization.

The distinction in assessment types only means that we can, where needed in the set of EPB standards, make different choices for different assessment types, chosen from this list of assessment types.

U-CERT Choice: adopt Table B.9 without changes.

Table UU.9 — EPB assessment types (See Clauses 6 and 9)

EPB_ASSESS_TYPE (see Table 3)		
Type	**Description**	**Comments**
EPB_ASSESS_CALC_DESIGN	Calculated, design	
EPB_ASSESS_CALC_ASBUILT	Calculated, as built	
EPB_ASSESS_CALC_ACTUAL	Calculated, actual	
EPB_ASSESS_CALC_TAILORED	Calculated, tailored	
EPB_ASSESS_MEAS_ACTUAL	Measured, actual	
EPB_ASSESS_MEAS_ CORR_CLIM	Measured, corrected for climate	
EPB_ASSESS_MEAS_ CORR_USE	Measured, corrected for use	
EPB_ASSESS_MEAS_STAND	Measured, standard (corrected for climate and use)	
NOTE 1 The type may be different for different object types, building or space categories.		

NOTE 2 The type of assessment may have an effect on the choices in this overarching document and in the other EPB standards. This property is therefore inherited by the other EPB standards, where relevant.

Table UU.10:
Type: Categorization.

The distinction in combination of services types only means that we can choose a different set of EPB services for (and only for) residential versus non-residential buildings (Note that **industrial** buildings were already excluded for all EPB services, see Table UU.5).

NOTE: if the content of Table B.10 is adopted, then all residential buildings have the same set of EPB services and all non-residential buildings have the same set of EPB services, as further specified in Table UU.18.

U-CERT Choice: Adopt Table B.10 without changes.

Table UU.10 — Combination services types (See Clauses 6 and 9)

EPB_LISTSERVICES_**TYPE**		
Type	**Description**	**Comments**
*EPB*_LISTSERVICES_*RES*	Services included for the EPB assessment of residential buildings	
*EPB*_LISTSERVICES_*NRES*	Services included for the EPB assessment of non-residential buildings	
NOTE 1 The combination may be different for different building or space categories. NOTE 2 The type of services combination may have an effect on the choices in this overarching document and in the other EPB standards. This property is therefore inherited by the other EPB standards, where relevant.		

UU.3 Method

Table UU.11:
Type: Categorization.

The distinction in electricity use types only means that we can distinguish these electricity use types, where needed.

U-CERT Choice: adopt Table B.11 without changes.

Table UU.11 — Electricity use types (See 7.3.3.4.)

Electric energy use type	Identifier
Main input to a generator	EL_USE_MAIN
Auxiliary energy	EL_USE_AUX
Direct heating (Joule effect)	EL_USE_JOULE
Non EPB uses	EL_USE_NEPB

Table UU.12:
Type: Categorization.

The distinction in electricity generation types only means that we can distinguish these electricity generation types.

Add on site or nearby storage:
In EN ISO 52000-1 the on site or nearby storage of electricity is not covered. It would help further improvement of the set of EPB standards if it is added to the EP calculation methodology.
Note that the 2021 update of the spreadsheet on EN ISO 52000-1 covers this aspect, in anticipation of future review of the standard.
If storage is regarded as a part of the electric energy system, then it is not a violation of EN ISO 52000-1: the energy is only released at another moment (and after subtracting the storage losses).

U-CERT Choice: adopt Table B.12 with added line on storage of electric energy.

Table UU.12 — Electricity generation types (See 7.3.3.6 and 9.6.6.2.4)

Electric energy generation type	Identifier
Photovoltaic	EL_PROD_PV
Wind turbine	EL_PROD_WIND
Cogeneration	EL_PROD_CHP

The electric energy system can include storage of electric energy, on site or nearby.

Table UU.13:
Type: Measured EP.
Calculation parameters. Technical

Only relevant for **measured energy**.
For that application it is recommended to make a choice between (conservative) estimated and certified caloric values. Certified caloric values, if available, may replace the estimated values.

U-CERT Choice: Not relevant for the U-CERT EP calculation method

Table UU.13 — Gross calorific value of some common solid fuels (See 7.3.4 and 9.6.2)

Fuel	Gross calorific value kWh/kg
Anthracite	~~8,9 – 9,7~~
Bituminous coal	~~4,7 – 6,9~~
Charcoal	~~8,22~~
Coke	~~7,8 – 8,6~~
Lignite	~~4,2 – 8,3~~
Peat	~~3,6 – 5,6~~
Wood (dry)	~~3,9 – 4,7~~
NOTE Add the rows of the energy carriers.	

Table UU.13 is kept blank because it not relevant for the EP calculation procedures

Table UU.14:
Type: Measured EP.
Calculation parameters. Technical

Only relevant for **measured energy**.
For that application it is recommended to make a choice between (conservative) estimated and certified caloric values. Certified caloric values, if available, may replace the estimated values.

U-CERT Choice: Not relevant for the U-CERT EP calculation method

Table UU.14 — Gross calorific value of some common liquid fuels (See 7.3.4 and 9.6.2)

Fuel	Density kg/l	Gross calorific value kWh/kg
Oil		
Heating oil, light	~~0,84 – 0,85~~	~~12,44~~
Heating oil, heavy	~~0,96~~	~~13,94 – 11,75~~
Liquid gas		
80 propane:20 butane	~~0,52~~	~~13,83~~
70 propane:30 butane	~~0,53~~	~~13,83~~
60 propane:40 butane	~~0,53~~	~~13,81~~
50 propane:50 butane	~~0,55~~	~~13,78~~
Commercial propane	~~0,51~~	~~13,89~~
[a] Confidence interval for liquid gas is about ± 0,1 MJ/kg.		
NOTE Add the rows of the energy carriers.		

Table UU.14 is kept blank because it not relevant for the EP calculation procedures

Table UU.15:
Type: Measured EP.
Calculation parameters. Technical

Only relevant for **measured energy**.
For that application it is recommended to make a choice between (conservative) estimated and certified caloric values. Certified caloric values, if available, may replace the estimated values.

U-CERT Choice: Not relevant for the U-CERT EP calculation method

Table UU.15 — Gross calorific values of some gaseous energy carriers (see 7.3.4 and 9.6.2)

Fuel	Density kg/m³	Gross calorific value kWh/m³
Natural gas L	~~0,64~~	~~9,75 – 9,78~~
Natural gas H	~~0,61~~	~~11,41 – 11,47~~

Methane	~~0,55~~	~~11,06 – 11,08~~
Propane	~~1,56~~	~~28,03~~
Butane	~~2,09~~	~~37,19~~
Hydrogen	~~0,09~~	~~39~~
Biogas	~~1,2~~	~~4 to 8~~ [a]
[a] Depending on its methane content.		
NOTE Add the rows of the energy carriers.		

Table UU.15 is kept blank because it not relevant for the EP calculation procedures

Table UU.16:
Type: Important factor for the calculated energy performance.
Calculation parameters. Policy choice

Harmonized weighting factors?:
The ALDREN D2.2 report [11], section A1.3, provides an extensive discussion on Primary energy factors and CO2 emission coefficients.
It supposes an evolution of primary energy factors in time, based on (increasing) off-site renewable energy sources to fulfil requirements on NZEB.
It gives an overview of advantages and disadvantages of three options:
1 National PEF and CO2 emission coefficients
2. Fixed common EU values (e.g. based on Annex B of EN ISO 52000-1:2017)
3. Calculation of PEF and CO2 emission coefficient for each country based on Eurostat data [..]

Although the ALDREN observations and recommendations are given in the context of the steps towards the *ALDREN European Voluntary Certificate (ALDREN methodology)*, it is equally relevant for the U-CERT *converged set of EPB calculation procedures*.

Option of time-dependent weighting factors:
One valuable innovation by U-CERT would be demonstrating the impact of time-dependent weighting factors; i.e., showing the convenience of on-site use of electricity from the grid during sun hours.
Under ALDREN D2.2, option 3, presented above in this explanation box, it is stated: "the hourly data is possible to use if it will become available at the European level for all countries"

NOTE: Application of the (new) EPB standard EN 17423:2020, *"Energy performance of buildings — Determination and reporting of Primary Energy Factors (PEF) and CO2 emission coefficient –General Principles, Module M1-7*" would provide more transparency in national primary energy factors.
https://epb.center/documents/en-17423/
The 2022 draft of the EPBD recast explicitly requires the use of this EPB standard.
Note that compensation of electricity delivered by the grid at one moment or season, by on-site produced surplus of renewable electricity (e.g. PV) at another moment or season should not be allowed in the trajectory towards **zero emission buildings (ZEB)**. It **covers up** the use of non-renewable energy. It also hinders the appreciation of smart designs, where supply and demand are better matched by local storage and/or smart control of energy using equipment and appliances. Hourly PEF factors provide the extra stimulus to optimize the interaction with the grid with respect to hourly peaks and overloads / congestion.
Read more in REHVA article on *The EPBD recast: how to come to a transparent and fair ZEB definition* [14].

District heating:
ALDREN recommends to add a note to District heating: "The values reported by specific heat producer based on national reporting rules may be used.". However, the footnote in Table B.16 has the same effect (except that the use of relevant EPB standard(s) is mentioned instead of national reporting rules).

Exported thermal energy?
(1) See EN ISO 52000-1, 11.6.4: "The energy performance is corrected for exported heat (is subtracted)." This implies that a weighting factor is needed for exported heat.
On the other hand, when it comes to on site produced Combined Heat and Power, the supposition in the EPB calculation is that the CHP is heat demand driven, so it should not produce a surplus of heat for the sake of more electricity production.

(2): An option that may be useful to avoid the issue of exported thermal energy is to assess the energy performance on a portfolio of buildings instead of an individual building.
See EN ISO 52000-1, 3.1.1: definition of an "assessed object": "building, part of a building ***or portfolio of buildings*** that is the object of the energy performance assessment".
EN ISO 52000-1, 3.1.6: definition of "portfolio of buildings": *set of buildings and common technical building systems whose energy performance is determined taking into account their mutual interactions*.

So the assessed object may include one or several building units or buildings, if these are not individually object of the energy performance assessment. For example: a university campus.
Such a portfolio of buildings may internally exchange ("import resp. export") thermal energy.

The U-CERT proposal is to add exported thermal energy, with for the moment the same weighting factors as the (default) values for delivered thermal energy via district heating and cooling.

➔ LINKED CHOICES:
The concept of a ***portfolio of buildings*** may also be relevant for electricity, if imported and exported within a local grid, see **Table UU.17** below.

- **Table UU.17 below:** choice if exported own-produced renewable energy is rewarded.
- **Table UU.4 of EN ISO 52003-1:** Choice of numerical indicators on Primary Energy, with or without compensation by exported own-produced renewable energy.

National or common weighting factors?
Even if national weighting factors are preferred, a set of common EU weighting factors will be important as reference values, in the context of cross-national comparison.

General conclusion:
The convergence towards more harmonized and dynamic weighting factors need to be further discussed and worked out.

U-CERT Choice: For the moment Table B.16 is adopted with an additional row for exported thermal energy

Table UU.16 — Weighting factors (based on gross or net calorific value)
(See 7.3.5, 9.5.1, 9.6.2, 9.6.5 and 9.6.6.3)

	Energy carrier Delivered from distant		f_{Pnren}	f_{Pren}	f_{Ptot}	K_{CO2e} (g/kW h)
1	Fossil fuels	Solid	1,1	0	1,1	360
2		Liquid	1,1	0	1,1	290
3		Gaseous	1,1	0	1,1	220
4	Bio fuels	Solid	0,2	1	1,2	40

5		Liquid	0,5	1	1,5	70
6		Gaseous	0,4	1	1,4	100
7	Electricity [c]		2,3	0,2	2,5	420
	Delivered from nearby					
8	District heating [a]		1,3	0	1,3	260
9	District cooling		1,3	0	1,3	260
	Delivered from on-site					
10	Solar	PV electricity	0	1	1	0
11		Thermal	0	1	1	0
12	Wind		0	1	1	0
13	Environment	Geo-, aero-, hydrothermal	0	1	1	0
	Exported					
14	Electricity [b c]	To the grid	2,3	0,2	2,5	420
15		To non EPB uses	2,3	0,2	2,5	420
16	Thermal energy		1,3			260?

[a] Default value based on a natural gas boiler. Specific values are calculated according to M3–8.5.

[b] It is possible to differentiate between different sources of electricity like wind or solar.

[c] These values are established in line with the default coefficient provided in Annex IV of Directive 2012/27/EU. This default coefficient is currently being reviewed and a later amendment of the above factors could be needed.

NOTE 1 Add a column in case of other requirements, e.g., CO_2 requirement.

NOTE 2 Add rows for each relevant energy carrier.

Table UU.17:
Type: Important factor for the calculated energy performance.
Calculation parameters. Policy choice

k_{exp} > 0 means that on the overall EP, the resources avoided by the external grid due to the export of the energy carrier are taken into account, for a k_{exp} part.
But before export to the grid, the local use by non-EPB services (e.g. appliances) may be taken into account, see row 15 in Table UU.15.

The recommendation from ALDREN D.2.2 [11] is to choose k_{exp} = 1 for the main indicator (main energy class), and to choose k_{exp} = 0 for a secondary indicator (energy class).

➔ LINKED CHOICES:
- **Table UU.16**: the option of "portfolio of buildings" avoids exported energy as long as the energy remains within the portfolio of buildings as defined in EN ISO 52000-1, definition 3.1.6.
- **Table UU.12** if (short term) on site storage of electricity is included in the calculation procedures, the impact will mainly be visible in the EP with k_{exp} = 0.
- **Table UU.4 of EN ISO 52003-1** (numerical indicators: for the main EP indicator the value of k_{exp} shall be the same as chosen here in this Table.

U-CERT Choice: Add as comment in Table B.17 the secondary indicator with k_{exp} = 0

Table UU.17 — k_{exp}-factor (See 7.3.5 and 11.6.2.1)

Description	Value
k_{exp} factor that is used to control which part of the exported energy is included in the energy performance of the building	1
For a secondary indicator: k_{exp} = 0 (see Table UU.4 of EN ISO 52003-1)	

Table UU.18:
Type: Important factor for the calculated energy performance.
Calculation parameters. Policy choice

Whether **lighting for residential buildings** should be included or excluded.

U-CERT Choice: adopt Table B.18, but check if "No" for lighting in residential buildings is (still) the best choice.

Table UU.18 — Building services considered in the energy performance calculation (See 8.2 and 8.5)

Combination of services type	**Choice: included in the energy performance calculation** ***< one column per service mix type, see Table UU.10 >***	
Building service [a]	***EPB***_LISTSERVICES_***RES***	***EPB***_LISTSERVICES_***NRES***
Heating	Yes	Yes
Cooling	Yes	Yes
Ventilation	Yes	Yes
Humidification	Yes	Yes
Dehumidification	Yes	Yes
Domestic hot water	Yes	Yes
Lighting	No	Yes
External lighting	No	No
People transport (e.g., elevators, escalators)	No	No
Other services consuming electricity (e.g., appliances)	No	No
Others	No	No
[a] Add rows or edit the lines in case of other/more differentiated services.		

Table UU.19:
Type: Important factor for the calculated energy performance.
Calculation parameters. Policy choice

In case of the principle of an "**Assumed system**" there is less risk of too optimistic EP due to undersized or absent system. But the EP is less realistic.

In case of the principle of "**Presence of system**" the indoor conditions may not meet the requirements due to absent or undersized system.
This is also risk of energy poverty.
In this case an additional warning or penalty is needed to safeguard a level playing field and fair comparison between buildings.

- In case of **heating or cooling** and/or **(de-)humidification** systems: a warning or penalty based on a thermal discomfort indicator.
- In case of **DHW systems**: a warning or penalty based on a DHW deficit & discomfort indicator.
- In case of **ventilation systems**: a warning or penalty based on IAQ indicator?
- In case of **lighting systems**: a warning or penalty based on light deficit & visual discomfort indicator?

So for other services than heating and cooling, indicators to mark a service deficit/discomfort has to be developed or selected and tested. See suggestions in **U-CERT Report D3.2** [5]: Domestic Hot Water thermal comfort and Daylight Autonomy. The indicators are (to be) specified in EN ISO 52003-1 and/or EN ISO 52018-1.

See **U-CERT Report D3.2**:
The choice for U-CERT is **presence of system**. This decision falls in line with the objective of representing in the EPB Assessment the actual equipment present in the building and enables to couple thermal discomfort to the energy performance calculation. Thus, when the present system cannot meet the required thermal load, some degree of discomfort is generated .
However, U-CERT also aims at producing an asset assessment with a main EP indicator, which shall be comparable between buildings and ought to have a rating according to a certain EP scale. For several buildings to be compared, there is a need to establish a comparable rating under the premise that comfort conditions are maintained. Thus, **exclusively for the EP rating**, the main EP indicator should be calculated with the **assumed system principle**.

➔ **LINKED CHOICES:**
- **Table UU.3 of EN ISO 52003-1**: main EPB indicators
- **Table UU.2 of EN ISO 52018-1**: thermal comfort score in case of heating or cooling system deficit
- **EPB system standards on technical building systems**, sections or parts on "Ways to express the energy performance" (not covered in this document).

U-CERT Choice: Change to principle of "Presence of system" combined with service deficit/discomfort indicators.

Table UU.19 — Principle assumed presence of systems (See 9.2)

Method		Choice Yes/No [a]
1	Principle "Assumed system"	~~YES~~NO
2	Principle "Presence of system"	~~NO~~YES
3	Other principle	NO
In case of method 3:		
	Reference to procedure:	< reference >

[a] Only one choice possible; choice may be differentiated per service.
NOTE Consistency with the conditions of use (module M1–6) is required.

Table UU.20:
Type: Important factor for the calculated energy performance.

Calculation detail. Policy choice

Table **B**.20 excludes floor area under a load bearing construction, because such construction cannot be removed or added easily and frequently. It also excludes area with ceiling height below 1,5 m.

ALDREN D2.2 Annex C ([12], chapter 4) recommends to adopt the IPMS 2 standard (formerly: Gross internal area, GIA) from the International Property Measurement Standards (see [13])
NOTE: The ALDREN report refers to the Reference floor area (Table A.22), but the reference floor area should be based on the useful floor area (or another metric, see Table UU.21).

IPMS-2 is basically the floor area contained within the building measured to the internal face of the external walls ignoring the internal partitions (using the "overall internal dimensions"). ALDREN specifies that the heat exchange envelope of building shall define the external walls, so that the floor area is coherent with the thermal losses calculation.

What is missing in this definition is that the useful floor area needs to be restricted to areas with a minimum clearance height. For specific (other) purposes IPMS introduces a clearance height of 1,5 m, the same value as in Table B.20. This threshold value will be adopted for U-CERT.

U-CERT Choice: Replace the description in Table B.20 as suggested above in this explanation box.

Table UU.20 — Specification of the useful floor area (See 9.3)

Specification and/or reference to document with more information
The useful floor area is equal to the area of the floor ~~with the following specific rules:~~ following the International Property Measurement Standards, IPMS 2 (Gross Internal Area), but with the following specific rules: External boundary: The heat exchange envelope of the building defines the external constructions. Excluded: The floor area under the external constructions. ~~The floor area under a load bearing construction is excluded.~~ The open floor area in vides (no floor) ~~is excluded~~. The floor area with height under the ceiling of less than 1,5 m (except for incidental beams). Included: ~~The floor area under a non-load bearing construction at the boundary of the considered space or spaces: measured to the centre.~~ The floor area under a ~~non-load bearing~~ construction inside the considered space or spaces. For building parts (space or spaces): The floor area under a construction separating two building parts are measured to the centre.

Table UU.21:
Type: Important factor for the calculated energy performance.
Calculation detail. Policy choice

U-CERT Choice: adopt Table B.21 without changes.

Table UU.21 — Type or types of metric for the building size (See 9.3 and 9.4)

Quantity	Unit	Specification and/or reference to document with more information
Reference floor area	m^2	Useful floor area as in Table UU.20 of this document, with fractions according to Table UU.22
NOTE Add rows for each metric.		

Table UU.22:
Type: Important factor for the calculated energy performance.
Calculation detail. Policy choice

➔ LINKED CHOICES:
: Consistency needs to be ensured between the choices of:
- **Table UU.5:** which building categories included in EP
- **Table UU.7**: List of space categories
- **Table UU.18**: Building services included in EP
- **Table UU.20:** Useful floor area
- **Table UU.21:** Reference size
- **Table UU3, Table UU.4, Table UU.5 of EN ISO 52003-1**: Numerical indicators on primary energy use

It is proposed to reconsider the concept of a fraction of useful floor area to neutralize/compensate for spaces with "lower energy intensity", because there are more aspects involved. A more sophisticated approach seems needed. See also the discussion in the explanation boxes on **Table UU.4 and Table UU.6 (Watch the chain)**. Better mechanisms to 'tailor' the EP indicator, or the EP requirement and EP benchmarks, to typical characteristics of specific conditions need to be explored and discussed.

Also relevant:
Mixed use buildings"
See the discussion in the explanation box on **Table UU.6**.

U-CERT Choice: adopt Table B.22 except for the use of a fraction ≠ 1 (pending outcome of further discussion as mentioned above)

Table UU.22 — Which space categories are contributing to the reference size (See 9.4)

Space categories	Contributing?	If YES: (Optional) fraction of-size contributing to ref. size ($f_{ref;cat,}$). Default value = 1 [a]
Residential living space, kitchen, bed room, study, bath room or toilet	YES	1,0
Residential individual: hall, corridor, staircase inside thermal envelope, attic inside thermal envelope	YES	1,0
Residential collective or non-residential: hall, corridor,	YES	1,0

staircase inside thermal envelope		
Thermally unconditioned adjacent space, such as storage room or unconditioned attic	NO	
Thermally unconditioned sunspace or atrium	NO	
Hall, corridor outside thermal envelope	NO	
Office space	YES	1,0
Educational space	YES	1,0
Hospital bed room	YES	1,0
Hospital other room	YES	1,0
Hotels room	YES	1,0
Restaurant space	YES	1,0
Restaurant kitchen	NO	
Meeting or seminar space	YES	1,0
Auditorium, lecture room	YES	1,0
Theatre or cinema space	YES	1,0
Server or computer room	NO	
Sport facilities, thermally conditioned	YES	1,0
Sport facilities, thermally unconditioned	YES	~~0,5~~ 0
Wholesale and retail trade services space (shop)	YES	1,0
Non-residential bath room, shower, toilet, if inside thermal envelope	YES	1,0
Heated storage space	NO	
Cooled storage space	NO	
Engine room	NO	
individual garage or collective indoor car park	NO	
Barn	NO	

[a] The choices in this table are choices that actually cannot be made without the holistic view on all EPB standards. The categorization of spaces is directly related to the assumed conditions of use for each space category and to the specific rules for combining spaces into zones. For instance, a fine subdivision into different space categories, with for each space category different conditions of use (such as temperature settings, ventilation rates, lighting levels, etc.) could easily lead to unwanted complexities in the assessment.

Table UU.23:
Type: Important factor for the calculated energy performance.
Calculation detail. Policy choice

U-CERT Choice: adopt Table B.23 without changes.

Table UU.23 — Perimeter specification (See 9.5.1 and 9.6.1)

Energy carrier	**Specification of nearby perimeter** (see 3.4.24)

Bio fuels	Solid	Not specified further
	Liquid	Connected to the same branch of the distribution network or having a dedicated connection, requiring specific equipment for the assessed object to be connected to it
	Gaseous	Connected to the same branch of the distribution network or having a dedicated connection, requiring specific equipment for the assessed object to be connected to it
Electricity		Connected to the same branch of the distribution network, meaning medium voltage or lower
District heating		Always nearby
District cooling		Always nearby

Table UU.24:
Type: Important factor for the calculated energy performance.
Calculation detail. Policy choice

The choices in Table B.24 imply that in the RER calculation the renewable energy (numerator) does not include distant renewable energy sources, while the total energy (denominator) does include energy from distant sources.
And that in delivered energy on site, nearby and distant sources are all taken into account.

➔ **LINKED CHOICES:**
Table UU.30: Energy flows taken into account in the building balance

U-CERT Choice: adopt Table B.24 without changes.

Table UU.24 — Perimeter choice (See 9.5.1 and 9.7)

Perimeter choice	Choice – RER calculation (renewable energy)	Choice – RER calculation (total energy)	Choice – EPB calculation (delivered energy)
On-site	Yes	Yes	Yes
Nearby	Yes	Yes	Yes
Distant	No	Yes	Yes

Table UU.25:
Type: Measured EP
Calculation parameter.

Only relevant for measured energy or when efficiency values need to be converted from net to gross or vice versa.

U-CERT Choice: Not relevant for the U-CERT EP calculation method.

Table UU.25 — Conversion factors for net to gross calorific values for energy carriers (See 9.6.2)

Energy carrier	Conversion factor $f_{GCV/NCV}$
oil	~~1,06~~
gas	~~1,11~~
LPG	~~1,09~~
coal	~~1,04~~
lignite	~~1,08~~
wood	~~1,08~~
NOTE Add the rows of the energy carriers.	

Table UU.25 is kept blank because it is not relevant for the EP calculation procedures

Table UU.26:
Type: Other (information only)
Calculation detail. Policy choice

Has no impact. Is only information related to the values chosen in Table UU.16.
Nevertheless, one would expect that the choices in this Table are consistent with the values in Table UU.16 (or vice versa)

➔ **LINKED CHOICES:**
Table UU.16: specification of the weighting factors

NOTE: From the perspective of circularity, "embedded energy" is becoming more important. But this may be complicated, especially if the energy carriers come from a variety of sources.
Also consistency is needed e.g. to avoid double counting. Embedded energy of the building itself is also not taken into account.

U-CERT Choice: adopt Table B.26 without changes, but discussion to be continued (see Table UU.16).

Table UU.26 — Overheads included in the primary energy and CO_2 emission factors (See 9.6.2 and 9.6.3)

		Primary energy factors	Emission coefficients
Included overheads	Energy to extract the primary energy carrier	Yes	Yes
	Energy to transport the primary energy carrier	Yes	Yes
	Energy used for any other operations necessary for the delivery to the building (e.g., storage)	Yes	Yes
	Energy to build, operate and dismantle the transformation units	No	No
	Energy to build, operate and dismantle the transportation system	No	No

	Energy to clean up or dispose the wastes	No	No
	Energy embedded in materials	No	No
Other greenhouse gases than CO_2 included [a]		n.a.	Yes
Applicable for ratings based on		net calorific value	net calorific value
[a] It is possible to list the other greenhouse gases.			

Table UU.27:
Type: Important factor for the calculated energy performance.
Calculation option. Policy choice

Note that the distinction between total and non-renewable energy only applies to the primary energy indicator (not to CO_2 or costs indicator).

➔ **LINKED CHOICES:**
Table UU.16: Weighting factors
Table UU.2 of EN ISO 52003-1: Choices of features for main requirements or key information: must be consistent with the choices in the Table UU.27 here.

U-CERT Choice: adopt Table B.27 without changes.

Table UU.27 — Basis for the energy performance of buildings (See 9.6.2)

Basis for the building energy performance	Choice	Application type (see Table A.6/B.6)
Total energy performance ($E_P = E_{Ptot}$) or non-renewable energy performance ($E_P = E_{Pnren}$)	$E_P = E_{Pnren}$	All application types in Table UU.6
NOTE Add lines in case of more assessment purposes.		

Table UU.28:
Type: Less crucial detail for calculation methodology.
Calculation detail.

U-CERT Choice: adopt Table B.28 without changes.

Table UU.28 — Priority for generation system, export (See 7.3.3.6 and 9.6.6.2.4)

Priority level to export	Priority identifier	Generation type
Priority level 1 (highest)	EL_EXP_PRIO_LEVEL_1	EL_PROD_PV
Priority level 2	EL_EXP_PRIO_LEVEL_2	EL_PROD_WIND
Priority level 3 (lowest)	EL_EXP_PRIO_LEVEL_3	EL_PROD_CHP

Table UU.29:
Type: Less crucial detail for calculation methodology.
Calculation detail.

The choice in this Table is only about the metric for the administration of the data exchange between zones and service areas in the calculation.

➔ LINKED CHOICES:
Table UU.21: Type of metric for building size

U-CERT Choice: adopt Table B.29 without changes.

Table UU.29 — Subdivision rules (See 10.5.1)

Type of zone or service area [a]	General rule	Specific rules (if any)
Thermal zone	Useful floor area weighted	See ISO 52016-1
Heating system service area	Useful floor area weighted	
Cooling system service area	Useful floor area weighted	
Ventilation service area	Useful floor area weighted	
DHW service area	Useful floor area weighted	
Lighting service area	Useful floor area weighted	

[a] Add lines in case of more service areas.

Table UU.30:
Type: Important factor for the calculated energy performance.
Calculation options. Policy choice

Free cooling and free heating:
In Table B.30 free cooling and free heating are counted as renewable energy. However, these amounts are impossible to determine and easy to manipulate: when is it “passive” heating or cooling (which is excluded in Table B.30) and when is it “active”? If “active”: which part (e.g. of the supply of outdoor air) is normal operation and which part is special cooling or heating?

The choice has no impact on the value of E_{Pnren}, but it has a high impact on the values of E_{Ptot}, E_{Pren} and *RER*

➔ LINKED CHOICES:
Table UU.16 (Weighting factors)
Table UU.23 (Perimeter choice)

U-CERT Choice: adopt Table B.30 with one change: free cooling and free heating are NOT counted as renewable energy

Table UU.30 — Energy flows taken into account in the building balance (See 11.6.2.1)

System or component	Counted as delivered energy? (Yes/No) [a]	Exported energy taken into account under step B of the energy performance

		assessment (11.6.2.1)[b] (Yes/No)
Needs		
Passive renewable energy	No	Not applicable
On-site		
Technical building systems located "on-site" and producing energy from renewable sources	Yes	Yes
Solar energy captured by thermal solar panels	Yes	Yes
Free cooling as renewable energy	~~Yes~~No	Not applicable
Free heating as renewable energy	~~Yes~~No	Not applicable
Heat from environment captured by heat pumps	Yes	Yes
Electricity produced by wind power	Yes	No
Nearby	[c]	
District heating	Yes	No
District cooling	Yes	No
Heat produced by biomass	Yes	No
Distant	[d]	
Electricity production from renewable sources	Yes	No

[a] A "No" in the second column implies "not applicable" in the third column.
[b] Only relevant if $k_{exp} > 0$, see Table A.19/B.19.
[c] If choice of perimeter is "nearby" (see Table A.9).
[d] If choice of perimeter is "distant" (see Table A.9).
NOTE Rows may be deleted or added.

Table UU.31:
Type: Important factor for the calculated energy performance.
Calculation detail. Policy choice…

U-CERT Choice: adopt Table B.31 without changes

Table UU.31 — Electrical uses not satisfied by on-site electricity production (See 11.6.2)

On-site electricity production type	Not allowed uses	Comment
All	None	Any EPB use of electricity can be satisfied by any type of on-site electricity production

Table UU.32:
Type: Important factor for the calculated energy performance.
Calculation detail.

➔ **LINKED CHOICES:**
Table UU.4 of EN ISO 52016-1: Hourly or monthly calculation procedures

U-CERT Choice: adopt Table B.32 without changes, but monthly is not applicable, because U-CERT's choice is hourly calculation procedures

Table UU.32 — Matching factor of produced and used electricity (See 11.6.2.4)

Calculation interval	Case	Matching factor function and parameters
Hourly	All building categories	$f_{\text{match}} = 1$
~~Monthly~~	~~All building categories~~	$f_{\text{match}} = \frac{x^n + \frac{1}{x^n} - k}{x^n + \frac{1}{x^n}}$ ~~with~~ ~~$x = E_{\text{pr;el}}/E_{\text{EPus;el}}$;~~ ~~$k$ = carrier = 1 and n = subsystem = 1~~

2 For ISO 52003-1

Annex UU of ISO 52003-1:2017, Energy performance of buildings — Indicators, requirements, ratings and certificates — Part 1: General aspects and application to the overall energy performance

EN ISO 52003-1 is a post-processing standard.
The choices for EN ISO 52003-1 and EN ISO 52018-1 are part of **U-CERT Task 3.2** (Development of a set of user centred and effective overall and partial indicators, including SRI) [5]

Annex UU
(informative)

Input and method selection data sheet — ~~Default~~ U-CERT choices

UU.1 General

The template in Annex A of this document shall be used to specify the choices between methods, the required input data and references to other documents.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations. If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a national annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g., the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g., small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b;

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, …).

NOTE 4 In the section “Introduction” of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

Specific information concerning Annex A and Annex B of this document:

The reporting tables allow full freedom of choice at national or regional level.

Typically, different choices will be made according to the type of work, notably for new constructions (or equivalent) or works on existing buildings. Furthermore, there may be differentiations according to other criteria, such as between residential and non-residential buildings. Each different application area will thus have its own set of tables if different choices are made. The application domain of every set shall be clearly specified.

UU.2 References

The references, identified by the EPB module code number, are given in a table complying with the format given in Table A.1 (template).

Table UU.1:
Type: references

See Explanation at EN ISO 52000-1, Table UU.1

Table UU.1 — References

Reference	Reference document[a]	
	Number	**Title**
M1–6[b]	~~ISO 17772-1~~	~~*Energy performance of buildings — Indoor environmental Quality — Part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings*~~
	EN 16798–1~~c~~	*Energy performance of buildings – Ventilation of buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics* (Module M1–6)
M1–14[b]	EN 15459-1	*Energy performance of buildings — Economic evaluation procedure for energy systems in buildings — Part 1: Calculation procedures, Module M1-14* *[Theme: "other" → not relevant for EP calculation procedure]*
M2–4[b]	ISO 52018-1	*Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features — Part 1: Overview of options*
M3–4[b]	EN 15316–1	*Energy performance of buildings — Method for calculation of system energy requirements and system efficiencies — Part 1: General and Energy performance expression, Module M3-1, M3-4, M3-9, M8-1, M8-4*
M4–4[b]	EN 16798–9	*Energy performance of buildings — Ventilation for buildings — Part 9: Calculation methods for energy requirements of cooling systems (Module M4–1, M4–4 M4–9) — General*
M5–4[b]	EN 16798–3	*Energy performance of buildings — Ventilation for buildings — Part 3: For non-residential buildings — Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)*
M6–4[b]	EN 16798-3	See M5–4
M7–4[b]	EN 16798-3	See M5–4
M8–4[b]	EN 15316-1	See M3–4
M9–4[b]	EN 15193–1	*Energy performance of buildings — Energy requirements for lighting — Part 1: Specifications, Module M9*

Reference	Reference document[a]	
	Number	Title
M10–4[b]	~~EN 15232–1~~ EN ISO 52120-1	~~*Energy performance of buildings – Part 1: Impact of Building Automation, Controls and Building Management – Modules M10-4,5,6,7,8,9,10*~~ *Energy performance of buildings -- Contribution of building automation, controls and building management -- Part 1: General framework and procedures* [in anticipation of publication]

[a] If a reference comprises more than one document, the references may be differentiated.

[b] Informative.

~~[c] Under preparation.~~

UU.3 Energy performance requirements

Table UU.2 and surrounding text / National Annex for new buildings:
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for comparing against minimum EP requirement or benchmark (including the reference values for the energy label classes).

NOTE: Most of the issues raised here are also applicable to Table UU.2 of EN ISO 52018-1.

Currently, EN ISO 52003-asks only to specify (in Annex A/B) which characteristics / features shall be included on the energy performance (EP) certificate as basis for setting **EP requirements**.
However, the set of features that are (nationally) chosen for setting EP requirements are typically selected from a larger set of "key features".
It makes sense to specify this larger set and -from there- to propose a subset as basis for setting EP requirements.

Consequently, the U-CERT proposal is to replace the symbol "X" for each characteristic selected as basis for setting EP requirements:
by the symbol "Req" if the characteristic is selected as basis for setting (minimum) EP requirements, or by a symbol "Inf" if the characteristic is selected only for information.

NOTE This does not mean that this EPB standard contains requirements.
The standard provides (as it is supposed to do) rules that lead to characteristics.
The characteristics for specific features are translated into numerical indicators that can be used to compare against benchmarks or e.g. to check compliance with requirements in regulations.
Consequently, a suggestion to replace "requirements" by "benchmarks" (the preferred terminology for the information on EP certificates, see e.g. the ALDREN report D2.2 [11]) is not necessary.
It would also be confusing, because *any characteristic* even if provided for information only ("Inf") requires one or more benchmarks in order to have any significance.

For transparency and comparability, the EU Member States should be asked to mandatory report in the national EP certificates the values of a few common EU indicators (and a common EU energy class, see Table UU.6). Even if these differ from the national choices. However, read the paragraph further on in this Explanation box: "*Using the same indicator does not mean that the values can be compared*"

The following two sources are used as basis for the proposal on the U-CERT set of main features for which key indicators are proposed:

Main features / indicators proposed in the *informative* Annex H in EN ISO 52000-1:
Informative Annex H in EN ISO 52000-1: *Proposal of indicators for the assessment of nearly Zero-Energy Buildings (NZEB)*, proposes the following four indicators for nZEB: from building needs, via system use and subtraction of renewable energy to overall non-renewable energy - balanced with the grid:
(I) First requirement: The building **fabric** (**Energy needs**)
(II) Second requirement: The **total primary energy use** (probable intention: without compensation for own produced renewable electricity exported to the grid)
(III) Third requirement: **Non-renewable primary energy use without** compensation for own produced renewable electricity, exported to the grid
(IV) Final NZEB rating: Numerical indicator of **non-renewable primary energy use with** compensation for own produced renewable electricity, exported to the grid

Main features / indicators proposed in ALDREN D2.2 report, Annex C:
The ALDREN D2.2 report, Annex C [12] contains recommendations for indicators (to qualify as NZEB).
(1) As prime indicator: Numerical indicator of non-renewable primary energy use with compensation for own produced renewable electricity, exported to the grid
The same as "IV, Final NZEB rating" of EN ISO 52000-1 Annex H
(2) Thermal comfort score
(3) Energy needs for heating, cooling and lighting
(4) Expenditure factor (ε) for systems (ε is the reciprocal value of the efficiency)

Other key indicators proposed in ALDREN, for information:
- Total primary energy use
- Non-renewable primary energy use without compensation for own produced renewable electricity, exported to the grid.
- Renewable energy ratio (RER):
- Final energy use
- SRI-indicator
- Produced renewable energy (on site)

Discussion:
EPBD Recast (2022-2023):
The metrics for the EPB requirements and for information on the EP Certificates need to be in line with and usable to support the implementation of the EPBD.
The EC's proposal for the revision of the EPBD in December 2021 and the successive discussions and amendments during 2022 and still continuing in 2023 implies that we are facing a **moving target**.
One of the results is that the proposals in this Annex 2 to U-CERT report D3.1 may slightly deviate from the proposals in the U-CERT report D3.2 [5], [6].
This should not be regarded as a problem, since further discussion will be needed anyway following the publication of the final version of the EPBD, expected in summer or autumn of 2023.

Total primary energy in Annex H of EN ISO 52000-1:
Unlike recommended in Annex H of EN ISO 52000-1, ALDREN does not recommend to include a requirement on the total primary energy.
The proposal for U-CERT is to follow ALDREN and ignore the total primary energy as basis for EP requirements.
On the other hand, as part of the discussion on the EPBD Recast 2022-2023, it is extensively being discussed how to safeguard the quality of the building itself, in case only-non-renewable primary energy is taken for the prime indicator.
In a recent REHVA Journal article [14] it is proposed to use as indicator for the energetic quality at the building level the total primary energy that is delivered to the building site, excluding the renewable energy that is produced and used on-site.

> Note: in this respect that according to EN ISO 52000-1 the renewable energy that is produced on-site is included in the sum of total primary energy delivered to the building site, so it has to be explicitly specified if this delivered energy is to be excluded from the equation.

The rationale behind this proposal is that the holistic approach allows for different approaches to optimize the energetic quality of the building and its systems. This includes the use of renewable energy on-site of which the source is unlimited: ambient air for a heat pump or for free cooling, solar irradiation for solar panels or solar collectors. The use of these free sources should not be punished.

System expenditure factor in ALDREN:
ALDREN includes the system expenditure factor as one of the indicators for setting requirements.
In the context of the *Trias energetica* this looks like logic, but it has the fundamental problem that the expenditure factor can only be presented ***per energy carrier***. If energy carriers are combined, they shall be combined on the basis of primary energy, to avoid comparing apples and oranges.
So an overall value of the expenditure factor could be based on individual expenditure factors multiplied by the respective primary energy factors (Table UU.16 of EN ISO 52000-1). But then the result is equal or close to already selected other (primary energy) indicators.
Conclusion: the proposal for U-CERT is to ignore the expenditure factor.

Renewable Energy Ratio (RER):
Neither EN ISO 52000-1 Annex H, nor ALDREN D2.2 Annex C recommends an EP requirement based on the Renewable Energy Ratio (RER).
The proposal for U-CERT is indeed to ignore RER as indicator for EP requirements. After all, why would it be required to have a minimum portion of renewable energy, if the overall non-renewable energy performance meets already the minimum requirement? That would only lead to unnecessary use of scarce & expensive renewable energy in projects where it is less needed, at the cost of other projects where it is hard to reach the minimum EP requirements without renewable energy (e.g. renovation of old buildings).
Note that the total primary energy excluding renewable energy produced and used on-site (proposed above as secondary indicator), compared with the non-renewable primary energy gives the RER for all energy that “passes the meter” of the building. This indicator would make sense and should eventually move towards the value 1, but this is not a credit for the building.

Final energy:
Final energy has the same fundamental problem as the expenditure factor discussed above in this explanation box: it can only be presented ***per energy carrier***.
Conclusion: the proposal for U-CERT is to ignore final energy.

Principle of assumed vs presence of systems:
See explanation box on Table UU.19 of EN ISO 52000-1: this choice can have a huge impact on the EP.

Conclusion: the main features / key indicators proposed for U-CERT:
Note: all based on (sub-)hourly energy balance calculations
As basis for EP requirements:
(1a) Numerical indicator of non-renewable primary energy use **with** compensation for own produced renewable electricity exported to the grid, using the **principle of assumed system**.
With the note that in the trajectory towards zero emission buildings (EPBD Recast 2022-2023) the compensation has to be rejected:
(1b) Numerical indicator of non-renewable primary energy use **without** compensation for own produced renewable electricity exported to the grid, using the **principle of assumed system**.
(2) Thermal comfort score using the **principle of presence of system**
(3) Energy needs for heating, cooling and lighting*)
As key information:
(4) SRI-indicator using the **principle of presence of system**
(5) Total primary energy, excluding renewable energy produced and used on-site, **without** compensation for own produced renewable electricity exported to the grid, using the **principle of assumed system**.

**): Whether the energy need for lighting should be included in such indicator is subject to discussion, see Table UU.2 of EN ISO 52018-1.*

Additional indicators for information:
Many other indicators are proposed in **ALDREN D2.2, Annex C** [12] and **U-CERT report D3.2** [5], to provide more detailed information, on a wide variety of features, for detailed analysis and comparison, for a variety of end users (e.g. building occupant, owner, building or system engineer, policy maker).
These are outside the scope of this document (the converged set of EP calculation procedures).

Watch the chain (3):
When translating selected main features into key indicators, it is important to consider how to formulate the corresponding minimum EP requirement or a benchmark (including the reference value for energy label class). This can be a fixed numeric value, or a numeric value that differentiates for specific characteristics of the building.
This is important for the actual strictness of the energy performance in the technological and economic terms.
A variable reference value may be necessary for reasons of cost-optimal performance.
The most important characteristics as basis for differentiation are (see EN ISO 52003-1):
- Building or space category (different conditions of use)
- Size of the building
- The ratio between thermal envelope area and the size of the building
- New building or major renovated building

When comparing buildings at different locations one should add:
- Climate

See also "**Watch the chain (1)**" and "**Watch the chain (2)**" in **Table UU.4 resp. Table UU.6 of EN ISO 52000-1**

Along the same lines:
Using the same indicator does not mean that the values can be compared
If two methodologies (e.g. national versus U-CERT) have selected the same indicators, it does not mean that the values of the indicators can be compared.
They only can be compared (and ergo: have comparable benchmarks and comparable minimum EP requirements) if they share
- same calculation procedures
- same national choices
- same conditions of use
- same climate

If this is not the case, only indirect ways can be used for a comparison.

New versus existing buildings and major renovations:
For clarity, the U-CERT proposal is to add that the application "new buildings" includes "buildings that have undergone major renovations".
On the other hand: the U-CERT proposal is to make no distinction at all in numerical indicators for new and existing buildings.
Selected numerical indicators for new buildings are also used as basis for requirements.
Whether such requirements are also applicable to existing buildings is outside the scope of EN ISO 52018-1.

➔ LINKED CHOICES:
- The choices in **Tables UU.3, Table UU.4 and Table UU.5** depend on the choices in this Table UU.2.
- **Table UU.4 and Table UU.6 of EN ISO 52000-1:** Building and space categories
- **Table UU.17 of EN ISO 52000-1:** the choice of compensation for exported energy (value of k_{exp}) is a key sub-choice when it comes to primary energy use.
- **Table UU.19 of EN ISO 52000-1:** Principle of assumed vs presence of systems.
- **Table UU.2 of EN ISO 52018-1:** specification of the indicators on the energy needs and thermal comfort: these are the two additional indicators for minimum EP requirements proposed in this Table UU.2.
- **Table UU.4 of EN ISO 52016-1:** Hourly or monthly calculation procedures influences the possible options

U-CERT Choice: Table B.2 with surrounding text is adopted with the changes and additions discussed in this explanation box. Note that some of these changes are not in line with the template of Annex A of the standard and therefore presented in red font (~ suggested for future revision of the standard).
As mentioned above in this explanation box, because of the current revision of the EPBD we are facing a moving target. As a consequence, the proposal here slightly deviates from the proposal in the U-CERT report D3.2 [5]. Further discussion will be needed anyway, following the publication of the final version of the EPBD, expected in summer or autumn of 2023.

The following table of the overall energy performance requirement mix should be filled out as follows:

— The first column lists the overall energy performance features that can be considered for setting requirements or for key information. The motivation for the chosen mix shall be reported. If required, other overall EPB features can be added at the bottom of the table. By means of a numbered reference, a precise description of each additional overall EPB feature will then be given and the motivation shall be described in a clear manner.

— In the second column, ~~an X-mark~~ a "Req"mark is put at each of the features chosen to set a requirement and an "Inf" mark for each of the features that is chosen as (other) key information on the EP label.

— In the third column, a numbered reference is made to a full, detailed and clear explanation for each exception, including the motivation for the exception.

The table should be seen in conjunction with all the partial EPB requirements (which are beyond the scope of this document, e.g. concerning technical systems). Partial EPB requirements related to the fabric are discussed in ISO 52018, which also provides reporting templates for the corresponding EPB features.

New buildings: ~~Default~~ U-CERT mix of the overall energy performance requirements:

Table UU.2~~a~~ — ~~Default~~ U-CERT choices with respect to the overall EPB requirements or key information on EP label (see 9.5)

Application: New and existing buildings		
Overall energy performance feature	**Requirement?**	**Exceptions*?**
~~Total primary energy use~~	~~X~~	~~1)~~
~~Non-renewable primary energy use~~	~~X~~	~~1)~~
~~Renewable primary energy use~~		
~~Renewable energy ratio~~		
Greenhouse gas emissions,	Inf(8)	
~~Annual energy costs~~		
~~Energy policy factors (define*)~~		
Non-renewable primary energy use with compensation for own produced renewable electricity exported to the grid	Req (1)	
Non-renewable primary energy use without compensation for own produced renewable electricity exported to the grid, using the principle of assumed system.	Req (2)	

Overall thermal comfort score	Req (3)	
Energy needs for heating, cooling [and lighting?]	Req (4)	
SRI-indicator	Inf (5)	
Total primary energy, excluding renewable energy produced and used on-site, without compensation for own produced renewable electricity exported to the grid	Inf (6)	

The columns or cells that are marked with an asterisk * (i.e. any cell involving a specific national/regional element) shall be marked with a numbered reference. Clear explanation and motivation shall be given for each of these new elements.

Complete:

Explanations according to each of the numbered references:

(1) ...<free text>

(2) ...

Motivation for the requirement mix: ...<free text>

Explanations and motivations according to each of the numbered references:

Exceptions: none ~~new religious buildings can apply (based on a well-motivated dossier) on a case by case basis for waiving of one or both of the requirements, or for laxer quantitative requirements. Motivation: the traditional appearance of such buildings cannot always be combined with energy efficiency techniques.~~

Motivation for the requirement mix:

~~(1) The first requirement on the total primary energy use ensures that in a first instance energy saving techniques are applied to a sufficient extent.~~

~~(2) The second complementary requirement ensures that renewable energy is applied to an extent that is warranted. Since the technical and economic potential for renewable energy may vary strongly from project to project, it may however prove very difficult to set an equitable, tailored requirement.~~

(1) Prime requirement: The non-renewable primary energy use is determined with compensation for own produced renewable electricity, exported to the grid (k_{exp} = 1, see Table UU.17 of EN ISO 52000-1).

The principle of assumed system shall be applied (see Table UU.19 of EN ISO 52000-1)

However, in the trajectory towards zero emission buildings (EPBD Recast 2022-2023) the compensation has to be rejected, so gradually (1) has to be replaced by:

(2) Prime requirement: non-renewable primary energy use without compensation for own produced renewable electricity, exported to the grid.

The principle of assumed system shall be applied (see Table UU.19 of EN ISO 52000-1)

(3) Secondary requirement: Thermal comfort score (see Table UU.2 and Table UU.4 of EN ISO 52018-1)

The principle of presence of system shall be applied (see Table UU.19 of EN ISO 52000-1)

(4) Tertiary requirement: Energy needs for heating, cooling <<and lighting? To be further discussed>> (see Table UU.2 and Table UU.7 of EN ISO 52018-1)

(5) Smart Readiness Indicator, SRI, see Carnero Melero, Pablo (IVE), *U-CERT. D3.2 Proposed set of user-centred and effective overall and partial indicators, including SRI*, June 28, 2022

The principle of presence of system shall be applied (see Table UU.19 of EN ISO 52000-1)

(6) Total primary energy, excluding renewable energy produced and used on-site, without compensation for own produced renewable electricity exported to the grid: this is a key indicator for the overall energetic quality of the building plus systems on-site.

The principle of assumed system shall be applied (see Table UU.19 of EN ISO 52000-1) (7) Optional: equivalent CO2 emissions per reference floor area [kg/(m²)], differentiated for different assumptions as for primary energy: see (1), (2), (6) Where relevant (e.g. (1), (2), (6), …) the **reference** energy performance shall be given on the EP label [kWh/(m²)] NOTE Additional partial EP indicators for requirements and information are specified in Annex UU of EN ISO 52018-1. (with respect to requirements: **2nd requirement** on Overall thermal comfort, and 3rd **requirement** on Energy needs for heating, cooling and lighting)

Table UU.2b on Existing buildings

See explanation box on Table UU.2 above: the U-CERT proposal is to make no distinction in selected main features or numerical indicators for new and existing buildings.
Consequently, Table UU.2b becomes obsolete.

U-CERT Choice: Replace Table UU.2b by a sentence to explain why there is no Table UU.2b.

Existing buildings: same as new buildings. Specific numerical indicators for new buildings are also used as basis for requirements. Whether such requirements are also applicable to existing buildings is outside the scope of this document.

~~**Table UU.2b — Default U-CERT choices with respect to the overall EPB requirements (see 9.5)**~~

~~**Application: Existing buildings**~~		
~~**Overall energy performance feature**~~	~~**Requirement?**~~	~~**Exceptions*?**~~
~~Total primary energy use~~		
~~Non-renewable primary energy use~~		
~~Renewable primary energy use~~		
~~Renewable energy ratio~~		
~~Greenhouse gas emissions~~		
~~Annual energy costs~~		
~~Energy policy factors (define*)~~		
~~The columns or cells that are marked with an asterisk * (i.e. any cell involving a specific national/regional element) shall be marked with a numbered reference. Clear explanation and motivation shall be given for each of these new elements.~~ ~~Complete:~~ ~~Explanations according to each of the numbered references:~~ ~~(1) …<free text>~~ ~~(2) …~~ ~~Motivation for the requirement mix: …<free text>~~		
~~No default choice in this annex for existing buildings.~~		

Table UU.3 and surrounding text:
Type: Post-processing. Important factor for calculated EP. Policy choice.

Note: in Table A.3 erroneously the term “useful floor area” is used instead of “reference floor area”. See e.g. definition for numerical indicator of primary energy use (3.3.16 of EN ISO 52003-1: primary energy use per unit of reference floor area
https://www.iso.org/obp/ui/#iso:std:iso:52003:-1:ed-1:v1:en

Table B.3 provides no choice: it remains ‘neutral’ because of the policy related character of the choice.

➔ **LINKED CHOICES:**
- The choices in Tables UU.3 depend on the choices in **Table UU.2**.
- **Table UU.21 and Table UU.22 of EN ISO 52000-1**: type of metric building size, reference floor area

U-CERT Choice:
Following the ALDREN recommendations ([11], [12]) the first option is chosen. Correction made in red font. Scope of Table A/B.3 is extended (see explanation box on Table UU.2)

As explained in Clause 9, the numerical value of the requirement on the total primary energy use (notably whether variable or constant) should be set with great care.

Table UU.3 — Numeric indicator used for the requirement or information on the total primary energy use (see 9.5)

Numeric indicator	Choice
Total primary energy use per ~~useful~~ reference floor area [kWh/m²]	Yes (1) ~~No default choice in this annex~~
Total primary energy use E_{Ptot} [kWh]	No ~~No default choice in this annex~~
Ratio (define)	No ~~No default choice in this annex~~
<free text> (Other: define*)	No ~~No default choice in this annex~~
…	No ~~No default choice in this annex~~

If another indicator is used, it shall be clearly described and precise reference shall be made to the determination method:
(1) ~~… < free text >~~ See specifications in Table UU.2
(2) …

Table UU.4 and surrounding text:
Type: Post-processing. Important factor for calculated EP. Policy choice.

Same observations and conclusions as for Table UU.3

➔ **LINKED CHOICES:**
- The choices in Tables UU.4 depend on the choices in **Table UU.2**.
- **Table UU.16** and **Table UU.17** of EN ISO 52000-1: PEF weighting factors and k_{exp} value
- **Table UU.21 and Table UU.22 of EN ISO 52000-1**: type of metric building size, reference floor area

U-CERT Choice: Similar as for Table UU.3

As explained in Clause 9, the numerical value of the requirement on the non-renewable primary energy use (notably whether variable or constant) should be set with great care.

Table UU.4 — Numeric indicator used for the requirement or information on the non-renewable primary energy use (see 9.5)

Numeric indicator	Choice
~~No default choice in this annex~~ Non-renewable primary energy use per ~~useful~~ reference floor area [kWh/m²]	Yes (1)

If another indicator is used, it shall be clearly described and precise reference shall be made to the determination method:
(1) ~~...<free text>~~ See specifications in Table UU.2
(2) ...

Table UU.5 and surrounding text:
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for EP requirements or as benchmark.
Note that Table UU.2 already contains the Renewable Energy Ratio (RER), for information.

➔ **LINKED CHOICES:**
- The choices in Tables UU.5 depend on the choices in **Table UU.2**.
- **Table UU.21 and Table UU.22 of EN ISO 52000-1**: type of metric building size, reference floor area

U-CERT Choice: adopt Table B.5 without changes: no requirement (or key information) for renewable primary energy other than RER in Table UU.2

As explained in Clause 9, the numerical value of the requirement on the renewable primary energy use (notably whether variable or constant) should be set with great care.

Table UU.5 — Numeric indicator used for the requirement or information on the renewable primary energy use (see 9.5)

Numeric indicator	Choice
No ~~default~~ U-CERT choice in this annex	

If another indicator is used, it shall be clearly described and precise reference shall be made to the determination method: (1) ...<free text> (2) ...	

UU.4 Rating

Table UU.6 and surrounding text:
Type: Post-processing. Important factor for calculated EP. Policy choice.

The procedure proposed in ALDREN D2.2 ([11], [12]) is adopted, which is the second method of Table B.6, including all default parameters. See also U-CERT report D3.2 [5].

Note that the adequacy of the reference value as proposed in ALDREN D2.2 Annex C [12] as function of climate zone has not been checked within the U-CERT project. And in particular the abrupt change when crossing from one climate zone to the next.
See also discussion in the explanation box on Table UU.2 on fixed or variable benchmarks and minimum EP requirements ("**Watch the chain**").

U-CERT Choice:
The second method of Table A.6 is adopted, as in Table B.6, including all default parameters. But because Method 1 is not applicable, the default choices for Method 1 are replaced by "Not applicable"

Table UU.6 — Energy rating methods (see 10.2 and 10.3)

Method	Choice[a]
1) Default energy rating method with two reference points (see 10.2)	NO
2) Default energy rating method with a single reference point (see 10.2)	YES
3) Other energy rating method (see 10.2)	NO
In case of method 1:	**Parameters**
Subclasses to expand the classes	~~A+~~ Not applicable
Position of the energy performance regulation reference, R_r,	~~Between class B and C~~ Not applicable
Position of the building stock reference, R_s,	~~Between class D and E~~ Not applicable
Measure for the building stock reference	~~median (50 %)~~ Not applicable
Position of EP = 0	~~Top of class A~~ Not applicable
In case of method 2:	**Parameters**
Numbering of the classes 1 to 7	A to G

Subclasses to expand the classes	A+ (EP < 0)
Boundary for the reference position, n_{ref}	4 (D)
In case of method 3:	**Reference**
Reference to procedure:	Not applicable
[a] Only one "YES" is possible.	

Table UU.7 and surrounding text:
Type: Post-processing. Policy choice

ALDREN D2.2 ([11], [12]) recommends the default model of Table A.7, like in Table B.7 (with minor modifications in the layout compared to the default model). See also U-CERT report D3.2 [5].

➔ **LINKED CHOICES:**
Table UU.6: Energy rating method (label classes)

U-CERT Choice: The default model of Table A.7 is adopted, like in Table B.7

Table UU.7 — Graphical representation of the rating (see 11.3)

Method	Choice[a]
1) Default model for the graphical representation of the rating (see 11.3)	YES
2) Other model for the graphical representation of the rating (see 11.3)	NO
In case of method 2:	
Reference to procedure:	Not applicable
[a] Only one "YES" is possible.	

3 For ISO 52010-1

Annex UU of ISO 52010-1:2017, Energy performance of buildings — External climatic conditions — Part 1: Conversion of climatic data for energy calculations

Annex UU
(informative)

Input and method selection data sheet — ~~Default~~ U-CERT choices

UU.1 General

The template in Annex A shall be used to specify the choices between methods, the required input data and references to other standards.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations. If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a national annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g., the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g., small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b;

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, …).

NOTE 4 In the section “Introduction” of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

UU.2 References

The references, identified by the EPB module code number, are given in Table UU.1.

Table UU.1:
Type: References

Not applicable, see note a in Table UU.1

Table UU.1 — References

Reference	Reference document	
	Number	Title
Mx-y[a]	…	…
	…	…

[a] In this document there are no choices in references to other EPB standards. The Table is kept to maintain uniformity between all EPB standards.

UU.3 Climatic input data

Table UU.2:
Type: Important factor for the calculated energy performance. Policy choice.
Major calculation parameters: Climatic data set

ALDREN report D2.2 [11] recommends to use local climate for the energy performance calculation instead of one for the whole country or region. This will reduce the gap between calculated and actual energy consumption.
Note that different climate implies different calculated energy performance, so the benchmarks and minimum EP requirements should match the chosen climatic data.

Note that if no hourly national, regional or local data set is available: hourly data for any location in Europe and almost any location beyond Europe can be obtained from the JRC TMY generator.
See https://epb.center/documents/tmy-iso-52010-1_conversion/

For U-CERT no specific choice is recommended at this moment. The choice between national or regional or local hourly climatic data depends on the regional climatic and geographic circumstances, including height differences. The choice also depends on the setting of minimum requirements and benchmarks (including the reference values for the energy label classes). Note that reducing the gap with measured energy use can also be reduces by a (separate) tailored energy performance assessment.

➔ **LINKED CHOICES:**
See discussion in explanation box on **Table UU.2 of EN ISO 52003-1** (“**Watch the chain**”) regarding differentiated EP requirements and benchmarks (including the reference values for the energy label classes) and regarding Using the same indicator but different methods or assumptions

U-CERT Choice: Open to national level to choose national or regional or local hourly climatic data

Table UU.2 — Weather station and climatic data set (See 6.3.2)

Name	Value
Identifier for climatic data set	~~DRYCOLD.TMY~~

Name	Value					
Station and/or name of data set	~~Denver, Colorado, USA~~ ~~File: DRYCOLD.TMY~~					
	Symbol	**Unit**	**Value**	**Validity interval**[a]	**Origin**	**Varying**[b]
Latitude	φ_w	°	~~39,76~~	−90 to +90	station	No
longitude [c]	λ_w		~~−104,86~~	−180 to +180	station	No
time zone	TZ	h	~~−7~~	−12 to +12	station	No
First day of time series (day of the year)	$n_{day;start}$	-	1	1 to 366	station	No
Last day of time series (day of the year)	$n_{day;end}$	-	365	1 to 366	station	No
Day of the week for January 1		-	Monday (day 1)	Monday to Sunday (day 1 to 7)	station	No
Daylight saving time? [c]						
Leap day included	No					
Specific other information	~~Time at this station:~~ ~~Winter: MST = UTC − 7~~ ~~Summer: MDT = UTC − 6~~					
Name	**Value**					
Reference to documentation on application range and type of data	~~ANSI/ASHRAE standard 140~~[~~10~~]					

a Practical range, informative.

b "Varying": value may vary over time: different values per time interval, for instance: hourly values or monthly values (not constant values over the year).

c If Yes: additional information to be added.

UU.4 Calculation method

Table UU.3:
Type: Less crucial detail for calculation methodology.
Calculation detail.

U-CERT Choice: adopt Table B.3 without changes. Direct (beam) radiation is available e.g. in JRC TMY datasets

Table UU.3 — Method to assess direct (beam) irradiance if not available from weather station (See 6.4.2)

Method		Choice Yes/No[a]
1	Default method	YES
2	Other method	NO
In case of method 2:		
	Reference to procedure:	Not applicable
[a] Only one choice possible.		

Table UU.4:
Type: Less crucial detail for calculation methodology.
Calculation parameter.

➔LINKED CHOICES:
Table UU.5 and **Table UU.6** (more details)

U-CERT Choice: adopt Table B.4 without changes, but allow national or regional option for time varying values.

Table UU.4 — Solar reflectivity of the ground ($\rho_{sol;grnd}$) (See 6.4.3)

Name	Value[a]
Fixed value	YES [1)]
Dependent on ground condition, listed in climatic data file	NO [1)]
Dependent on local ground condition (near the inclined surface)	NO [1)]
Values available in climatic data file	NO [1)]
[a] Only one choice possible.	
[1)] This is the default choice, but may be replaced by national or regional choice	

If fixed value:

Table UU.5:
Type: Less crucial detail for calculation methodology.
Calculation parameter.

U-CERT Choice: adopt Table B.5 without changes, but allow national or regional option for time varying values, see Table UU.6.

Table UU.5 — Solar reflectivity of the ground; if fixed value

Name	Value

Name	Value
Solar reflectivity of the ground, $\rho_{sol;grnd}$ [-]	0,2

If dependent on ground condition: ~~Not applicable and therefore no Table UU.6 given.~~ At national or regional level a time varying value may be given, as specified in Table UU.6.

Table UU.6:
Type: Less crucial detail for calculation methodology.
Calculation parameter.

There is no Table B.6, so any content of Table UU.6 differs from Table B.6 and is therefore in blue font.

U-CERT Choice: national or regional option for time varying values

Table UU.6 — Solar reflectivity of the ground; if dependent on ground conditions

Description of ground condition[a]	Value for solar reflectivity of the ground, $\rho_{sol;grnd}$ [-]
See Table UU.4: Dry or wet ground snow free	See Table UU.4: Optional national or regional value (0 to 1)
See Table UU.4: ...	See Table UU.4: Optional national or regional value (0 to 1)

Table UU.7:
Type: Less crucial detail for calculation methodology.
Calculation detail.

In Table B.7 the choice is not to calculate the effect of solar shading by external objects in the climatic data set, but to leave the calculation of the impact of solar shading by external objects to the EPB standards in which the climatic data are used as input (e.g. thermal balance: EN ISO 52016-1 (Table UU.25), PV and thermal solar power: EN 15316-4-3)

➔ LINKED CHOICES:
Table UU.25 of EN ISO 52016-1: Shading by external objects

U-CERT Choice: adopt Table B.7 without changes but allow national or regional option for time varying values, see Table UU.6 (snow covered ground).

Table UU.7 — Choice between options and methods for calculation of shading by external objects (See 6.4.5.1)

Application[b]	All applications	
Description	**Choice**	
Effect of shading calculated in this document?	No [1)]	
If Yes:	**Choice**[a]	

Only method 1, Simplified method (shading of direct radiation)	Yes [1)]	
Only method 2, Detailed method (shading of direct and diffuse radiation)	No [1)]	
Both methods are allowed	No [1)]	
a Only one Yes per column possible. b Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).		
[1)] This is the default choice, but may be replaced by national or regional choice, with explanation which external objects have been included (to avoid double counting in the standards where the climatic data are used as input)		

Table UU.8:
Type: Less crucial detail for calculation methodology.
Calculation parameter

➔LINKED CHOICES:
If this table is applicable: a similar choice is to be made in **EN ISO 52016-1, Table UU.25**, but there is no necessity to make the same choice

Consideration: less subdivisions is too little and more subdivisions gives false sense of accuracy

U-CERT Choice: adopt Table B.8 without changes, if applicable.

Table UU.8 — Number of skyline segments, $n_{sh;segm}$ for input solar shading objects (See 6.4.5.2)

Application[b]	**All applications** [1)]	**....**
Description	**Value of $n_{sh;segm}$**[a]	**Value of $n_{sh;segm}$**[a]
Maximum number of segments over 360 degrees	15	
Fixed width (= 360 / $n_{sh;segm}$) [c]	No	
a Practical range, informative. b Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.). c If not fixed, the width of each segment can be adapted to the width of the shading object, with limitation of maximum number of segments $n_{sh;segm}$.		
1): If applicable (see Table UU.7)		

Table UU.9:
Type: Less crucial detail for calculation methodology.
Calculation parameter.

U-CERT Choice: adopt Table B.9 without changes: fixed conversion factor (= luminance efficacy): simple but effective.

Table UU.9 — Choice between methods for calculation of illuminance (See 6.4.6)

Application[a]	**All applications**	**....**
Description	**Choice**	**Choice**
Method 1, Default method, or Method 2, Alternative method	Method 1	
If choice is method 2:	**Description**	**Description**
Describe method 2	Not applicable	

[a] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).

4 For EN 16798-1

Annex UU of EN 16798-1:2019, Energy performance of buildings — Ventilation of buildings — Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1–6)

Grey shading:

Concerning Annex B as basis for Annex UU for EN 16798-1:

In this U-CERT document, the cells in the tables have been grey shaded when it is part of the template of Annex A. Also some of the texts between the tables have been grey shaded, when it was part of the explanation given in Annex A. Without such grey shading it is not clear what is allowed to be changed and what not.

However, see disclaimer below, in particular because in this standard the explanation in Annex B differs here and there from the explanation in Annex A.

So only the non-shaded elements are allowed to be edited to stay in line with the standard (in casu: in line with the normative template of Annex A). and what has been added in Annex B (and adopted or changed in this U-CERT National Datasheet).

Clause A.1/B.1 has not been grey shaded, but shall not be edited in any case.

Disclaimer:

Because neither Annex A nor Annex B of this standard contains any shading of cells in the tables, it was not always fully clear whether the texts in the tables are examples of normative texts.

Annex UU
(informative)

~~Default~~ U-CERT criteria for the indoor environment

GENERAL:

IMPORTANT:
Especially for this standard it is not always immediately clear whether the term "**default**" means:
a) default option for a **mandatory** national choice (in the spirit of Annex B in general); for instance: a default temperature set point.
In this case the term "default" has to be replaced by "U-CERT". (e.g. as in the title of this Annex)
or:
b) an option for a national **default** choice. For example: default product data or other default conservative values that may be replaced by more detailed information, if available.
In this case the term "default" needs to remain unchanged or (to be more clear) replaced by "U-CERT default"

The phrasing of Annex B versus Annex A does not always give clear guidance:
In many instances Annex A uses the term "(national) recommended" and Annex B uses the term "default". This would translate into "U-CERT recommended", which is more or less equivalent to "U-CERT default". But for many choices we need unambiguous, reproducible choices: mandatory for the U-CERT calculation methodology.
In these cases the choice between the two options has been made to the best of the author's knowledge, with help from EPB Center expert on the field of ventilation and IAQ.

In the cases where in Annex B the adjective "default" is inserted, we could simply replace "default" by "U-CERT"
In the cases where Annex A already uses the adjective "default", it remains ('of course') unchanged

UU.1 General

Note This annex includes all recommended ~~default~~ U-CERT criteria for the indoor environment.

[Copy of common text from Annex A is missing in Annex B]:

The common EPB Table UU.1 with references to other EPB standards is missing in EN 16798-1

UU.2 ~~Default~~ U-CERT criteria for the thermal environment

Note This clause includes all ~~default~~ U-CERT criteria for the thermal environment

UU.2.1 ~~Default~~ U-CERT categories for mechanically heated and cooled buildings

Assuming different criteria for the PPD-PMV (EN ISO 7730 [10]) different categories of the indoor environment are established. Recommended PPD ranges are given in the Table UU.1. For the design and dimensioning further criteria for the thermal environment (draught, vertical air temperature

differences, floor temperature, and radiant temperature asymmetry) shall be taken into account (see Table UU.3).

Table UU.1:
Type: Important factor for the calculated energy performance, because the tolerances are used as basis for the thermal comfort score (see **Table UU.2 – Table UU.4 of EN ISO 52018-1**)

The choices in this table have impact on the *assumptions* for the hourly EP calculation.
Because the design values given in this table are also used to check/assess the achieved thermal comfort score as part of the post-processing of the calculated energy needs for heating and cooling and indoor temperatures (using EN ISO 52016-1).

See Clause 7 (*Indoor environment parameters for energy calculation*) for back reference to Clause 6 (*Design input parameters for design of buildings and sizing of heating, cooling, ventilation and lighting systems*), as explained by G. Zweifel in EPB Center webinar 5.
(https://epb.center/news/news_events/fifth-webinar-epb-standards-health-wellbeing/)

The PMV-PPD values can be used directly, with specifically assumed parameters, such as levels of activity ("met") and values of thermal insulation for clothing ("clo", winter and summer); e.g. for special occupant groups (such as elderly people).
For typical occupation, typical parameters may be assumed, so that the PMV-PPD levels can be replaced by operative temperature criteria: see Table UU.2.

➔ **LINKED CHOICES:**
- **Table UU.5:** Conversion of PMV-PPD to operative temperature criteria.
- **Table UU.19 of EN ISO 52000-1:** Principle of assumed or presence of system: see explanation box there.
- **Annex C:** Occupant conditions for different building or space types.
- **Table UU.4 of EN ISO 52016-1**: Hourly or monthly calculation procedures.

U-CERT Choice: adopt Table B.1 without changes

Table UU.1 — ~~Default~~ U-CERT categories for design of mechanical heated and cooled buildings

Category	Thermal state of the body as a whole	
	Predicted Percentage of Dissatisfied PPD %	Predicted Mean Vote PMV
I	< 6	−0,2 < PMV < + 0,2
II	< 10	−0,5 < PMV < + 0,5
III	< 15	−0,7 < PMV < + 0,7
IV	< 25	−1,0 < PMV < + 1,0

Table UU.2:
Type: Less crucial detail for calculation methodology

For design only.

U-CERT Choice: adopt Table B.2 without changes.

Table UU.2 — ~~Default~~ U-CERT design values of the indoor operative temperature in winter and summer for buildings with mechanical cooling systems (for more examples see ~~Fpr~~CEN/TR 16798–2 [11])

Type of building/ space	Category	Operative temperature °C	
		Minimum for heating (winter season), approximately 1,0 clo	Maximum for cooling (summer season), approximately 0,5 clo
Residential buildings, living spaces (bed room's, living rooms, kitchens, etc.) Sedentary activity ~1,2 met	I	21,0	25,5
	II	20,0	26,0
	III	18,0	27,0
	IV	16,0	28,0
Residential buildings, other spaces (utility rooms, storages, etc.) Standing-walking activity ~1,5 met	I	18,0	
	II	16,0	
	III	14,0	
Offices and spaces with similar activity (single offices, open plan offices, conference rooms, auditorium, cafeteria, restaurants, class rooms, Sedentary activity ~1,2 met	I	21,0	25,5
	II	20,0	26,0
	III	19,0	27,0
	IV	18,0	28,0
NOTE A 50 % relative humidity level and low air velocity level (<0,1 m/s) is assumed.			

Table UU.2 presents design values for the indoor operative temperature in buildings that have active heating systems in operation during winter season and active cooling systems during summer season.

Assumed clothing thermal insulation level for winter and summer (clo-value) and activity level (met-value) are listed in Table UU.2. Note that the operative temperature limits shall be adjusted when clothing levels and/or activity levels are different from the values mentioned in the table.

Table UU.3:
Type: Other (system sizing)

➔ LINKED CHOICES:
- **Table UU.1:** PMV-PPD levels are the basis for design. This Table UU.3 provides the further details that are needed for the design and dimensioning of the thermal environment.

U-CERT Choice: adopt Table B.3 without changes, because it has no direct impact on the EP calculation.
It is only used for heating and/or cooling system sizing

Table UU.3 gives ~~default~~ U-CERT criteria for local thermal discomfort parameters for the three categories for design of buildings and HVAC systems.

Table UU.3 — Local thermal discomfort design criteria

	Draught			**Vertical air temperature difference (head ankle)**		**Range of floor temperature**		**Radiant temperature asymmetry**				
	DR (Draught Rate) [%]	Maximum air velocity [a] Winter [m/s]	summer [m/s]	PD [%]	Temp. Difference [b] [K]	PD [%]	Floor surface temperature range [°C]	PD [%]	Warm ceiling [K]	Cool wall [K]	Cool ceiling [K]	Warm wall [K]
Category I	10	0,10	0,12 [c]	3	2	10	19 to 29	5	< 5	< 10	< 14	< 23
Category II	20	0,16	0,19 [c]	5	3	10	19 to 29	5	< 5	< 10	< 14	< 23
Category III	30	0,21	0,24 [c]	10	4	15	17 to 31	10	< 7	< 13	< 18	< 35

[a] Assuming an activity level of 1,2 met, a turbulence intensity of 40 % and an air temperature equal to the operative temperature of around 20 °C in winter and 23 °C in summer.

[b] Difference between 1,1 and 0,1 m above the floor.

[c] When the air temperature is above 25 °C higher maximum air speeds are allowed and often even preferred (draught becomes pleasurable breeze); but only under the condition that occupants have direct control over the air speed. See B.2.3 for examples of operative temperature corrections.

For more information, see EN ISO 7730 [10] and FprCEN/TR 16798–2 [11].

UU.2.2 ~~Default~~ U-CERT acceptable indoor temperatures for buildings without mechanical cooling systems

Clause UU.2.2:
Type: Important factor for the calculated energy performance

This alternative method of acceptable indoor temperatures adapted to the outdoor temperature only applies under specific conditions. One of the conditions is that there is no mechanical cooling system. E.g. because expectations are different when a mechanical cooling system is present.

In the calculation of the energy needs for heating and cooling and internal temperatures according to EN ISO 52016-1 the adaptive limits of acceptable indoor temperature can be introduced to assess the thermal comfort in case of natural cooling (e.g. ventilative cooling) and if all other conditions apply.
This calculation is important to ensure that the assessed energy performance is not at the cost of low thermal comfort.

➔ LINKED CHOICES:
Table UU.5: that Table provides the criteria for buildings with mechanical cooling. Read the explanation box on that Table UU.5 for extensive explanation.
- **Table UU.1:** PMV-PPD levels as basis for these operative temperature criteria.
- **Table UU.4 of EN ISO 52016-1**: Hourly or monthly calculation procedures: only the hourly calculation provides the required output (operative temperatures).
- **Table UU.4, Table UU.5 and Table UU.7 of EN ISO 52000-1** and **Annex C** of this standard (EN 16798-1): the building/space types in this Table UU.2 need to cover all building (and space..) categories in those Tables.
- **Table UU.3 and Table UU.4 of EN ISO 52018-1**: The thermal comfort score are based on the criteria in this Table UU.2

Note that some countries (e.g. Switzerland, Denmark) slightly adapted formulae or limits are proposed.
See e.g.
https://www.researchgate.net/publication/245145577_Derivation_of_the_adaptive_equations_for_thermal_comfort_in_free-running_buildings_in_European_standard_EN15251

U-CERT Choice: adopt Clause B.2.2 without changes but allow for adapted versions, pending future harmonization

In Figure UU.1 ~~recommended~~ ranges of indoor operative temperatures are presented for buildings without mechanical cooling systems as function of the outdoor running mean temperature, defined below. This alternative method only applies for office buildings and other buildings of similar type (e.g. residential buildings) used mainly for human occupancy with mainly sedentary activities, where there is easy access to operable windows and occupants can freely adapt their clothing to the indoor and/or outdoor thermal conditions, where thermal conditions are regulated primarily by the occupants through opening and closing of openings (windows) in the building envelope.

During the summer season and during the shoulder seasons (spring and autumn) so-called adaptive criteria (upper and lower temperature limits that change with the running mean outdoor temperature) shall be applied (see the cat. I, II and III upper and lower limits in Figure UU.1).

During the winter season, the same temperature limits shall be applied as presented in Table UU.2 for buildings with mechanical cooling systems (winter upper and lower limits are not presented in Figure UU.1).

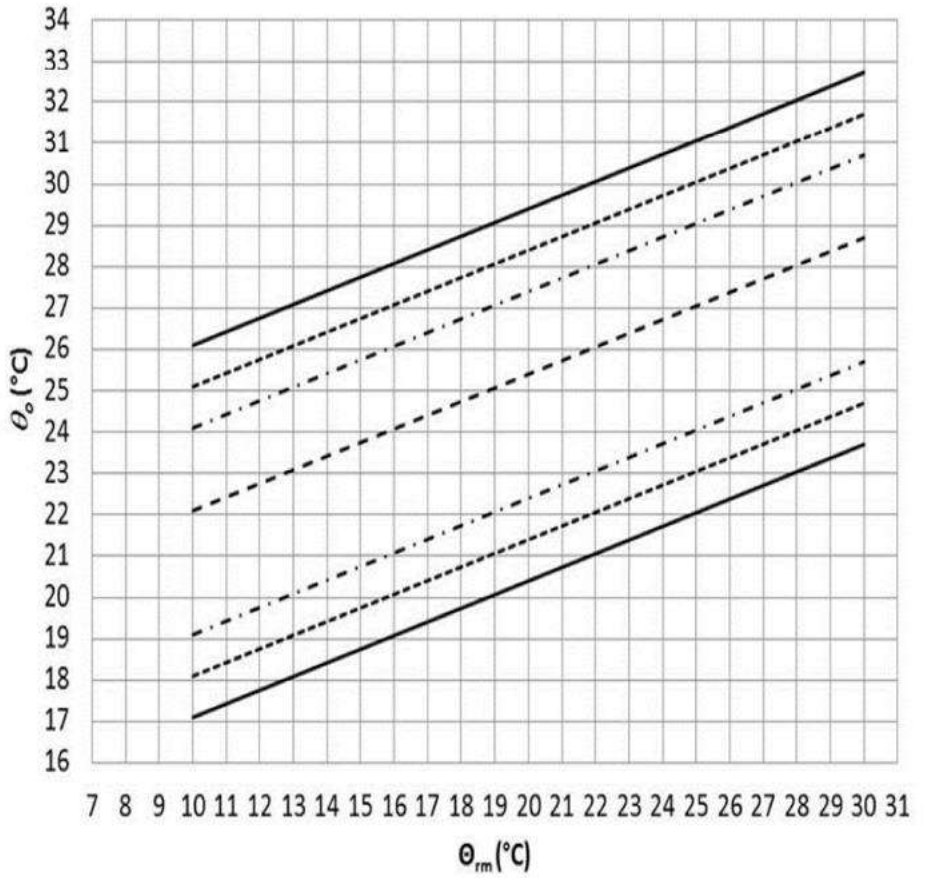


Figure UU.1 — Default design values for the indoor operative temperature for buildings without mechanical cooling systems as a function of the exponentially-weighted running mean of the outdoor temperature

The outdoor running mean temperature is calculated by means of Formula (UU.1):

$$\Theta_{rm} = (1-\alpha).\left\{\Theta_{ed-1} + \alpha.\Theta_{ed-2} + \alpha^2\Theta_{ed-3}\right\} \quad \text{(UU.1)}$$

where

Θ_{rm}	= Outdoor Running mean temperature for the considered day (°C).
Θ_{ed-1}	= daily mean outdoor air temperature for previous day
α	= constant between 0 and 1 (recommended value is 0,8)
Θ_{ed-i}	= daily mean outdoor air temperature for the *i-th* previous day

The following approximate formula shall be used where records of daily running mean outdoor temperature are not available:

$$\Theta_m = \left(\Theta_{ed-1} + 0,8\ \Theta_{ed-2} + 0,6\ \Theta_{ed-3} + 0,5\ \Theta_{ed-4} + 0,4\ \Theta_{ed-5} + 0,3\ \Theta_{ed-6} + 0,2\ \Theta_{ed-7}\right) / 3,8 \qquad \text{(UU.2)}$$

The allowable indoor operative temperatures of Figure UU.1 are plotted against the running mean outdoor temperature Θ_{rm}. This is defined as the exponentially weighted running mean of the daily outdoor temperature (see Formulae (UU.1) and (UU.2)).

The formulae representing the lines in Figure B.1 are:

Category I	upper limit:	$\Theta_o = 0,33\ \Theta_{rm} + 18,8 + 2$
	lower limit:	$\Theta_o = 0,33\ \Theta_{rm} + 18,8 - 3$
Category II	upper limit:	$\Theta_o = 0,33\ \Theta_{rm} + 18,8 + 3$
	lower limit:	$\Theta_o = 0,33\ \Theta_{rm} + 18,8 - 4$
Category III	upper limit:	$\Theta_o = 0,33\ \Theta_{rm} + 18,8 + 4$
	lower limit:	$\Theta_o = 0,33\ \Theta_{rm} + 18,8 - 5$

The dotted line in the middle refers to the optimal operative temperature. Formula (B.3) represents this line:

$$\Theta_c = 0,33\Theta_{rm} + 18,8 \qquad \text{(UU.3)}$$

where

Θ_o	= indoor operative temperature, °C
Θ_{rm}	= running mean outdoor temperature, °C
Θ_c	= Optimal operative temperature, °C

The limits only apply when $10 < \Theta_{rm} < 30$ °C.

If further developed procedures are available at national level, these may be used instead, with proper justification or references.

UU.2.3 Increased air velocity

Table UU.4 and surrounding text**:**
Type: Less crucial detail for calculation methodology

Increased tolerance for summer temperatures under specific conditions.

➔ LINKED CHOICES:
Annex C: The increased tolerance would overrule the criteria in Annex C.

Is it possible to specify when these conditions apply, in which case they would overrule the values from Annex C?

U-CERT Choice: adopt Table B.4 without changes, but see question in this explanation box.

Under summer comfort conditions with indoor operative temperatures > 25 °C artificially increased air velocity can be used to compensate for increased air temperatures according to Table UU.4 only if the increased air velocity is under personal control. The correction value depends on the air speed range of the appliance.

Table UU.4 — Indoor operative temperature correction ($\Delta\Theta_o$) applicable for buildings equipped with fans or personal systems providing building occupants with personal control over air speed at occupant level

Average Air Speed (v_a) 0,6 m/s	Average Air Speed (v_a) 0,9 m/s	Average Air Speed (v_a) 1,2 m/s
1,2 K	1,8 K	2,2 K

NOTE An air speed over 0,8 m/s moves the normal office paper from the desk.

UU.2.4 ~~Default~~ U-CERT indoor temperatures for energy calculations

Table UU.5 and surrounding text:
Type: Important factor for the calculated energy performance, because the tolerances are used as basis for the thermal comfort score (see **Table UU.2 – Table UU.4 of EN ISO 52018-1**).

See extensive explanation in explanation box on **Table UU.1**.

➔ **LINKED CHOICES:**
- **Table UU.1:** PMV-PPD levels as basis for these operative temperature tolerances.
- **Table UU.4 of EN ISO 52016-1**: Hourly or monthly calculation procedures: only the hourly calculation provides the required output (operative temperatures).
- **Table UU.4, Table UU.5 and Table UU.7 of EN ISO 52000-1** and **Annex C** of this standard (EN 16798-1): It has not been checked within the U-CERT project if the building/space types in this Table UU.5 need to cover all building (and space..) categories in these linked Tables.
- **Table UU.3 and Table UU.4 of EN ISO 52018-1**: The thermal comfort scores are based on the criteria in this Table UU.5.
- **Clause UU.2.2** of this standard (above): Alternative tolerances for situations without mechanical cooling.

U-CERT Choice: adopt Table B.5 without changes, but check if all necessary space categories are covered.

Table UU.5 — Temperature ranges for hourly calculation of cooling and heating energy in four categories of indoor environment

Type of building or space	Category	Operative Temperature range for heating seasons, °C Clothing approximately 1,0 clo	Operative Temperature range for cooling seasons, °C Clothing

			approximately 0,5 clo
Residential buildings, living spaces (bed room's, ~~kitchens,~~ living rooms etc.) Sedentary activity ~1,2 met	I	21,0 –25,0	23,5 - 25,5
	II	**20,0–25,0**	**23,0 - 26,0**
	III	18,0- 25,0	22,0 - 27,0
	IV	17,0–25,0	21,0 – 28,0
Residential buildings, other spaces (~~utility roomskitchens~~, storages etc.) Standing-walking activity ~1,5 met	I	18,0–25,0	
	II	**16,0–25,0**	
	III	14,0–25,0	
	IV		
Offices and spaces with similar activity (single offices, open plan offices, conference rooms, auditoria, cafeteria, restaurants, class rooms, etc) Sedentary activity ~1,2 met	I	21,0 – 23,0	23,5 - 25,5
	II	**20,0 – 24,0**	**23,0 - 26,0**
	III	19,0 – 25,0	22,0 - 27,0
	IV	17,0–25,0	21,0 – 28,0
During the between heating and cooling seasons (with Θ_{rm} between 10 and 15) temperature limits that lie in between the winter and summer values may be used. Air velocity is assumed < 0,1 m/s and RH~40 % for heating season and 60 % for cooling season.			

The mean design operative temperature can vary from the values shown to take account of e.g. local custom or a desire for energy saving so long as the within-day variation from the design temperature is within the given range, and the occupants are given time and opportunity to adapt to the modified design temperature.

During between the heating and cooling seasons (with Θ_{rm} between around 10 and 15 °C), adjusted upper and lower temperature limits may be used that lie in between the winter and summer values mentioned in Table UU.5.

UU.3 Basis for the criteria for indoor air quality and ventilation rates

Note This clause includes criteria for indoor air quality and ventilation rates.

UU.3.1 ~~Default~~ U-CERT design ventilation air flow rates

UU.3.1.1 General

Due to health reasons the total minimum airflow rate during occupancy expressed as l/s per person should never be below 4 l/s per person (Table UU.6) and the WHO Guideline values in clause UU.7 is met. The ~~default~~ U-CERT air flow rates given in this clause UU.3.1 are design ventilation air flow rates.

The ~~default~~ U-CERT air flow rates given in this Annex assume complete mixing in the room (concentration of pollutants is equal in extract and in occupied zone). For non-residential buildings ventilation rates should be adjusted by the ventilation effectiveness in accordance with EN 16798 3 if the air distribution differs from complete mixing.

UU.3.1.2 Method 1: method based on perceived air quality

Table UU.6 and surrounding text:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

Note that one of the experts proposed to introduce the correction of outdoor air flow with the ventilation efficiency defined by EN 16798-3.
Note that one of the experts also proposed to differentiate Table UU.6 according to the category of building or space.

It has not been checked within the U-CERT project is it up to the individual user or is it a national choice which method (1, 2 or 3) is chosen.

U-CERT Choice: adopt Table B.6 without changes, but see notes above in this explanation box.

The design ventilation rate is calculated from two components (a) ventilation to dilute/remove pollution from the occupants (bio effluents) and (b) ventilation to remove/dilute pollution from the building and systems. The ventilation for each category is the sum of these two components as illustrated with the Formula (1) in 6.2.2.2.

The ventilation rates for occupants are presented for non-adapted.

The total ventilation rate will then depend on occupancy density and building type. Examples of the total ventilation rates for non-industrial, non-residential buildings based on these values with default occupancy density are shown in ~~Fpr~~CEN/TR 16798–2 [11]. A building is a low-polluting building if the majority of building materials are low emitting and activity does not result in pollution of the building (e.g. smoking).

The category very low-polluting requires that the majority of building materials used for finishing the interior surfaces meet the national or international criteria of very low-polluting materials. An example of how to define very low-polluting building materials is given in Annex J.

Values for occupants (q_p) only are listed in Table UU.6.

Table UU.6 — Design ventilation rates for sedentary, adults, non-adapted persons for diluting emissions (bio effluents) from people for different categories

Category	Expected Percentage Dissatisfied	Airflow per non-adapted person l/(s per person)
I	15	10
II	20	7
III	30	4
IV	40	2,5

Table UU.7 and surrounding text:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

Note that one of the experts proposed to differentiate Table UU.7 according to the category of building or space.

U-CERT Choice: adopt Table B.7 without changes, but see note above in this explanation box.

The ventilation rates (q_B) for the building emissions are given in Table UU.7.

Table UU.7 — Design ventilation rates for diluting emissions from different type of buildings

Category	Very low polluting building, LPB-1 l/(s m²)	Low polluting building, LPB-2 l/(s m²)	Non low-polluting building, LPB-3 l/(s m²)
I	0,5	1,0	2,0
II	0,35	0,7	1,4
III	**0,2**	**0,4**	**0,8**
IV	0,15	0,3	0,6

Table UU.8 and surrounding text:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

U-CERT Choice: adopt Table B.8 without changes

Table UU.8 — Example of ~~default~~ U-CERT design ventilation air flow rates for a single-person office of 10 m² in a low polluting building (un-adapted person)

Category	Low-polluting building l/(s*m²)	Airflow per non-adapted person l/(s per person)	Total design ventilation air flow rate for the room expressed in different ways		
			l/s	l/(s per person)	l/(s* m²)
I	1,0	10	20	20	2
II	0,7	7	14	14	1,4
III	**0,4**	**4**	**8**	**8**	**0,8**
IV	0,3	2,5	5,5	5,5	0,55

As seen from Table UU.8 the total ventilation rate is never lower than 4 l/s per person. The ventilation rate should always be higher than 4 l/s per person (minimum 4 l/s per person for human emissions and a part for building and activity related emissions).

UU.3.1.3 Method 2 - method using limit values of substance concentration

Table UU.9 and surrounding text:
Type: Less crucial detail for calculation methodology

Note: Also in Annex A the term “default” is used in text and Table title.

Contribution to the assessment of the required air flow rate, as input for EN 16798-7: CO_2 values are used for demand controlled ventilation in EN 16798-7.

Note that one of the experts proposed to introduce the correction of outdoor air flow with the ventilation efficiency defined by EN 16798-3.

It has not been checked within the U-CERT project if is it up to the individual user or is it a national choice which method (1, 2 or 3) is chosen.

U-CERT Choice: adopt Table B.9 and surrounding text without changes (has no direct impact on calculation methodology), but see notes above in this explanation box.

The design ventilation rates are calculated based on a mass balance equation for the substance concentration in the space taking into account the outdoor concentration.

If CO_2 is used as a tracer of human occupancy, the default limit values are extracted from Table UU.9. Further recommended criteria for the CO2 calculation are included in ~~Fpr~~CEN/TR 16798–2 [11]. The listed CO_2 values can also be used for demand controlled ventilation.

Table UU.9 — Default design CO_2 concentrations above outdoor concentration assuming a standard CO_2 emission of 20 L/(h per person)

Category	Corresponding CO_2 concentration above outdoors in PPM for non-adapted persons
I	550 (10)
II	800 (7)
III	1 350 (4)
IV	1 350 (4)

UU.3.1.4 Method 3 Method based on predefined ventilation flow rates

Table UU.10 and surrounding text:
Type: Less crucial detail for calculation methodology

Note: Also in Annex A the term “default” is used in the Table title.

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

It has not been checked within the U-CERT project if it up to the individual user or is it a national choice which method (1, 2 or 3) is chosen.

U-CERT Choice: adopt Table B.10 and surrounding text without changes, but see notes above in this explanation box.

The design ventilation air flow rates can also be expressed as a required rate per person (l/(s per person)) or as a required rate per m^2 floor area (l/(s* m^2), as required air change rate, required total ventilation for either supply air flow or extract air flow rates or both.

Table UU.10 — Default predefined design ventilation air flow rates for an office (non-adapted person)

Category	Total design ventilation air flow rate for the

	room	
	l/(s per person)	l/(s* m²)
I	20	2
II	14	1,4
III	8	0,8
IV	5,5	0,55

If design rates are given for both per person and per m² the higher ventilation air flow rate should be used for design.

The present example gives the same total ventilation as Method 1. Further examples are given in ~~Fpr~~CEN/TR 16798–2 [11].

UU.3.1.5 Ventilation air flow rate during unoccupied periods

Clause UU.3.1.5:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

Note that there is no Clause A.3.1.5.

U-CERT Choice: adopt Clause B.3.1.5 without changes

In case the ventilation is shut off, the minimum amount of air to be delivered prior to occupation is by default: 1 volume within 2 hours of the zone to be ventilated.

In case the ventilation is lowered for un-occupied periods, the total air flow rate for diluting emissions from building should be minimum 0,15 l/s.m² of floor area in all rooms.

UU.3.2 ~~Default~~ U-CERT design ventilation air flow rates for residential buildings

UU.3.2.1 General

Predefined ventilation air flow rates can be given based on one or more of the following components:

— total air change rate for the dwelling;

— extract air flows for specific rooms;

— supply air flows for specific rooms;

— design opening areas for natural ventilation.

Any of the criteria can be used in the design.

Both the total air flow rate for the entire dwelling and the extract air flow rate from wet rooms shall be calculated. Either one of the criteria can be used in the design.

UU.3.2.2 Design supply air flow rates

Table UU.11 and surrounding text:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

Note: Also in Annex A the term "default" is used in the text above the Table.

U-CERT Choice: adopt Table B.11 and surrounding text without changes

Table UU.11 gives the default values for the three criteria. It is assumed that air is supplied in living rooms and extracted from wet rooms.

Table UU.11 — Criteria based on pre-defined supply ventilation air flow rates: Total ventilation (1), Supply air flow (2) and (3)

Category	Total ventilation including air infiltration (1)		Supply air flow per. person (2)	Supply air flow based on perceived IAQ for adapted persons (3)	
	l/s,m²	ach	l/s [a] per	q_P l/s*per	q_B l/s,m²
I	0,49	0,7	10	3,5	0,25
II	0,42	0,6	7	2,5	0,15
III	0,35	0,5	4	1,5	0,1
IV	0,23	0,4			

[a] Supply air flow for Method 3 is based on Formula (1) from 6.3.2.2.

[from Annex A, missing in Annex B] The values assume that outdoor air is the primary source. Unused outdoor air may be transferred from other rooms. These values may be converted to l/s/m² of floor area at national level depending on the average density of occupation of dwellings.

Table UU.12:
Type: Less crucial detail for calculation methodology

Basis for assessing required air flow rate, as input for EN 16798-7.

U-CERT Choice: adopt Table B.12 without changes

The values in Table UU.12 assume that supply air is outdoor air, or unused air transferred from other rooms. These values may be converted to l/(s m²) of floor area at national level depending on the average number of occupants in dwellings.

Table UU.12 — Design CO_2 concentrations in occupied living rooms and bedrooms

Category	Design ΔCO_2 concentration for living rooms (ppm above outdoors)	Design ΔCO_2 concentration for bedrooms (ppm above outdoors)

I	550	380
II	800	550
III	1 350	950
IV	1 350	950
NOTE 1 The above values in Table UU.12 correspond to the equilibrium concentration when the air flow rate is 4, 7, 10 l/s per person for cat. I, II, III respectively and the CO_2 emission is 20 l /h per person and 13,6 l/h per person for living rooms and bedrooms respectively. NOTE 2 For a 10 m^2 room (room height 2,5 m, 25 m^3) 4; 7 and 10 l/s per person correspond, with two persons in the room, to an air change rate of 1,2; 2,0 and 2,9 ACH.		

UU.3.2.3 Design extract air flow rates

Table UU.13:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

U-CERT Choice: adopt Table B.13 without changes

This annex gives ~~default~~ U-CERT values for the design extract air flow rate based on air flow rates by room and building type (q_{room}) given in Tables UU.13 and UU.14.

Table UU.13 — Design air flow rates by room and building type (q_{room})

Number of main rooms in the dwelling	Design extract air flow rates in l/s				
	Kitchen	Bathroom or shower with or without toilets	Other wet room	Toilets	
				Single in dwelling	Multiple (2 or more in dwelling)
1	20	10	10	10	10
2	25	10	10	10	10
3	30	15	10	10	10
4	35	15	10	15	10
5 and more	40	15	10	15	10

Table UU.14:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

U-CERT Choice: adopt Table B.14 without changes

Table UU.14 — Categories for predefined extract air flow rates

Category	Airflow rates defined in Table UU.13 multiplied by
I	1,4
II	1
III	0,7
IV	0,5
NOTE In the tables only the category numbers are used without the IEQx symbol.	

Category 4 applies only if there is an additional range hood in the kitchen.

UU.3.2.4 Design opening areas for natural ventilation.

Table UU.15:
Type: Other (System design)

Note: Also in Annex A the term "default" is used in the text and in the Table title & content.

U-CERT Choice: adopt Table B.15 without changes (has no direct impact on calculation methodology)

Table UU.15 gives a methodology for defining default design opening areas for natural ventilation systems in dwelling. The opening areas shall be provided as supply/extract grilles, stack ducts, window grilles, or similar system. When designing with design opening areas, the local climatic conditions should be taken into account.

Table UU.15 — Default design opening areas for dwellings. Values for bedrooms and living rooms may be given per m² floor area or as fixed values per room

	Extract Kitchen, bathrooms and toilets (cm^2)	Supply Bedrooms and living rooms (cm^2)
Default design opening area	100 per room	60 per room
NOTE Values for bedrooms and living rooms may be given per m2 floor area or as fixed values per room.		

UU.3.2.5 Design ventilation air flow rate during unoccupied periods

Clause UU.3.2.5:
Type: Less crucial detail for calculation methodology

Contribution to the assessment of the required air flow rate, as input for EN 16798-7.

U-CERT Choice: adopt Clause B.3.2.5 without changes

The total air flow rate needed to deal with building materials emissions and humidity reduction is between 0,1 and 0,15 l/(s*m²) of floor area, depending on the size and occupancy of the dwelling.

UU.3.3 The recommended criteria for dimensioning of humidification and dehumidification

Table UU.16:
Type: Less crucial detail for calculation methodology

Basis for humidity set points.

➔ **LINKED CHOICES:**
Annex C (conditions of use)

U-CERT Choice: adopt Table B.16 without changes

For buildings with no other humidity requirements than human occupancy (e.g. offices, schools and residential buildings), humidification or dehumidification is usually not needed.

Usually humidification or dehumidification is needed only in special buildings like museums, certain health care spaces, process control, paper industry, etc.). If humidification or dehumidification is used the values in the Table UU.16 is recommended as design values under design conditions.

Table UU.16 — Example of recommended design criteria for the humidity in occupied spaces if humidification or dehumidification systems are installed

Type of building/space	Category	Design relative humidity for dehumidification, %	Design relative humidity for humidification, %
Spaces where humidity criteria are set by human occupancy. Special spaces (museums, churches, etc.) may require other limits	I	50	30
	II	60	25
	III	70	20

Besides it is recommended to limit the absolute humidity to 12g/kg.

The recommended air flow rates in UU.3.1 and UU3.2 may in very cold climate increase risk for too ~~try~~ dry air. In these cases, especially for IEQ category l and II is recommended to use humidity recovery. See ~~Fpr~~CEN/TR 16798–2 [11] for further guidance.

UU.4 Example on how to define low and very low polluting buildings

Table UU.17:
Type: Less crucial detail for calculation methodology

➔ **LINKED CHOICES:**
These criteria have an impact on the (ventilation system design) values that are applicable in **Table UU.6**, **Table UU.7** and **Table UU.8**.

U-CERT Choice: adopt Table B.17 without changes

The building is low or very low polluting if the majority of the interior materials are low or very low emitting. Low and very low emitting materials are stone, glass, ceramics and non-treated metal, which are known to show no emissions into indoor air, and materials that show low or very low emissions when tested in a ventilated test chamber after 28 days in line with international testing standards like EN 16516 or ISO 16000 3/ISO 16000-6/EN ISO 16000-9/EN ISO 16000-11, with the results calculated for the European Reference Room as specified in EN 16516.

Table UU.17 —Criteria for the different building types

SOURCE	Low emitting products for low polluted buildings	Very low emitting products for very low polluted buildings
Total VOCs TVOC (as in EN 16516)	< 1,000 µg/m³	< 300 µg/m³
Formaldehyde	< 100 µg/m³	< 30 µg/m³
Any C1A or C1B classified carcinogenic VOC	< 5 µg/m³	< 5 µg/m³
R value (as in EN 16516)	< 1,0	< 1,0

The R value includes the pollutants with limit values that have been identified.

Compliance can be shown by presentation of a test report, issued by a testing laboratory with an EN ISO/IEC 17025 accreditation that includes the relevant testing standards, or by showing a valid attestation of compliance with any regulation or voluntary label that includes the above (or more stringent) limit values after 28 days storage in a ventilated test chamber (or earlier).

UU.5 Examples of criteria for lighting

Table UU.18:
Type: Less crucial detail for calculation methodology
Required illuminance values

➔ **LINKED CHOICES:**
Annex C (conditions of use)

It has not been checked within the U-CERT project if this is consistent with values in Annex C? (e.g. 300 Lux is not found there, except for restaurants)
Note that the lighting standard (EN 15193–1) is not part of the selected EPB standards for the U-CERT methodology

U-CERT Choice: adopt Table B.18 without changes, but more differentiated criteria are given in Annex C. See also notes above in this explanation box.

Table UU.18 — Examples of criteria for some buildings and spaces according to the EN 12464 series

Ref. n° acc. to EN 12464–1:2011	Type of area, task or activity	$\bar{E}_m$ lx
5.26.2 5.26.5	Offices - Writing, typing, reading, data processing, - Conference and meeting rooms	500

5.36.1–5.36.3	Educational buildings - Classrooms, tutorial rooms, Classroom for evening classes and adults education, Auditorium, lecture halls	500
5.36.24	Educational premises – Educational buildings - Sports halls, gymnasiums, swimming pools	300
NOTE Specific use of visual tasks not yet identified. For detailed design specific lighting standards like EN 12464–1 are needed.		

Table UU.19:
Type: Less crucial detail for calculation methodology
Daylight criteria

It has not been checked within the U-CERT project what is the meaning of this classification? Are these for the four classes I, II, II and IV? Should these have been filled in in the third column (missing in Table B.19)?

➔ **LINKED CHOICES:**
Somehow this Table is linked to the calculation of "the energy need for heating, cooling and lighting" that is one of the main EP indicators; see **Table UU.2 & Table UU.7 of EN ISO 52018-1**.

Note that the lighting standard (EN 15193–1) is not part of the selected EPB standards for the U-CERT methodology

U-CERT Choice: See questions above in this explanation box.

Table UU.19 — Daylight availability classification as a function of the daylight factor $D_{Ca,j}$ of the raw building carcass ~~envelop~~ opening and D_{SNA}

Vertical Facades Daylight factor $D_{Ca,j}$	**Roof lights Daylight factor D_{SNA}[a]**	*[from Annex A, missing in Annex B]* **Classification of daylight availability**
$D_{Ca,j} \geq 6$ %	7 % < D_{SNA}[a]	
6 % > $D_{Ca,j} \geq 4$ %	7 % > $D_{SNA} \geq 4$ %	
4 % > $D_{Ca,j} \geq 2$ %	4 % > $D_{SNA} \geq 2$ %	
$D_{Ca,j} < 2$ %	2 % > $D_{SNA} \geq 0$ %	
[a] Values of $D_{SNA} > 10$ % should be avoided due to danger of overheating.		

Besides the risk of overheating also the risk of glare should be evaluated with increased use of daylight (see ~~Fpr~~CEN/TR 16798–2 [11]).

UU.6 Indoor system noise criteria of some spaces and buildings

Table UU.20:
Type: Other (Noise criteria)

For energy performance assessment, these design criteria for sound levels are not relevant.
However, if the IEQ assessment will be included in the U-CERT, these figures can be used as requirements.

➔ **LINKED CHOICES:**
Annex C: Conditions of use for different space categories

U-CERT Choice: adopt Table B.20 without changes

Table UU.20 — Examples of design equivalent continuous sound level, $L_{eq,nT,A}$ [dB(A)] for continuous sources

Building	Type of space	Equivalent Continuous Sound Level Leq, nT,A [dB(A)]		
		I	II	III
Residential	Living-room	≤ 30	≤ 35	≤ 40
	Bedrooms	≤ 25	≤ 30	≤ 35
Places of assembly	Auditoriums	≤ 24	≤ 28	≤ 32
	Libraries	≤ 25	≤ 30	≤ 35
	Cinemas	≤ 24	≤ 28	≤ 32
	Museums	≤ 28	≤ 32	≤ 36
Commercial	Retail Stores	≤ 35	≤ 40	≤ 45
	Department stores, Supermarkets	≤ 40	≤ 45	≤ 50
Hospitals	Bedrooms	≤ 25	≤ 30	≤ 35
	Wards	≤ 32	≤ 36	≤ 40
	Operating theatres	≤ 35	≤ 40	≤ 45
Hotels	Hotel rooms	≤ 25	≤ 30	≤ 35
	Reception, Lobbies	≤ 30	≤ 35	≤ 40
Offices	Small offices	≤ 30	≤ 35	≤ 40
	Landscaped offices	≤ 35	≤ 40	≤ 45
	Conference rooms	≤ 30	≤ 35	≤ 40
Restaurants	Cafeterias	≤ 35	≤ 40	≤ 45
	Bars, Dining rooms	≤ 32	≤ 36	≤ 40
	Kitchens	≤ 45	≤ 50	≤ 55
Schools	Classrooms	≤ 30	≤ 34	≤ 38
	Gymnasiums	≤ 35	≤ 40	≤ 45
Sport	Covered sport facilities	≤ 35	≤ 40	≤ 45
General	Service rooms, Corridors	≤ 35	≤ 40	≤ 45
	Toilets	≤ 35	≤ 45	≤ 55

The values given in Table UU.20 refer to sound generated inside the considered room by building service systems.

Further information in ~~Fpr~~CEN/TR 16798–2.

UU.7 WHO health-based criteria for indoor air

Table UU.21:
Type: Other (IAQ guidelines for air pollutants)

These guidelines have an impact on the ventilation system design in case of specific indoor or outdoor air pollutants.

Whatever leads to a required outdoor air flow is a potential input to EN 16798-7.

➔ **LINKED CHOICES:**
It has not been checked within the U-CERT project how this is linked to **EN 16798-7** (air flow calculation)?
Table UU.21, 2nd column gives suggested guideline values for indoor and outdoor air pollutants as formulated by the WHO. For some pollutants no indoor air requirements have been defined yet by WHO. For those values only WHO outdoor requirements are presented, see the 3rd column.
Note: the CO_2 figures are included in **EN 16798-1.** See **Table A/B.9** of **EN 16798-7**

U-CERT Choice: adopt Table B.21 without changes, but see remark above in this explanation box.

Table UU.21 — WHO guideline values for indoor and outdoor air pollutants

Pollutant	WHO Indoor Air Quality guidelines 2010	WHO Air Quality guidelines 2005
Benzene	No safe level can be determined	-
Carbon monoxide	15 min. mean: 100 mg/m³ 1 h mean: 35 mg/m³ 8h mean: 10 mg/m³ 24 h mean: 7 mg/m³	-
Formaldehyde	30 min. mean: 100 µg/m³	-
Naphthalene	Annual mean: 10 µg/m³	-
Nitrogen dioxide	1 h mean: 200 µg/m³ Annual mean: 20 µg/m³	-
Polyaromatic Hydrocarbons (e.g. Benzo Pyrene A B[a]P)	No safe level can be determined	-

Pollutant	WHO Indoor Air Quality guidelines 2010	WHO Air Quality guidelines 2005
Radon	100 Bq/m³ (sometimes 300 mg/m³, country-specific)	-
Trichlorethylene	No safe level can be determined	-
Tetrachloroethylene	Annual mean: 250 µg/m³	
Sulfure dioxide	-	10 min. mean: 500 µg/m³ 24 h mean: 20 µg/m³
Ozone	-	8 h mean: 100 µg/m³
Particulate Matter PM 2,5	-	24 h mean: 25 µg/m³ Annual mean: 10 µg/m³
Particulate Matter PM 10	-	24 h mean: 50 µg/m³ Annual mean: 20 µg/m³

WHO Air Quality Guidelines values may be considered as a reference for indoor air quality when no other guidelines or national recommendations for indoor air quality value exist. Due to health effects confirmed at lower concentrations than current limit values and carcinogenic effect, the level of PAHs, particles, benzene should always be kept as low as possible.

In case of specific indoor pollution, ventilation rates shall be adapted to optimize the diluting effect of ventilation and additional air cleaning strategies can be considered.

UU.8 Occupants schedules for energy calculations

Clause UU.8 and whole Annex C:
Type: Important factor for the calculated energy performance

Important, because it has a strong impact on the EP and can be more complex than what is in Annex C, e.g. because of choices above (Table UU.1, Clause UU.2.1 and Table UU.4)

It has no been checked within the U-CERT project if the building / space types are consistent with the building /space categorization in EN ISO 52000-1
See also the other Tables in the selected 10 EPB standards that has a link with the space categorization and the conditions of use per space category.
In this context: check also usability of national choices, e.g. Table 26 of Italian Annex (26a to 26x).

- Check the report on case study calculations by the EPB Center which parameters need to be added or modified in Annex C to enable a full EP calculation.

➔ **LINKED CHOICES:**
All Tables in the selected 10 EPB standards where a linked choice with Annex C of EN 16798-1 is mentioned.
Main linked choice: **Table UU.7 of EN ISO 52000-1:** differentiation of space categories

U-CERT Choice: see above in this explanation box

If occupant schedules and internal loads are ~~know~~ known these should be used for calculation of the energy performance.

The following ~~default~~ U-CERT occupant schedules (Annex C) are examples that ~~can~~ shall be used as input to calculations of energy use in a building, when a standard calculation is made and ~~now~~ no specific values are available for a project.

The criteria used for room temperatures, ventilation, and humidity are based on IEQ category IEQ_I. *(Table 4 of EN 16798-1)* work place to work place depending on type of task.

The values in the tables cannot be used as standalone criteria and input values for design and energy calculations. The standard as a whole should be used.

In the example below a reference is given to the sections and tables of the standard where the values come from.

	Parameter Office, landscaped	Value	Unit	Section-table		Diversity factor Energy calculation					
						Weekdays			Weekends		
Operation time	Hour at day, START	7	hour	assumed							
	Hour at day, END	18	hour	assumed							
	Breaks, inside range	0	hours	assumed							
	days/week	5	days								
	hours/day	11	hours		h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
	hours/year	2 868	hours	calculated							
Internal gains	Occupants	17	m²/pers	assumed	1	0	0	0	0	0	0
	Occupants (Total)	7,0	W/m²	Calculated	2	0	0	0	0	0	0
	Occupants (Dry)	4,7	W/m²	calculated	3	0	0	0	0	0	0
	Appliances	12	W/m²	assumed	4	0	0	0	0	0	0
	Lighting				5	0	0	0	0	0	0
	Moisture production	3,53	g/(m², h)	Calculated	6	0	0	0	0	0	0
	CO_2 production	1,10	l/(m², h)	Calculated	7	0	0	0	0	0	0
Setpoints	Min T,op in unoccupied hours	16	°C	Assumed	8	0,2	0,2	0,2	0	0	0
	Max T,op in unoccupied hours	32	°C	Assumed	9	0,6	0,6	0,6	0	0	0
	Min T,op, heating/winter	20	°C	Sec.7.2-UU.2	10	0,6	0,6	0,6	0	0	0
	Max T,op, cooling/summer	26	°C	Sec.7.2-UU.*2*	11	0,7	0,7	0,7	0	0	0
	Ventilation rate (min.), Method 1	0,8	l/(s m²)	Sec.6.3.2.2,	12	0,7	0,7	0,7	0	0	0
	Max CO_2 concentration (above outdoor)	450	ppm	Sec.6.3.2.3	13	0,4	0,4	0,4	0	0	0
	Min. relative humidity	25	%	Sec.7.4- Table UU.16	14	0,6	0,6	0,6	0	0	0
	Max. relative humidity	60	%	Sec.7.4- Table UU.16	15	0,7	0,7	0,7	0	0	0
	Lighting, illuminance in working areas	500	lux	Sec.7.5-Table UU.18 ?	16	0,7	0,7	0,7	0	0	0
	Domestic hot water use				17	0,6	0,6	0,6	0	0	0

	Parameter Office, landscaped	Value	Unit	Section-table
Other				

	Diversity factor			Energy calculation		
18	0,2	0,2	0,2	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Annex C
(informative)

Occupants schedules for energy calculations

School, classroom

Parameters and set points

	Parameter	Value	Unit
Operation time	Hour at day, START	8	hour
	Hour at day, END	17	hour
	Breaks, inside range	0	hours
	days/week	5	days
	hours/day	9	hours
	hours/year	2346	hours
Internal gains	Occupants	5,4	m2/pers
	Occupants (Total)	21,7	W/m²
	Occupants (Dry)	13,8	W/m²
	Appliances	8	W/m²
	Lighting		
	Moisture production	11,11	g/(m2, h)
	CO_2 production	3,46	l/(m2, h)

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0

Set points	Min T,op in unoccupied hours	16	°C		**8**	0	0	0	0	0	0
	Max T,op in unoccupied hours	32	°C		**9**	0,6	0,6	0,6	0	0	0
	Min T,op	20	°C		**10**	0,7	0,7	0,7	0	0	0
	Max T,op	26	°C		**11**	0,6	0,6	0,6	0	0	0
	Ventilation rate (min.)	3,8	l/(s m^2)		**12**	0,4	0,4	0,4	0	0	0
	Ventilation rate for CO_2 emission	1,84	l/(s m^2)		**13**	0,3	0,3	0,3	0	0	0
	Max CO_2 concentration (above outdoor)	500	ppm		**14**	0,7	0,7	0,7	0	0	0
	Min. relative humidity	25	%		**15**	0,6	0,6	0,6	0	0	0
	Max. relative humidity	60	%		**16**	0,4	0,4	0,4	0	0	0
	Lighting, illuminance in working areas	500	lux		**17**	0,2	0,2	0,2	0	0	0
Other	Domestic hot water use	100	l/(m2 year)		**18**	0	0	0	0	0	0
					19	0	0	0	0	0	0
					20	0	0	0	0	0	0
					21	0	0	0	0	0	0
					22	0	0	0	0	0	0
					23	0	0	0	0	0	0
					24	0	0	0	0	0	0

Day-care, kindergarten

Parameters and set points

	Parameter	Value	Unit
Operation time	Hour at day, START	7	hour
	Hour at day, END	19	hour
	Breaks, inside range	0	hours
	days/week	5	days
	hours/day	12	hours
	hours/year	3129	hours
Internal gains	Occupants	3,8	m2/pers
	Occupants (Total)	33,3	W/m²
	Occupants (Dry)	20,0	W/m²
	Appliances	4	W/m²
	Lighting		
	Moisture production	15,79	g/(m2, h)
	CO_2 production	4,92	l/(m2, h)
Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	17,5	°C
	Max T,op	25,5	°C
	Ventilation rate (min.)	4,5	l/(s m²)
	Ventilation rate for CO_2 emission	1,64	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0,4	0,4	0,4	0	0	0
9	0,8	0,8	0,8	0	0	0
10	0,8	0,8	0,8	0	0	0
11	0,3	0,3	0,3	0	0	0
12	0,3	0,3	0,3	0	0	0
13	0,8	0,8	0,8	0	0	0
14	0,1	0,1	0,1	0	0	0
15	0,1	0,1	0,1	0	0	0
16	0,4	0,4	0,4	0	0	0

	Lighting, illuminance in working areas	500	lux
Other	Domestic hot water use	100	l/(m2 year)

h						
17	0,3	0,3	0,3	0	0	0
18	0,3	0,3	0,3	0	0	0
19	0,3	0,3	0,3	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Department store

Parameters and set points

	Parameter	**Value**	**Unit**
Operation time	Hour at day, START	8	hour
	Hour at day, END	21	hour
	Breaks, inside range	0	hours
	days/week	7	days
	hours/day	13	hours
	hours/year	4745	hours
Internal gains	Occupants	17	m2/pers
	Occupants (Total)	9,3	W/m²
	Occupants (Dry)	4,5	W/m²
	Appliances	1	W/m²
	Lighting		
	Moisture production	3,53	g/(m2, h)

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0

	CO_2 production	1,10	l/(m2, h)
Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	16	°C
	Max T,op	25	°C
	Ventilation rate (min.)	2,2	l/(s m²)
	Ventilation rate for CO_2 emission	0,53	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	500	lux
Other	Domestic hot water use	100	l/(m2 year)

7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0,1	1	1	0,1	1	1
10	0,3	1	1	0,3	1	1
11	0,3	1	1	0,6	1	1
12	0,7	1	1	0,9	1	1
13	0,6	1	1	1	1	1
14	0,5	1	1	0,9	1	1
15	0,6	1	1	0,7	1	1
16	0,6	1	1	0,5	1	1
17	0,9	1	1	0,3	1	1
18	0,9	1	1	0,3	1	1
19	1	1	1	0,45	1	1
20	0,9	1	1	0,45	1	1
21	0,7	1	1	0,45	1	1
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Meeting room

Parameters and set points

	Parameter	**Value**	**Unit**
Operation time	Hour at day, START	7	hour
	Hour at day, END	18	hour
	Breaks, inside range	0	hours
	days/week	5	days
	hours/day	11	hours

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting

	hours/year	2868	hours
Internal gains	Occupants	2	m2/pers
	Occupants (Total)	59,2	W/m²
	Occupants (Dry)	40,1	W/m²
	Appliances	12	W/m²
	Lighting		
	Moisture production	30,00	g/(m2, h)
	CO_2 production	9,35	l/(m2, h)
Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	20	°C
	Max T,op	26	°C
	Ventilation rate (min.)	3,8	l/(s m²)
	Ventilation rate for CO_2 emission	5,11	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	500	lux
Other	Domestic hot water use	100	l/(m2 year)

1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0,5	0,5	0,5	0	0	0
10	0,8	0,8	0,8	0	0	0
11	0,9	0,9	0,9	0	0	0
12	0,8	0,8	0,8	0	0	0
13	0	0	0	0	0	0
14	0,7	0,7	0,7	0	0	0
15	0,8	0,8	0,8	0	0	0
16	0,8	0,8	0,8	0	0	0
17	0,7	0,7	0,7	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Office, Landscaped

Parameters and set points

	Parameter	Value	Unit
Operation time	Hour at day, START	7	hour
	Hour at day, END	18	hour
	Breaks, inside range	0	hours
	days/week	5	days
	hours/day	11	hours
	hours/year	2868	hours
Internal gains	Occupants	17	m2/pers
	Occupants (Total)	7,0	W/m²
	Occupants (Dry)	4,7	W/m²
	Appliances	12	W/m²
	Lighting		
	Moisture production	3,53	g/(m2, h)
	CO_2 production	1,10	l/(m2, h)
Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	20	°C
	Max T,op	26	°C
	Ventilation rate (min.)	0,8	l/(s m²)
	Ventilation rate for CO_2 emission	0,53	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	500	lux

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0,2	0,2	0,2	0	0	0
9	0,6	0,6	0,6	0	0	0
10	0,6	0,6	0,6	0	0	0
11	0,7	0,7	0,7	0	0	0
12	0,7	0,7	0,7	0	0	0
13	0,4	0,4	0,4	0	0	0
14	0,6	0,6	0,6	0	0	0
15	0,7	0,7	0,7	0	0	0
16	0,7	0,7	0,7	0	0	0
17	0,6	0,6	0,6	0	0	0

Other	Domestic hot water use	100	l/(m2 year)

18	0,2	0,2	0,2	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Office, single

Parameters and set points

	Parameter	**Value**	**Unit**
Operation time	Hour at day, START	7	hour
	Hour at day, END	18	hour
	Breaks, inside range	0	hours
	days/week	5	days
	hours/day	11	hours
	hours/year	2868	hours
Internal gains	Occupants	10	m2/pers
	Occupants (Total)	11,8	W/m²
	Occupants (Dry)	8,0	W/m²
	Appliances	12	W/m²
	Lighting		
	Moisture production	6,00	g/(m2, h)
	CO_2 production	1,87	l/(m2, h)

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0

Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	20	°C
	Max T,op	26	°C
	Ventilation rate (min.)	1	l/(s m²)
	Ventilation rate for CO_2 emission	0,96	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	500	lux
Other	Domestic hot water use	100	l/(m2 year)

h						
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	1	1	1	0	0	0
11	1	1	1	0	0	0
12	1	1	1	0	0	0
13	0	0	0	0	0	0
14	1	1	1	0	0	0
15	1	1	1	0	0	0
16	1	1	1	0	0	0
17	0	0	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	0	0	0	0	0

Restaurant

Parameters and set points

	Parameter	Value	Unit
Operation time	Hour at day, START	6	hour
	Hour at day, END	24	hour
	Breaks, inside range	0	hours
	days/week	7	days
	hours/day	18	hours
	hours/year	6570	hours

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting

Internal gains	Occupants	6,1	m2/pers
	Occupants (Total)	19,4	W/m²
	Occupants (Dry)	13,2	W/m²
	Appliances	4	W/m²
	Lighting		
	Moisture production	9,84	g/(m2, h)
	CO_2 production	3,07	l/(m2, h)
Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	16	°C
	Max T,op	25	°C
	Ventilation rate (min.)	5,2	l/(s m²)
	Ventilation rate for CO_2 emission	1,62	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	300	lux
Other	Domestic hot water use	100	l/(m2 year)

1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0,1	0,13	0,3	0,1	0,13	0,3
8	0,4	0,15	0,3	0,4	0,15	0,3
9	0,4	0,18	0,55	0,4	0,18	0,55
10	0,4	0,21	0,55	0,4	0,21	0,55
11	0,2	0,26	0,75	0,2	0,26	0,75
12	0,5	0,29	0,75	0,5	0,29	0,75
13	0,8	0,27	0,75	0,8	0,27	0,75
14	0,7	0,25	0,75	0,7	0,25	0,75
15	0,4	0,23	0,75	0,4	0,23	0,75
16	0,2	0,23	0,75	0,2	0,23	0,75
17	0,25	0,26	0,7	0,25	0,26	0,7
18	0,5	0,26	0,75	0,5	0,26	0,75
19	0,8	0,24	0,75	0,8	0,24	0,75
20	0,8	0,22	0,75	0,8	0,22	0,75
21	0,8	0,2	0,75	0,8	0,2	0,75
22	0,5	0,18	0,75	0,5	0,18	0,75
23	0,35	0,09	0,5	0,35	0,09	0,5
24	0,2	0,03	0,3	0,2	0,03	0,3

Residential, apartment, retired

Parameters and set points

	Parameter	Value	Unit
Operation time	Hour at day, START	0	hour
	Hour at day, END	24	hour
	Breaks, inside range	0	hours
	days/week	7	days
	hours/day	24	hours
	hours/year	8760	hours
Internal gains	Occupants	28,3	m2/pers
	Occupants (Total)	4,2	W/m²
	Occupants (Dry)	2,8	W/m²
	Appliances	3	W/m²
	Lighting		
	Moisture production	2,12	g/(m2, h)
	CO_2 production	0,66	l/(m2, h)
Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	20	°C
	Max T,op	26	°C
	Ventilation rate (min.)	0,5	l/(s m²)
	Ventilation rate for CO_2 emission	0,28	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	0	lux

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
1	1	0,5	0	1	0,5	0
2	1	0,5	0	1	0,5	0
3	1	0,5	0	1	0,5	0
4	1	0,5	0	1	0,5	0
5	1	0,5	0	1	0,5	0
6	1	0,5	0	1	0,5	0
7	1	0,5	0,15	1	0,5	0,15
8	1	0,7	0,15	1	0,7	0,15
9	1	0,7	0,15	1	0,7	0,15
10	1	0,5	0,15	1	0,5	0,15
11	1	0,5	0,05	1	0,5	0,05
12	1	0,6	0,05	1	0,6	0,05
13	1	0,6	0,05	1	0,6	0,05
14	1	0,6	0,05	1	0,6	0,05
15	1	0,6	0,05	1	0,6	0,05
16	1	0,5	0,05	1	0,5	0,05
17	1	0,5	0,2	1	0,5	0,2

Other	Domestic hot water use	100	l/(m2 year)

Residential, apartment

Parameters and set points

	Parameter	Value	Unit
Operation time	Hour at day, START	0	hour
	Hour at day, END	24	hour
	Breaks, inside range	0	hours
	days/week	7	days
	hours/day	24	hours
	hours/year	8760	hours
Internal gains	Occupants	28,3	m2/pers
	Occupants (Total)	4,2	W/m²
	Occupants (Dry)	2,8	W/m²
	Appliances	3	W/m²
	Lighting		
	Moisture production	2,12	g/(m2, h)
	CO_2 production	0,66	l/(m2, h)

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting
1	1	0,5	0	1	0,5	0
2	1	0,5	0	1	0,5	0
3	1	0,5	0	1	0,5	0
4	1	0,5	0	1	0,5	0
5	1	0,5	0	1	0,5	0
6	1	0,5	0	1	0,5	0
7	0,5	0,5	0,15	0,8	0,5	0,15
18	1	0,7	0,2	1	0,7	0,2
19	1	0,7	0,2	1	0,7	0,2
20	1	0,8	0,2	1	0,8	0,2
21	1	0,8	0,2	1	0,8	0,2
22	1	0,8	0,2	1	0,8	0,2
23	1	0,6	0,15	1	0,6	0,15
24	1	0,6	0,15	1	0,6	0,15

Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	20	°C
	Max T,op	26	°C
	Ventilation rate (min.)	0,5	l/(s m²)
	Ventilation rate for CO_2 emission	0,28	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	0	lux
Other	Domestic hot water use	100	l/(m2 year)

h						
8	0,5	0,7	0,15	0,8	0,7	0,15
9	0,5	0,7	0,15	0,8	0,7	0,15
10	0,1	0,5	0,15	0,8	0,5	0,15
11	0,1	0,5	0,05	0,8	0,5	0,05
12	0,1	0,6	0,05	0,8	0,6	0,05
13	0,1	0,6	0,05	0,8	0,6	0,05
14	0,2	0,6	0,05	0,8	0,6	0,05
15	0,2	0,6	0,05	0,8	0,6	0,05
16	0,2	0,5	0,05	0,8	0,5	0,05
17	0,5	0,5	0,2	0,8	0,5	0,2
18	0,5	0,7	0,2	0,8	0,7	0,2
19	0,5	0,7	0,2	0,8	0,7	0,2
20	0,8	0,8	0,2	0,8	0,8	0,2
21	0,8	0,8	0,2	0,8	0,8	0,2
22	0,8	0,8	0,2	0,8	0,8	0,2
23	1	0,6	0,15	1	0,6	0,15
24	1	0,6	0,15	1	0,6	0,15

Residential, Detached house

Parameters and set points

	Parameter	**Value**	**Unit**
Operation time	Hour at day, START	0	hour
	Hour at day, END	24	hour
	Breaks, inside range	0	hours
	days/week	7	days
	hours/day	24	hours
	hours/year	8760	hours

Usage schedule

	Energy calculation					
	Weekdays			Weekends		
h	Occupants	Appliances	Lighting	Occupants	Appliances	Lighting

Internal gains	Occupants	42,5	m2/pers
	Occupants (Total)	2,8	W/m²
	Occupants (Dry)	1,9	W/m²
	Appliances	2,4	W/m²
	Lighting		
	Moisture production	1,41	g/(m2, h)
	CO_2 production	0,44	l/(m2, h)
Set points	Min T,op in unoccupied hours	16	°C
	Max T,op in unoccupied hours	32	°C
	Min T,op	20	°C
	Max T,op	26	°C
	Ventilation rate (min.)	0,5	l/(s m²)
	Ventilation rate for CO_2 emission	0,16	l/(s m²)
	Max CO_2 concentration (above outdoor)	500	ppm
	Min. relative humidity	25	%
	Max. relative humidity	60	%
	Lighting, illuminance in working areas	0	lux
Other	Domestic hot water use	100	l/(m2 year)

1	1	0,5	0	1	0,5	0
2	1	0,5	0	1	0,5	0
3	1	0,5	0	1	0,5	0
4	1	0,5	0	1	0,5	0
5	1	0,5	0	1	0,5	0
6	1	0,5	0	1	0,5	0
7	0,5	0,5	0,15	0,8	0,5	0,15
8	0,5	0,7	0,15	0,8	0,7	0,15
9	0,5	0,7	0,15	0,8	0,7	0,15
10	0,1	0,5	0,15	0,8	0,5	0,15
11	0,1	0,5	0,05	0,8	0,5	0,05
12	0,1	0,6	0,05	0,8	0,6	0,05
13	0,1	0,6	0,05	0,8	0,6	0,05
14	0,2	0,6	0,05	0,8	0,6	0,05
15	0,2	0,6	0,05	0,8	0,6	0,05
16	0,2	0,5	0,05	0,8	0,5	0,05
17	0,5	0,5	0,2	0,8	0,5	0,2
18	0,5	0,7	0,2	0,8	0,7	0,2
19	0,5	0,7	0,2	0,8	0,7	0,2
20	0,8	0,8	0,2	0,8	0,8	0,2
21	0,8	0,8	0,2	0,8	0,8	0,2
22	0,8	0,8	0,2	0,8	0,8	0,2
23	1	0,6	0,15	1	0,6	0,15
24	1	0,6	0,15	1	0,6	0,15

5 For ISO 52016-1

Annex UU of ISO 52016-1:2017, Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures

Annex UU
(informative)

Input and method selection data sheet — ~~Default~~ U-CERT choices

UU.1 General

The template in Annex A of this document shall be used to specify the choices between methods, the required input data and references to other documents.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations. If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a national annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g. the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g. small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a Table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b.

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, ...).

NOTE 4 In the section "Introduction" of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

UU.2 References

The references, identified by the EPB module code number, are given in Table UU.1.

Table UU.1:
Type: References

See Explanation at EN ISO 52000-1, Table UU.1

Table UU.1 — References

Reference	Reference document [a]	
	Number	Title
M1-4	ISO 52003-1	*Energy performance of buildings – Indicators, requirements, ratings and certificates – Part 1: General aspects and application to the overall energy performance*
M1-6	~~ISO 17772-1~~ EN 16798-1	~~*Energy performance of buildings - Indoor environmental Quality - part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings*~~ *Energy performance of buildings – Ventilation for buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1-6)*
M1-8	ISO 52000-1	*Energy performance of buildings – Overarching EPB assessment – Part 1: General framework and procedures*
M1-13	ISO 52010-1	*Energy performance of buildings - External climatic conditions - Part 1: Conversion of climatic data for energy calculations*
M2-4	ISO 52018-1	*Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features — Part 1: Overview of options*
M2-5.1	ISO 13789	*Thermal performance of buildings - Transmission and ventilation heat transfer coefficients - Calculation method*
M2-5.2	ISO 13370	*Thermal performance of buildings – Heat transfer via the ground – Calculation methods*
M2-5.3	ISO 6946	*Building components and building elements – Thermal resistance and thermal transmittance – Calculation method*
M2-5.4	ISO 10211	*Thermal bridges in building construction – Heat flows and surface temperatures – Detailed calculations*
M2-5.5	ISO 14683	*Thermal bridges in building construction – Linear thermal transmittance – Simplified methods and default values*
M2-5.6	ISO 10077-1	*Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: General*
M2-5.7	ISO 10077-2	*Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 2: Numerical method for frames*
M2-8	ISO 9050 ISO 15099 ISO 52022-3	*Glass in building – Determination of light transmittance, solar direct transmittance, total solar energy transmittance, ultraviolet transmittance and related glazing factors* [for non-scattered glazings] *Thermal performance of windows, doors and shading devices – Detailed calculations* [for windows with scattering glazing and/or solar shading devices] *Energy performance of buildings – Thermal, solar and daylight properties of building components and elements – Part 3: Detailed calculation method of the solar and daylight characteristics for solar protection devices combined with glazing* [for normal incidence angle] (or see Subjects 4, 5 and 6 in Table C.1)
M3-1	EN 15316-1	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 1: General and Energy performance expression, Module M3–1, M3–4, M3–9, M8–1, M8–4*

Reference	Reference document [a]	
	Number	Title
M3-4[b]	EN 15316-1	See M3-1
M3-5	EN 15316-2	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 2: Space emission systems (heating and cooling), Module M3–5, M4–5*
M4-1	EN 16798-9	*Energy performance of buildings — Ventilation for buildings — Part 9: Calculation methods for energy requirements of cooling systems (Modules M4-1, M4-4, M4-9) — General*
M4-4[b]	EN 16798-9	See M4-1
M4-5	EN 15316-2	See M3-5
M5-1	EN 16798-3	*Energy performance of buildings — Ventilation for buildings — Part 3:For non-residential buildings – Performance requirements for ventilation and room-conditioning systems (Modules M5-1, M5-4)*
M5-5	EN 16798-7	*Energy performance of buildings — Ventilation for buildings — Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration (Module M5-5)*
M5-6	EN 16798-5-1 EN 16798-5-2	*Energy performance of buildings — Ventilation for buildings – Part 5-1: Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8) -– Method 1: Distribution and generation* *Energy performance of buildings — Ventilation for buildings — Part 5-2: Calculation methods for energy requirements of ventilation systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8) — Method 2: Distribution and generation*
M6-1	EN 16798-3	See M5-1
M6-4[b]	EN 16798-3	See M5-1
M6-5	EN 16798-5-1 EN 16798-5-2	See M5-6
M7-1	EN 16798-3	See M5-1
M7-4[b]	EN 16798-3	See M5-1
M7-5	EN 16798-5-1 EN 16798-5-2	See M5-6
M9-1	EN 15193-1	*Energy performance of buildings - Energy requirements for lighting - Part 1: Specifications, Module M9*
M10-1	~~EN 15232–1~~ EN ISO 52120-1	~~*Energy performance of buildings – Part 1: Impact of Building Automation, Controls and Building Management – Modules M10–4,5,6,7,8,9,10*~~ *Energy performance of buildings -- Contribution of building automation, controls and building management -- Part 1: General framework and procedures* [in anticipation of publication]

a If a reference comprises more than one document, the references can be differentiated.
b Informative.

UU.3 Selection of main method

Table UU.2:
Type: Critical for calculation tool development. Important factor for the calculated energy performance

Prime choice of calculation procedures with very large impact on the calculation procedures and on the interaction between energy performance and thermal comfort (see also (EN) ISO 52000-1, Table UU.19)

Only the hourly calculation procedures enable to include various innovative technical solutions and evaluation of thermal comfort in case of undersized or absent systems.

➔ **LINKED CHOICES:**
Many other Tables in this EPB standard and the other selected EPB standards depend on the choice between hourly or monthly calculation procedures, or are only achievable with an hourly calculation method.

U-CERT Choice: adopt Table B.2 without changes

Table UU.2 — Choice between hourly or monthly calculation method (see 5.2)

Type of object and/or application	**All applications**	[b]
Description	Choice [a]	
Only hourly method allowed	Yes	
Only monthly method allowed	No	
Both methods are allowed	No	

[a] Only one Yes per column possible.

[b] Add more columns if needed to differentiate between type of object, type of building or space, type of application or type of assessment. Use the list of identifiers from ISO 52000-1:2017, Tables A.2 to A.7 (normative template, with informative default choices in Tables B.2 to B.7).

UU.4 Zoning

Table UU.3:
Type: Important factor for the calculated energy performance

Preparatory steps to be done before the actual EP calculation. The zoning rules can be simple or very refined. This has a large impact on the complexity of the actual calculation and required input data.

➔ **LINKED CHOICES:**
Table UU.7 of EN ISO 52000-1: differentiation of space categories

U-CERT Choice: adopt Table B.3 without changes.

Table UU.3 — Thermal zoning rules (see 6.4.2.~~122~~)[1]

	Application: ..... [a]	
Description [b]	**Apply the described method?**	**If "No": Alternative method** If the described method is not used, describe details of the alternative method or give reference to source document

[1] Suspected erratum in (EN) ISO 52016-1:2017 here corrected.

Zoning step 1. Assessment of thermal envelope	Yes	Not applicable
Zoning step 2. Grouping according to space category	Yes	Not applicable
Zoning step 3. Grouping in case of large openings	Yes	Not applicable
Zoning step 4. Split to have same combination of services	Yes	Not applicable
Zoning step 5. Further grouping according to similar thermal conditions of use	Yes	Not applicable
Zoning step 6. Split according to specific system or subsystem properties	Yes	Not applicable
Zoning step 7. (Further) split to have sufficient homogeneity in thermal balance	Yes	Not applicable
Zoning step 8. (Further) grouping of thermally unconditioned zones	Yes	Not applicable
Zoning step 9. Simplification in case of small thermal zones	Yes	Not applicable
Zoning step 10. Simplification in case of very small thermal zones	Yes	Not applicable

[a] Add more columns to differentiate per application, if needed.

[b] Additional rows may be added for alternative steps.

Table UU.4:
Type: Less crucial detail for calculation methodology
Calculation simplification

U-CERT Choice: adopt Table B.4 without changes.

Table UU.4 — Choice of method for thermally unconditioned zones (see 6.4.5)

Situation	**Default value of $b_{ztu;m}$ in case of a thermally unconditioned zone, type: external** [a]
	No default values provided
Internal thermally unconditioned zone type allowed?	
Choice	Yes
If Yes: (optionally) specify default values for the adjustment factor (free text)	
Situation	**Default value of $b_{ztu;m}$ in case of a thermally unconditioned zone, type: internal** [a]
	No default values provided

[a] Add more rows if needed.

Table UU.5:
Type: Less crucial detail for calculation methodology
Calculation simplification

U-CERT Choice: adopt Table B.5 without changes.

Table UU.5 — Default contribution of ventilation in external construction of a thermally unconditioned zone (see 6.4.5.4)

Application	All applications [a]	
Description	**Choice**	
Default allowed?	Yes	
If Yes:		
Coefficient for default contribution of ventilation, $c_{ztu;ve}$	0,5	

[a] Add more columns if needed.

Table UU.6:
Type: Less crucial detail for calculation methodology

Calculation option with minor impact on the complexity of the calculation procedures
Probably in many countries the Table B.6 choice is regarded as too complicated.

➔ **LINKED CHOICES:**
Table UU.7 of EN ISO 52000-1: differentiation of space categories

U-CERT Choice: do not adopt this option selected in Table B.6

Table UU.6 — Choice of spatial temperature averaging in residential buildings (see 6.4.6)

Description		**Choice** [a]
Application of the given formula for spatial temperature averaging		~~Yes~~ No
If No:		
No application of the given formula for spatial temperature averaging	It is assumed that the same temperature set-point for heating applies also to partly or moderately thermally conditioned residential spaces.	~~Not applicable~~ Yes
	Calculate the fully and partly or moderately thermally conditioned residential spaces as separate, thermally uncoupled thermal zones.	Not applicable

	Calculate the fully and partly or moderately thermally conditioned residential spaces as separate, thermally coupled thermal zones.	Not applicable
[a] Only one Yes possible.		

In case of application of the formula	Value
$f_{mod;t}$	~~0,8~~ Not applicable
$f_{mod;sp}$	~~0,5~~ Not applicable
$H_{H;int;spec}$ (W/m².K)[2]	~~2,0~~ Not applicable

Table UU.7:
Type: Critical for calculation tool development. Important factor for the calculated energy performance

Calculation option with major impact on the complexity of the calculation procedures and the required input data.

The option chosen in Table B.7 is probably the choice in most countries, because thermally coupled zones are complicated and require more input data and knowledge (e.g. on air flow patterns from zone to zone as function of time)

➔ **LINKED CHOICES:**
Table UU.3: Thermal zoning rules

U-CERT Choice: adopt Table B.7 without changes.

Table UU.7 — Choice between calculations with thermally coupled or uncoupled thermal zones (see 6.4.7)

Application	All applications	
Description	Choice [a]	[b]
Thermally uncoupled calculations	Yes	
Thermally coupled calculations	No	
Both methods are allowed	No	

[a] Only one Yes per column possible.

[b] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.). Note the link with the choice in Table A.9.

Table UU.8:
Type: Less crucial detail for calculation methodology

Calculation option

[2] Suspected erratum in (EN) ISO 52016-1:2017 here corrected.

Not applicable, see Table UU.7

➔ **LINKED CHOICES:**
Table UU.7: Calculation with thermally coupled or uncoupled thermal zones

U-CERT Choice: adopt Table B.8 without changes.

Table UU.8 — Default thermal coupling properties in case of thermally coupled zones (see 6.4.7)

		Choice	
Heat transfer part	**Quantity**	**Default value**	**Unit**
Transmission heat transfer between zones *z* and *y*	Not applicable	Not applicable	…
ventilation heat transfer from zone *z* to zone *y*	Not applicable	Not applicable	…
ventilation heat transfer from zone *y* to zone *z*	Not applicable	Not applicable	…[a]
[a] Add more rows if needed.			

UU.5 Hourly calculation procedures

Table UU.9:
Type: Other (design load calculation)

Calculation parameter.

U-CERT Choice: adopt Table B.9 without changes, but only applicable for design heat load calculations

Table UU.9 — Factor for consideration of internal heat gains in design heat load calculation (see 6.5.~~5.5~~4.5.2)[2]

Application	**All applications**	…. [a]
Description	**Choice**	**Choice**
Value for factor $f_{H;ig}$	0,5	Not applicable
[a] Add more rows if needed.		

Table UU.10:
Type: Important factor for the calculated energy performance

Calculation option with minor impact on the complexity of the calculation procedures, but possibly major impact on the calculation tool.

For future investigation in U-CERT and/or EPB Center: e.g. Italy considers the use of a national alternative for the third choice. Would that be an improvement?

➔ **LINKED CHOICES:**
Table UU.13 and Table UU.14 are linked to the method for the conversion of physical properties of building elements into properties per layer (node)

U-CERT Choice: adopt Table B.10 without changes.

Table UU.10 — Alternative choices in modelling (see 6.5.5.2, 6.5.6.3.1 and 6.5.7.1)

Description	Choice	If choice is No, describe or give reference to the applied alternative method
Use the method in 6.5.5.2 to calculate the actual temperatures and loads	Yes	Not applicable
Use method in 6.5.6.3.1 for the calculation of the thermal (longwave) radiation exchange	Yes	Not applicable
Use method in 6.5.7.1 for the conversion of physical properties of building elements into properties per layer (node)	Yes	Not applicable
NOTE In case of one or more "No", the procedures are validated using the validation cases in 7.2, as described in that subclause.		

Table UU.11:
Type: Less crucial detail for calculation methodology
Calculation parameter.

U-CERT Choice: adopt Table B.11 without changes.

Table UU.11 — Convective fractions (see 6.5.6.2)

$f_{int;c}$ [a]	$f_{sol;c}$	$f_{H;c}$	$f_{C;c}$
0,40 for all source types	0,10	0,40	0,40
[a] Can be differentiated per source type.			

Table UU.12:
Type: Less crucial detail for calculation methodology
Calculation simplification

➔ LINKED CHOICES:
Table UU.17: Specific heat capacity of air and furniture

U-CERT Choice: adopt Table B.12 without changes.

Table UU.12 — Specification of internal partitions (see 6.5.6.3.1)

	Choice
Internal partitions need to be specified?	No
If by default: specify the default thermal characteristics	

Default characteristics	Specification [a]
Not applicable	Not applicable

[a] Add more rows if needed.

Table UU.13:
Type: Less crucial detail for calculation methodology
Calculation parameters.

➔ **LINKED CHOICES:**
Table UU.10: the method for the conversion of physical properties of building elements into properties per layer (node)

U-CERT Choice: adopt Table B.13 without changes

Table UU.13 — Distribution of mass of opaque and ground floor elements (see 6.5.7.2 and 6.5.7.3)

Class	Specification of the class
Class I (mass concentrated at internal side)	Construction with external thermal insulation (main mass component near inside surface) , or equivalent
Class E (mass concentrated at external side)	Construction with internal thermal insulation (main mass component near outside surface) , or equivalent
Class IE (mass divided over internal and external side)	Construction with thermal insulation in between two main mass components, or equivalent
Class D (mass equally distributed)	Uninsulated construction (e.g. solid or hollow bricks, heavy or lightweight concrete, or lightweight construction with negligible mass (e.g. steel sandwich panel), or equivalent

Table UU.14:
Type: Less crucial detail for calculation methodology
Calculation parameters.

➔ **LINKED CHOICES:**
Table UU.10: the method for the conversion of physical properties of building elements into properties per layer (node)

U-CERT Choice: adopt Table B.14 without changes

Table UU.14 — Specific heat capacity of opaque and ground floor elements (see 6.5.7.2 and 6.5.7.3)

Class	$\kappa_{m;op}$ $J/(m^2 \cdot K)$	Specification of the class
Very light	50 000	Construction containing no mass components, other than e.g. plastic board and/or wood siding, or equivalent
Light	75 000	Construction containing no mass components other than 5 to 10 cm lightweight brick or concrete, or equivalent

Medium	110 000	Construction containing no mass components other than 10 to 20 cm lightweight brick or concrete, or less than 7 cm solid brick or heavy weight concrete, or equivalent
Heavy	175 000	Construction containing 7 to 12 cm solid brick or heavy weight concrete, or equivalent
Very heavy	250 000	Construction containing more than 12 cm solid brick or heavy weight concrete, or equivalent

Table UU.15:
Type: Less crucial detail for calculation methodology
Calculation parameter.

The Table B.15 choice was given in from the perspective to keep the threshold for the hourly method as low as possible.
But a differentiation is more realistic, because it may have a significant impact on the energy and thermal comfort.

U-CERT Choice: change into differentiated values and add description.
E.g. based on materials from Balcomb, *Passive Solar Design Handbook*:

Table UU.15 — Solar absorption coefficient of external opaque surfaces (see 6.5.7.2)

	Choice
Differentiation in solar absorption coefficient?	~~No~~Yes
If Yes: specify the procedure to classify the three categories (free text)	
The three categories are based on the tabulated material properties (see below table) from J.Douglas Balcomb, *Passive Solar Design Handbook,* March 1980	
Category	**Specification**
Category 1 α_{sol} **= 0,3** **(light colour)**	~~Not applicable~~
Category 2 α_{sol} **= 0,6** **(intermediate colour)**	~~Not applicable~~
Category 3 α_{sol} **= 0,9** **(dark colour)**	~~Not applicable~~
	Choice
If No: choose the default category	2

TABLE 2.3

Solar ABSORPTANCE for Various Exterior Surfaces (Clean)

Material	ABSORP-TANCE	Paint Paint	ABSORP-TANCE
Aluminum, polished reflector sheet	0.12	Aluminum paint	0.40
Asphalt pavement, weathered	0.82	Black, flat	0.95
Brick, buff, light	0.55	Black, lacquer	0.92
Brick, red	0.88	Black, oil	0.90
Brick, Stafford blue	0.89	Black, optical flat	0.98
Brick, white glazed	0.25	Blue, azure lacquer	0.88
Cement, uncolored asbestos	0.75	Blue, dark	0.91
Cement, white asbestos	0.61	Blue, medium	0.51
Concrete, black	0.91	Blue-gray, dark	0.88
Concrete, brown	0.85	Brown, dark brown	0.88
Concrete, uncolored	0.65	Brown lacquer	0.79
Film, Mylar aluminized	0.10	Brown, medium	0.84
Felt, bituminous	0.88	Brown, medium light	0.80
Felt, bituminous, aluminized	0.40	Gray, dark	0.91
Gravel	0.29	Gray, light oil	0.75
Iron, white-on-galvanized	0.26	Green, lacquer	0.79
Lab vapor deposited coatings	0.02	Green, lacquer, dark	0.88
Marble, white	0.58	Green, light	0.47
Roof, white built-up	0.50	Green, medium dull	0.59
Roofing, green	0.86	Green, medium Kelly	0.51
Slate, blue-gray	0.87	Olive, dark drab	0.89
Tin surface	0.05	Orange, medium	0.58
Wood, smooth	0.78	Red, oil	0.74
		Rust, medium	0.78
		Silver	0.25
		White, gloss	0.25
		White, lacquer	0.21
		White, semi-gloss	0.30
		Yellow	0.57

The table above is a compilation of data from several sources including *Passive Solar Design Analysis* by J.D. Balcomb (DOE, Office of the Assistant Secretary for Conservation and Solar

Table UU.16:
Type: Less crucial detail for calculation methodology
Calculation parameter.

U-CERT Choice: adopt Table B.16 without changes.

Table UU.16 — Coefficient to limit assumed temperature in adjacent thermally unconditioned zone (see 6.5.9)

Application	All applications	….[a]
	$c_{ztu,h;max}$	$c_{ztu,h;max}$
Value	1,0	Not applicable

a Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).

Table UU.17:
Type: Less crucial detail for calculation methodology
Calculation parameter.

➔ **LINKED CHOICES:**
Table UU.12: Specification of internal partitions

U-CERT Choice: adopt Table B.17 without changes

Table UU.17 — Specific heat capacity of air and furniture (see 6.5.11)

$\kappa_{m;int}$ J/(m^2·K)
10 000

Table UU.18:
Type: Less crucial detail for calculation methodology
Calculation parameter.

U-CERT Choice: adopt Table B.18 without changes.

Table UU.18 — View factor to the sky (see 6.5.13.3)

	Unshaded horizontal roof	Unshaded vertical wall
F_{sky}	1,0	0,5

Table UU.19:
Type: Less crucial detail for calculation methodology
Calculation parameter.

U-CERT Choice: adopt Table B.19 without changes.

Table UU.19 — Difference between external air temperature and sky temperature (see 6.5.13.3)

Climatic region [a]	Sub-polar areas	Tropics	Intermediate zones
$\Delta\theta_{sky;t}$ (K)	9 (fixed value)	13 (fixed value)	11 (fixed value)
[a] Add more columns if needed to differentiate between climatic regions.			

Table UU.20:
Type: Important factor for the calculated energy performance. Critical for calculation tool development

Calculation option with large impact on the complexity of the calculation procedures (including the type and amount of required input data). Including the calculation tool development.

The option chosen in Table B.20 is probably the choice in most countries, because calculating moisture absorption and desorption in materials is complicated and requires many extra input data (on properties of materials including internal lining)

U-CERT Choice: adopt Table B.20 without changes.

Table UU.20 — Choice of method for moisture absorption and desorption in materials (see 6.5.14.1)

Application	All applications	.... [a]
Description	Choice	Choice

Moisture absorption and desorption calculated?	No	Not applicable
If No:	Gabs;zt;t = 0	Gabs;zt;t = 0
If Yes: give reference to method	Not applicable	Not applicable
[a] Add more columns if needed.		

Table UU.21:
Type: Less crucial detail for calculation methodology
Calculation simplification.

Real glazing area or glazing area as fixed fraction of window area.

NOTE: differentiation between windows and skylights seems to make sense, because skylights may have a large frame area. But on the other hand the standard clearly states: "in case of protruded components the projected area shall be used." It is worth adding this as note to the Table.

U-CERT Choice: adopt Table B.21 with added note.

Table UU.21 — Choice of glazing area or frame area fraction (see E.2.1)

Description	Choice [a]
For each window: free choice between glazing area or fixed frame fraction	No
For all windows the same choice: either glazing area or fixed frame fraction	Yes
For all windows: only glazing area allowed	No
For all windows: only fixed frame fraction	No
[a] Only one Yes per column possible.	
NOTE: a fixed frame fraction may seem to be a bad choice if skylights are included, which may have very large frame area. However, in this document (ISO 52016-1) it is clearly stated that: "in case of protruded components the projected area shall be used.".	
In case of frame fraction:	F_{fr}
Frame fraction fixed value	0,25

Table UU.22:
Type: Less crucial detail for calculation methodology
Calculation parameters.

U-CERT Choice: adopt Table B.22 without changes.

Table UU.22 — Factors related to the solar energy transmittance (see E.2.2.1)

Correction and weighting factor for g-value non-scattering and scattering transparent glazings and blinds:		
F_w	a_g	alt_g °
0,90	0,75	45

Default values of the total solar energy transmittance at normal incidence, g_n, for typical types of glazing [a]	
Type	g_n
Single glazing	0,85
Double glazing	0,75
Double glazing with selective low-emissivity coating	0,67
Triple glazing	0,7
Triple glazing with two selective low-emissivity coatings	0,5
Double window	0,75

[a] Assuming a clean surface and normal, untainted and non-scattering glazing.

Default values of the reduction factor, for typical types of blinds [a]				
Blind type	**Optical properties of blind**		**Reduction factor with**	
	absorption	**transmission**	**blind inside**	**blind outside**
White venetian blinds	0,1	0,05	0,25	0,10
		0,1	0,30	0,15
		0,3	0,45	0,35
White curtains	0,1	0,5	0,65	0,55
		0,7	0,80	0,75
		0,9	0,95	0,95
Coloured textiles	0,3	0,1	0,42	0,17
		0,3	0,57	0,37
		0,5	0,77	0,57
Aluminium-coated textiles	0,2	0,05	0,20	0,08

[a] Add more rows or columns if needed.

Table UU.23:
Type: Less crucial detail for calculation methodology
Calculation parameters.

Note that the term “shutters” is used for opaque components, for thermal insulation.
➔ **LINKED CHOICES:**
Transparant or louvred shutters are dealt with as solar shading devices (**Table UU.24).**

Current new development in CEN and ISO: **EN ISO 52016-3** (Calculation according to EN ISO 52016-1, with adaptive building envelope elements) is under preparation with default control strategies that take into account more parameters. The draft, prEN ISO/DIS 52016-1, is expected to be published during autumn 2021.

U-CERT Choice: Until prEN ISO/DIS 52016-1 has been published: adopt Table B.23 without changes

Table UU.23 — Rules for operation of shutters (see G.2.2.1.2)

Application	All applications [a]	.... [a]
Control level	**Rules**	**Rules**
0 Manual operation	Closed: after sunset, if occupied Open: after sunrise, if occupied, but not during sleeping hours	Not applicable
1 Motorized operation with manual control	Same	Not applicable
2 Motorized operation with automatic control	Closed: after sunset Open: after sunrise	Not applicable
3 Combined light/blind/HVAC control	Same [b]	Not applicable
[a] Add more columns if needed.		
[b] Conservative rule; a level 3 combined control is not covered in this table.		

Table UU.24:
Type: Less crucial detail for calculation methodology
Calculation parameters.

Current new development in CEN and ISO: **EN ISO 52016-3** (Calculation according to EN ISO 52016-1, with adaptive building envelope elements) is under preparation with default control strategies that take into account more parameters. The draft, prEN ISO/DIS 52016-1, is expected to be published during autumn 2021.

U-CERT Choice: Until prEN ISO/DIS 52016-1 has been published: adopt Table B.24 without changes

Table UU.24 — Rules for operation of solar shading devices (see G.2.2.1.2)

Application	All applications [a]	.... [a]
Control level	**Rules**	**Rules**
0 Manual operation	Closed: if solar irradiance > 300 W/m^2 Open: if solar irradiance < 200 W/m^2	Not applicable
1 Motorized operation with manual control	Same	Not applicable
2 Motorized operation with automatic control	Closed: if solar irradiance > 200 W/m^2 Open: if solar irradiance < 200 W/m^2 and ≥ 2 hours passed since closing	Not applicable

3 Combined light/blind/HVAC control	Same [b]	Not applicable

[a] Add more columns if needed.
[b] Conservative rule; a level 3 combined control is not covered in this table.

Table UU.25:
Type: Important factor for the calculated energy performance

➔ LINKED CHOICES:
This is linked to the choice in **EN ISO 52010-1, Table UU.7**: the UU_CERT choice there is not to take into account shading by external objects in the climatic data.

Note that the normative method in EN ISO 52016-1 calculates the effect of shading on direct solar radiation. Diffuse solar radiation is assumed not to be shaded. On the other hand: extra solar radiation from reflection at the surfaces of surrounding buildings or other objects is also disregarded. Otherwise the calculation would require very detailed input data on surrounding buildings and more detailed calculation procedures.

Note that " opaque building elements" do not include thermal solar collectors or photovoltaic panels: those are dealt with in a separate EPB standard (EN 15316-4-3)

U-CERT Choice: adopt Table B.25 without changes

Table UU.25 — Choices between options and methods for calculation of shading by external objects (see F.1)

Application [b]	**All applications**			**Not applicable**		
Description	**Choice**			**Choice**		
Calculation of the effect of shading by distant objects included in this document?	Yes			n.a.		
When calculating solar shading on building elements: which types of distant shading objects (not on site) may or shall be taken into account or ignored NOTE For instance landscape (such as hills or dikes), vegetation (such as trees), other constructions (such as buildings)	Shall be taken into account:	May be taken into account:	Shall be ignored:	Shall be taken into account:	May be taken into account:	Shall be ignored:
	Landscape (such as hills or dikes), other constructions (such as buildings)	Vegetation (such as trees)	-	n.a.	n.a.	n.a.
When calculating solar shading on opaque building elements such as roofs or facades: which types of on	Shall be taken into account:	May be taken into account:	Shall be ignored:	Shall be taken into account:	May be taken into account:	Shall be ignored:

site shading objects can or shall be ignored NOTE For instance rebates, overhangs or other shading objects from the own building(s) on site	-	-	Rebates, overhangs or other shading objects from the own building(s) on site	n.a.	n.a.	n.a.
When calculating solar shading on transparent building elements: NOTE For instance window rebates, overhangs and side fins	Shall be taken into account:	May be taken into account:	Shall be ignored:	Shall be taken into account:	May be taken into account:	Shall be ignored:
	Window rebates, overhangs and side fins if depth larger than 20% of window height resp. width	Other window rebates, overhangs and side fins	-	n.a.	n.a.	n.a.
Specific subdivision rules for the calculation of solar shading on building elements	None			n.a.		
Choice between the two methods for the solar shading calculation:	Choice [a]			Choice [a]		
Method 1, Shading of direct radiation	Yes			n.a.		
Method 2, Shading of direct and diffuse radiation	No			n.a.		
In case of method 2: give reference to calculation procedure	n.a.			n.a.		

[a] Only one Yes per column possible.

[b] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).

Table UU.26:
Type: Less crucial detail for calculation methodology
Calculation parameters.

➔ LINKED CHOICES:
This is linked to the choice in **EN ISO 52010-1, Table UU.8** (if applicable there)

Consideration: less subdivisions is too little and more subdivisions gives a false sense of accuracy

U-CERT Choice: adopt Table B.26 without changes

Table UU.26 — Number of skyline segments, $n_{sh;segm}$ for input solar shading objects (see F.3.3)

Application [b]	All applications	....

Description	Value of $n_{sh;segm}$ [a]	Value of $n_{sh;segm}$ [a]
Maximum number of segments over 360 degrees	15	
Fixed width (= 360 / $n_{sh;segm}$) [c]	No	

[a] Practical range, informative.

[b] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).

[c] If not fixed, the width of each segment can be adapted to the width of the shading object, with limitation of maximum number of segments $n_{sh;segm}$.

UU.6 Monthly calculation procedures

Table UU.27:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.27 —Monthly ventilation heat transfer coefficient (see 6.6.6.2)

Application	All applications	.... [b]
Description	Choice [a]	Choice [a]
Method A	Yes	Not applicable
Method B [c]	No	Not applicable
Both methods [c]	No	Not applicable

[a] Only one Yes per column possible.

[b] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).

[c] Method B is only allowed outside the CEN area.

Not applicable, because of the choice for hourly calculation procedures

Table UU.28:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.28 —Dynamics correction factor for ventilation (see 6.6.6.2)

Dynamics correction factor for monthly mean air flow	Value
$f_{ve;dyn;k}$	1,0

Not applicable, because of the choice for hourly calculation procedures

Table UU.29:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.29 — Solar absorption coefficient of external opaque surfaces (see 6.6.8.2)

	Choice
Differentiation in solar absorption coefficient?	No
If Yes: specify the procedure to classify the three categories (free text)	
Category	**Specification**
Category 1 α_{sol} **= 0,3** **(light colour)**	Not applicable
Category 2 α_{sol} **= 0,6** **(intermediate colour)**	Not applicable
Category 3 α_{sol} **= 0,9** **(dark colour)**	Not applicable
	Choice
If No: choose the default category	2

Not applicable, because of the choice for hourly calculation procedures

Table UU.30:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.30 — View factor to the sky (see 6.6.8.3)

	Unshaded horizontal roof	**Unshaded vertical wall**
F_{sky}	1,0	0,5

Not applicable, because of the choice for hourly calculation procedures

Table UU.31:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.31 — Difference between external air temperature and sky temperature (see 6.6.8.3)

Climatic region [a]	Sub-polar areas	Tropics	Intermediate zones
$\Delta\theta_{sky;m}$ (K)	9 (fixed value)	13 (fixed value)	11 (fixed value)
[a] Add more columns if needed to differentiate between climatic regions.			

Not applicable, because of the choice for hourly calculation procedures

Table UU.32:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.32 — Choice between detailed or simple method to determine the internal effective heat capacity (monthly method; see 6.6.9)

Application	All applications	
Description	Choice [a]	[b]
Only detailed method allowed	No	
Only simple method allowed	Yes	
Both methods allowed	No	
[a] Only one Yes per column possible. [b] Add more columns if needed to differentiate between applications (e.g. construction types or building categories).		

Not applicable, because of the choice for hourly calculation procedures

Table UU.33:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.33 — Simple method to determine the internal effective heat capacity. Specification of the classes (monthly method; see 6.6.9)

Class	Specification of the class
Very light	Construction type is dominated by very light constructions as specified in Table UU.14
Light	Construction type is dominated by light constructions as specified in Table UU.14
Medium	Construction type is dominated by medium constructions as specified in Table UU.14
Heavy	Construction type is dominated by heavy constructions as specified in Table UU.14
Very heavy	Construction type is dominated by very heavy constructions as specified in Table UU.14

Not applicable, because of the choice for hourly calculation procedures

Table UU.34:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.34 — Values of the reference numerical parameter $a_{H,0}$ and the reference time constant $\tau_{H,0}$ for the gain utilization factor (see 6.6.10.2)

$a_{H,0}$	$\tau_{H,0}$ h
1,0	15

Not applicable, because of the choice for hourly calculation procedures

Table UU.35:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.35 — Values of the reference numerical parameter $a_{C,0}$ and the reference time constant $\tau_{C,0}$ for the loss utilization factor (see 6.6.10.3)

$a_{C,0}$	$\tau_{C,0}$ h
1,0	15

Not applicable, because of the choice for hourly calculation procedures

Table UU.36:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.36 — Choice between methods A and B for heating intermittency (see 6.6.11.3)

Application	**All applications**	
Description	**Choice** [a]	[b]
Only Method A	Yes	
Only Method B	No	
Both methods are allowed	No	

Not applicable, because of the choice for hourly calculation procedures

Table UU.37:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.37 — Choice between methods A and B for cooling intermittency (see 6.6.11.4)

Application	All applications	
Description	**Choice** [a]	[b]
Only method A	Yes	
Only method B	No	
Both methods are allowed	No	
[a] Only one Yes per column possible. [b] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).		
If method A applies		
Correlation factor for method A for intermittent cooling	**Value**	
$b_{C;red}$	0,3	

Not applicable, because of the choice for hourly calculation procedures

Table UU.38:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.38 — Choice between methods A and B for overheating indicator (see 6.6.12)

	..... [b]	.... [b]
Description	**Choice** [a]	**Choice** [a]
Method A	Yes/No	Yes/No
Method B	Yes/No	Yes/No
[a] Only one Yes per column possible. [b] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.)		
If Method B applies		
Provide details or reference to details	<free text>	

Not applicable, because of the choice for hourly calculation procedures

Table UU.39:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.39 — The monthly fraction of energy need for humidification (see 6.6.14)

	Monthly fraction of energy need for humidification

	$f_{HU;m}$		
Formula?	Yes		
If Yes, give formula	for each month m: $f_{HU;m} = Q_{H;nd;m}/Q_{H;nd;an}$ where $Q_{H;nd;m/an}$ is the monthly / annual energy need for heating, as determined in6.5.4.1, in kWh		
If No, give fraction for each month (total = 1)	**Monthly fraction of energy need for humidification $f_{HU;m}$**		
January	Not applicable	July	Not applicable
February	Not applicable	August	Not applicable
March	Not applicable	September	Not applicable
April	Not applicable	October	Not applicable
May	Not applicable	November	Not applicable
June	Not applicable	December	Not applicable

Not applicable, because of the choice for hourly calculation procedures

Table UU.40:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.40 — Efficiency of latent heat recovery (see 6.6.14)

Type of heat recovery unit	Efficiency of latent heat recovery $\eta_{HU;rvd}$
Provisions specifically made for transporting moisture from exhaust to supply air (such as a heat recovery wheel with moisture absorbing surface)	0,55
Other provisions	0
-	-
- [a]	-
[a] Add more rows if needed to differentiate between types.	

Not applicable, because of the choice for hourly calculation procedures

Table UU.41:
Type: Other (monthly calculation method)

not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.41 — Annually accumulated amount of moisture to be supplied per kg dry air supply (monthly method; see 6.6.14)

Space category [a]	Annually accumulated amount of moisture to be supplied per kg dry air

	supply $\Delta x \cdot t_{a;sup}$ (kg h/kg)
SPACECAT_RES_LIV	0,17
SPACECAT_RES_INDIV_OTHER	0,17
SPACECAT _RES_COLL	0,17
SPACECAT_TH.UNCOND_OTHER	0
SPACECAT_TH.UNCOND_SUN	0
SPACECAT_TH.UNCOND_CORR	0
SPACECAT_OFF	4,2
SPACECAT_ EDUC	4,2
SPACECAT_HOSP_BED	4,2
SPACECAT_HOSP_OTHER	4,2
SPACECAT_HOTEL	0,17
SPACECAT_REST	0,17
SPACECAT_REST_KITCH	0
SPACECAT_MEET	0,17
SPACECAT_AUDIT	0,17
SPACECAT_THEAT	0,17
SPACECAT_SERVER	0
SPACECAT_SPORT_TH.COND	0,17
SPACECAT_SPORT_TH.UNCOND	0
SPACECAT_RETAIL	0,17
SPACECAT_NONRES_BATH	0
SPACECAT_STOR_HEAT	0
SPACECAT_STOR_COOL	0
SPACECAT ENGINE	0
SPACECAT_CAR	0
SPACECAT _BARN	0
[a] Add more rows if needed to differentiate between types.	
NOTE The space categories are inherited from ISO 52000-1:2017, Annex B. The values are based on NEN 7120 (The Netherlands).	

Not applicable, because of the choice for hourly calculation procedures

Table UU.42:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.42 — Choice of glazing area or frame area fraction (see E.2.1)

Description	Choice [a]
For each window: free choice between glazing area or fixed frame fraction	Yes/No
For all windows the same choice: either glazing area or fixed frame fraction	Yes/No
For all windows: only glazing area allowed	Yes/No
For all windows: only fixed frame fraction	Yes/No
[a] Only one Yes per column possible.	
In case of frame fraction:	**F_{fr}**
Frame fraction fixed value	0,25

Not applicable, because of the choice for hourly calculation procedures

Table UU.43:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.43 — Factors related to the solar energy transmittance (see E.2.2.1)

Correction and weighting factor for *g*-value non-scattering and scattering transparent glazings and blinds:		
F_w	**a_g**	**alt_g** °
0,90	0,75	45
Default values of the total solar energy transmittance at normal incidence, g_n, for typical types of glazing [a]		
Type		**G_n**
Single glazing		0,85
Double glazing		0,75
Double glazing with selective low-emissivity coating		0,67
Triple glazing		0,7
Triple glazing with two selective low-emissivity coatings		0,5
Double window		0,75
[a] Assuming a clean surface and normal, untainted and non-scattering glazing.		
Default values of the reduction factor, for typical types of blinds [b]		
Blind type	**Optical properties of blind**	**Reduction factor with**
	absorption / **transmission**	**blind inside** / **blind outside**
White venetian blinds	0,1 / 0,05	0,25 / 0,10

		0,1 0,3	0,30 0,45	0,15 0,35
White curtains	0,1	0,5 0,7 0,9	0,65 0,80 0,95	0,55 0,75 0,95
Coloured textiles	0,3	0,1 0,3 0,5	0,42 0,57 0,77	0,17 0,37 0,57
Aluminium-coated textiles	0,2	0,05	0,20	0,08
[b] Add more rows or columns if needed.				

Not applicable, because of the choice for hourly calculation procedures

Table UU.44:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.44a — Movable shutter reduction factor, $f_{sht;with}$, and movable solar shading reduction factor $f_{sh;with}$ (see G.2.2.2.2)

Month	Paris (France)				
	$f_{sht;with}$ [a]	$f_{sh;with}$ [a]			
		N	E	S	W
1	0,5	0,00	0,15	0,58	0,09
2	0,5	0,00	0,19	0,52	0,13
3	0,5	0,00	0,53	0,76	0,44
4	0,5	0,00	0,32	0,50	0,26
5	0,5	0,00	0,31	0,44	0,27
6	0,5	0,00	0,42	0,47	0,38
7	0,5	0,00	0,51	0,59	0,40
8	0,5	0,00	0,37	0,54	0,31
9	0,5	0,00	0,28	0,52	0,20
10	0,5	0,00	0,13	0,53	0,16
11	0,5	0,00	0,08	0,47	0,09
12	0,5	0,00	0,07	0,46	0,08
Annual	0,5	0,00	0,36	0,55	0,30
[a] Add more columns or rows if needed to differentiate between e.g. applications (e.g. building categories, new or existing buildings, etc.), space categories, orientations or climates.					

Not applicable, because of the choice for hourly calculation procedures

Table UU.44:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.44b — Movable shutter reduction factor, $f_{sht;with}$, and movable solar shading reduction factor $f_{sh;with}$ (see G.2.2.2.2)

Month	Rome (Italy)				
	$f_{sht;with}$ [a]	$f_{sh;with}$ [a]			
		N	E	S	W
1	0,5	0,00	0,52	0,81	0,39
2	0,5	0,00	0,48	0,82	0,55
3	0,5	0,00	0,66	0,81	0,63
4	0,5	0,00	0,71	0,74	0,62
5	0,5	0,00	0,71	0,62	0,64
6	0,5	0,00	0,75	0,56	0,68
7	0,5	0,00	0,74	0,62	0,73
8	0,5	0,00	0,75	0,76	0,72
9	0,5	0,00	0,73	0,82	0,67
10	0,5	0,00	0,72	0,86	0,60
11	0,5	0,00	0,62	0,84	0,30
12	0,5	0,00	0,50	0,86	0,42
Annual	0,5	0,00	0,69	0,77	0,63

[a] Add more columns or rows if needed to differentiate between e.g. applications (e.g. building categories, new or existing buildings, etc.), space categories, orientations or climates.

Not applicable, because of the choice for hourly calculation procedures

Table UU.44:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.44c — Movable shutter reduction factor, $f_{sht;with}$, and movable solar shading reduction factor $f_{sh;with}$ (see G.2.2.2.2)

Month	Stockholm (Sweden)				
	$f_{sht;with}$ [a]	$f_{sh;with}$ [a]			
		N	E	S	W
1	0,5	0,00	0,10	0,71	0,00
2	0,5	0,00	0,42	0,76	0,18

3	0,5	0,00	0,56	0,77	0,47
4	0,5	0,00	0,74	0,80	0,59
5	0,5	0,02	0,70	0,71	0,59
6	0,5	0,05	0,69	0,66	0,56
7	0,5	0,03	0,67	0,65	0,53
8	0,5	0,00	0,61	0,70	0,54
9	0,5	0,00	0,58	0,70	0,44
10	0,5	0,00	0,47	0,74	0,24
11	0,5	0,00	0,19	0,62	0,00
12	0,5	0,00	0,00	0,59	0,00
Annual	0,5	0,02	0,62	0,71	0,50

[a] Add more columns or rows if needed to differentiate between e.g. applications (e.g. building categories, new or existing buildings, etc.), orientations or climates.

Not applicable, because of the choice for hourly calculation procedures

Table UU.45:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.45 — Choices between options and methods for calculation of shading by external objects (see F.1)

Application [b]	**All applications**			**Not applicable**		
Description	**Choice**			**Choice**		
Calculation of the effect of shading by distant objects included in this document?	Yes			n.a.		
When calculating solar shading on building elements: which types of distant shading objects (not on site) may or shall be taken into account or ignored NOTE For instance landscape (such as hills or dikes), vegetation (such as trees), other constructions (such as buildings)	Shall be taken into account:	May be taken into account:	Shall be ignored:	Shall be taken into account:	May be taken into account:	Shall be ignored:
	Landscape (such as hills or dikes), other constructions (such as buildings)	Vegetation (such as trees)	-	n.a.	n.a.	n.a.
When calculating solar shading on opaque building elements such as roofs or facades: which types of on	Shall be taken into account:	May be taken into account:	Shall be ignored:	Shall be taken into account:	May be taken into account:	Shall be ignored:

site shading objects can or shall be ignored NOTE For instance rebates, overhangs or other shading objects from the own building(s) on site	-	-	Rebates, overhangs or other shading objects from the own building(s) on site	n.a.	n.a.	n.a.
When calculating solar shading on transparent building elements: NOTE For instance window rebates, overhangs and side fins	Shall be taken into account:	May be taken into account:	Shall be ignored:	Shall be taken into account:	May be taken into account:	Shall be ignored:
	Window rebates, overhangs and side fins if depth larger than 20% of window height resp. width	Other window rebates, overhangs and side fins	-	n.a.	n.a.	n.a.
Specific subdivision rules for the calculation of solar shading on building elements	None			n.a.		
Choice between the two methods for the solar shading calculation:	Choice [a]			Choice [a]		
Method 1, Shading of direct radiation	Yes			n.a.		
Method 2, Shading of direct and diffuse radiation	No			n.a.		
In case of method 2: give reference to calculation procedure	n.a.			n.a.		

[a] Only one Yes per column possible.

[b] Add more columns if needed to differentiate between applications (e.g. building categories, new or existing buildings, etc.).

Not applicable, because of the choice for hourly calculation procedures

Table UU.46:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.46 — Parameters for monthly solar shading due to overhangs (See F.3.5.1.2)

Period:		summer: June - September			
Orientation		A_1	B_1	A_2	B_2
North hemisphere	**South hemisphere**				

S	N	-3,023	0,045	1,285	-0,006
SE-SW	NE-NW	-1,255	0,015	0,905	-0,008
E-W	E-W	-0,684	0,005	0,610	-0,004
NE-NW	SE-SW	-0,654	0,006	0,616	-0,006
N	S	-0,726	0,007	0,616	-0,007

Not applicable, because of the choice for hourly calculation procedures

Table UU.47:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.47 — Parameters for monthly solar shading due to fins (See F.3.5.1.2)

Period:		summer: June - September			
Orientation		A_1	B_1	A_2	B_2
North hemisphere	**South hemisphere**				
S	N	-1,175	0,012	0,860	-0,008
SE-SW	NE-NW	-0,799	0,009	0,684	-0,006
E-W	E-W	0,118	-0,014	0,005	0,010
NE-NW	SE-SW	0,155	-0,041	-0,680	0,009
N	S	0,275	-0,133	0,641	0,039

Not applicable, because of the choice for hourly calculation procedures

Table UU.48:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.48a — Parameters for monthly solar shading by obstacles; more detailed method (See F.3.1.2 and F.3.5.2.2)

Location:	40º north latitude								
Period:	winter: October - May								
Orientation	**Weight, $w_{obst;m;i}$ per sector**				**Solar altitude, $\alpha_{sol;m;i}$ per sector**				**Fraction direct solar irradiation $f_{sol;dir;m}$**
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
N	0	0	0	0	-	-	-	-	0
NE	0	0	0	1,00	-	-	-	7,6	0,10
E	0	0	0,31	0,69	-	-	9,0	20,8	0,50

SE	0	0,14	0,58	0,28	-	9,2	22,2	24,0	0,70
S	0,06	0,40	0,47	0,07	9,4	22,8	22,6	9,7	0,75
SW	0,22	0,63	0,15	0	24,2	22,0	9,6	-	0,70
W	0,70	0,30	0	0	20,6	9,5	-	-	0,50
NW	1,00	0	0	0	8,7	-	-	-	0,10

Not applicable, because of the choice for hourly calculation procedures

Table UU.48:
Type: Other (monthly calculation method)

Not applicable for hourly calculation procedures, see choice in **Table UU.2**

Table UU.48b — Parameters for monthly solar shading by obstacles; more detailed method (See F.3.1.2 and F.3.5.2.2)

Location:	40º north latitude								
Period:	summer: June - September								
Orientation	**Weight, $w_{obst;m;i}$ per sector**				**Solar altitude, $\alpha_{sol;m;i}$ per sector**				**Fraction direct solar irradiation $f_{sol;dir;m}$**
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
N	0	0	0	1,00	-	-	-	17,4	0,10
NE	0	0	0,62	0,38	-	-	20,9	50,2	0,30
E	0	0,48	0,48	0,04	-	21,8	52,5	74,4	0,45
SE	0,33	0,53	0,10	0,03	23,2	54,0	74,4	74,4	0,55
S	0,30	0,20	0,21	0,29	60,5	74,4	74,4	60,7	0,50
SW	0,03	0,11	0,52	0,34	74,4	74,4	54,2	23,1	0,55
W	0,04	0,47	0,49	0	74,4	52,7	21,8	-	0,45
NW	0,37	0,63	0	0	50,3	20,9	-	-	0,30

Not applicable, because of the choice for hourly calculation procedures

6 For ISO 52018-1

Annex UU of ISO 52018-1:2017, Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features — Part 1: Overview of options

EN ISO 52018-1 is a post-processing standard.
The choices for EN ISO 52003-1 and EN ISO 52018-1 are part of U-CERT Task 3.2 (Development of a set of user centred and effective overall and partial indicators, including SRI) [5]

Annex UU
(informative)
Input and method selection data sheet — ~~Default~~ U-CERT choices

UU.1 General

The template in Annex A of this document shall be used to specify the choices between methods, the required input data and references to other documents.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations. If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a national annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g., the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g., small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b;

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, …).

NOTE 4 In the section “Introduction” of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

Specific information concerning Annex A and Annex B in this document

Although the tables in this annex cover most EPB requirements that currently apply in various countries, they are of course not necessarily exhaustive, also in view of possible new developments in the future. Still, other variables can possibly be considered for setting regulatory EPB requirements and the tables have been conceived flexibly to allow to report such other choices.

Table A.1/B.1 provides a table to specify the modular references.

Table A.2/B.2 provides a table for regulators to report in a uniform manner the chosen mix of partial EPB features for which regulatory requirements are set, in as far as they fall within the scope of this document. Extra features can be added at the bottom of the table. The table shall be seen in conjunction with all other overall and partial EPB requirements (which are beyond the scope of this document, e.g. concerning technical building systems); see also the relevant standard under EPB module M1-4.

Tables A.3/B.3 to A.14/B.14 provide tables to report in a uniform manner, for each of the partial EPB features selected for setting requirements, as reported in Table A.2/B.2, the numeric indicator that is chosen to express the quantitative requirement. An X-mark shall be set in the second column corresponding to the row of the chosen indicator. Still, other numeric indicators can be added at the bottom of each of the tables. For partial EPB features that are not subjected to a requirement, the corresponding table will of course remain empty. If requirements are set for extra EPB features, as reported in additional rows in Table A.2/B.2, then the format of generic Table A.14/B.14 shall be used for reporting the corresponding indicators that are used.

Due to their open-endedness, all the reporting tables allow full freedom of choice by the regulators.

Typically, different choices will be made according to the type of work, notably for new constructions (or equivalent) on the one hand and works on existing buildings on the other hand. Furthermore, there may be differentiations according to other criteria, such as between residential and non-residential buildings. Each different application area will thus have its own set of tables if different choices are made (see Note 3 above). The application domain of every set shall be clearly specified.

Specific information concerning this annex

This annex provides in B.3 an example of the reporting of regulatory choices. The choices made can be considered "best guess" default choices, but each public authority should make a judicious choice of its own, based on such factors as the pursued policy objectives, the local climate, the local building styles and construction traditions, the technological state of advancement of the entire professional construction sector, etc. The example tables are elementary. Especially for (small and large) extensions and (simple and thorough) renovations, a great variety of differentiated requirements can be set, depending on the exact nature of the works.

UU.2 References

The references, identified by the EPB module code number, are given in Table UU.1.

Table UU.1:
Type: References

See Explanation at EN ISO 52000-1, Table UU.1

Table UU.1 — References

Reference	Reference document	
	Number	**Title**
M1-4	ISO 52003-1	*Energy performance of buildings — Indicators, requirements, ratings and certificates — Part 1: General aspects and application to the overall energy performance*
M1-6	~~ISO 17772-1~~ EN 16798–1 ~~(under preparation)~~	~~*Energy performance of buildings — Indoor environmental quality — Part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings*~~ *Energy performance of buildings – Ventilation of buildings – Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics* (Module M1–6)
M1-13	ISO 52010-1	*Energy performance of buildings — External climatic conditions — Part*

Reference	Reference document	
	Number	Title
		1: Conversion of climatic data for energy calculations
M2-2	ISO 52016-1	*Energy performance of buildings — Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads — Part 1: Calculation procedures*
M2-5.1	ISO 13789	*Thermal performance of buildings — Transmission and ventilation heat transfer coefficients — Calculation method*
M2-5.2	ISO 10211	*Thermal bridges in building construction — Heat flows and surface temperatures — Detailed calculations*
M2-5.3	ISO 14683	*Thermal bridges in building construction — Linear thermal transmittance — Simplified methods and default values*
M2-8.1	ISO 52022-1	*Energy performance of buildings — Thermal, solar and daylight properties of building components and elements — Part 1: Simplified calculation method of the solar and daylight characteristics for solar protection devices combined with glazing*
M2-8.2	ISO 52022-3	*Energy performance of buildings — Thermal, solar and daylight properties of building components and elements — Part 3: Detailed calculation method of the solar and daylight characteristics for solar protection devices combined with glazing*
M5-8	EN 16798–5-1 EN 16798–5-2	*Energy performance of buildings — Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8 — Ventilation for buildings — Calculation methods for energy requirements of ventilation and air conditioning systems — Part 5-1: Distribution and generation (revision of EN 15241) — Method 1* *Energy performance of buildings — Modules M5-6.2, M5-8.2 — Ventilation for buildings — Calculation methods for energy requirements of ventilation systems — Part 5-2: Distribution and generation— Method 2*
M9-1	EN 15193–1	*Energy performance of buildings — Module M9 — Energy requirements for lighting — Part 1: Specifications*

UU.3 Mix of partial energy performance requirements

UU.3.1 General

Table UU.2 and surrounding text / National Annex for new buildings:
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for comparing against minimum EP requirement or benchmark.

The introduction in Table B.2 of 4 different mixes, for different situations, is considered to be too complicated for a converged set of choices.
For the purpose of a converged set of choices in U-CERT, one mix is proposed and it is left to the national/regional procedure for the EP certificate (but in line with 11.2 of EN ISO 52003-1) to specify further details, including exceptions.

➔ **LINKED CHOICES:**
Most of the issues raised at Table UU.2 of EN ISO 52003-1 are also applicable here but not repeated.
So please read the explanation box at **Table UU.2 of EN ISO 52003-1.**
This includes justification of the two proposed additional indicators for minimum EP requirements that are within the scope of this Table UU.2 of EN ISO 52018-1: the indicators on the energy needs and thermal comfort.

The series of Tables from **Table UU.3 to Table UU.14** provide more details on the indicators listed here in this Table.

Indicator for energy need for heating and cooling; include energy need for lighting too?
In the ALDREN report D2.2 [11] lighting is included, because the intention is to evaluate envelope properties including geometry. The good shape factor for energy for heating (the ratio between thermal envelope area and the size of the building) is bad for the daylight and energy use for lighting, as confirmed in ALDREN simulations. Lighting will be more important for (n)ZEB buildings. The reason is also the control of the comfort level required by the EPBD. The small ratio of windows could have positive influence on heating but negative on comfort and lighting energy need. If we exclude lighting from the envelope, it could lead to the misleading conclusion that the envelope is good.
Within the U-CERT project the pro's and con's have not been discussed in detail, so the choice is kept open.

Indicator for energy need for heating and cooling:
The details in Table B.2 on the calculation of the energy need for heating and for cooling are duplicating the details given in Table B.5 and Table B.6. They fit better in the latter and are therefore removed here.

Indicator for thermal comfort:
ALDREN D2.2 report [11] proposes and works out a procedure for thermal comfort score indicators, linked to the IEQ categories in EN 16798-1. For U-CERT this procedure is proposed; see details in the explanation box of Table UU.3.

U-CERT Choice: as explained in this explanation box.

See Clause 6.

The table based on the template of Table A.2 shall be filled out as follows.

— The first column lists the partial EPB features that can be considered for setting requirements or for key information. The motivation for the mix that is chosen shall be reported below the table. If needed, still other partial EPB features can be added at the bottom of the table. By means of a numbered reference, a precise description of each additional EPB feature will then be given below the table. If possible, the description of the extra feature shall be taken from an EPB standard. Also, for each extra partial EPB feature, the motivation shall be described in a clear manner.

— In the second column, an ~~X-mark~~ "Req" mark is placed at each of the features that is chosen to set a requirement and an "Inf" mark for each of the features that is chosen as (other) key information on the EP label.

— In the third column, for each exception, a numbered reference is made to a full, detailed and clear explanation below the table, including the motivation for the exception. For some types of (detailed) requirements (e.g. on element level, such as thermal insulation), it may be easier to explain the exceptions in conjunction with the detailed description of the actual requirements. In these instances, it suffices to give here the general synthesis, the motivation and a precise reference to the regulatory texts where the requirements and exceptions are described.

UU.3.2 Application: new buildings

~~Four different requirement mixes are distinguished depending on typical conditioning habits (i.e. commonly heated and/or cooled or not). The mix that is most appropriate for a certain building category (e.g. dwelling or office) obviously varies strongly with the local climate, typical internal gains, etc. It is clear that for a given geographical location, different building categories can best be served by~~

~~different requirement mixes. For instance, in moderate summer climates, mix A may be best for dwellings, but for offices, mix D may be most appropriate.~~

Table UU.2a — Choices with respect to the mix of partial EPB requirements or key information on EP label related to thermal energy balance and fabric features (see Clause 6)

Application: New constructions including constructions that underwent major renovation						
Partial EPB feature	**Requirement / Information ?**				**Exceptions* ?**	**Details in**
	~~**Mix A**~~	~~**Mix B**~~	~~**Mix C**~~	~~**Mix D**~~		
Summer thermal comfort	~~X~~ Inf	~~X~~	—	—	—	Table A.3/B.3
Winter thermal comfort	— Inf	~~X~~	~~X~~	—	—	Table A.4/B.4
Overall thermal comfort	Req (1)					Table A.4/B.4bis
Energy "need" for heating: give further specifications*	~~X~~ Inf (~~1~~2)	—	—	~~X (1)~~	—	Table A.5/B.5
Energy "need" for cooling: give further specifications*	— Inf (3)	—	~~X (2)~~	~~X (2)~~	—	Table A.6/B.6
Combined energy "need" for heating and cooling (and possibly still other quantities): define precisely*	— Req (4)	—	—	—	—	Table A.7/B.7
Overall thermal insulation of the envelope	—	—	—	—	—	Table A.8/B.8
Thermal insulation of individual elements of the thermal envelope	~~X~~ —	~~X~~	~~X~~	~~X~~	~~X (3)~~	Table A.9/B.9
Thermal bridges	—	—	—	—	—	Table A.10/B.10
Window energy performance	—	—	—	—	—	Table A.11/B.11
Airtightness of the thermal envelope: mandatory measurement: give further specifications*	~~X~~ —	~~X (4)~~	~~X (4)~~	~~X (4)~~	—	~~Table A.12/B.12~~ 3
Airtightness of the thermal envelope: quantitative requirement: give further specifications*	—	—	—	—	—	Table A.12/B.12
Solar control	—	—	—	—	—	Table A.13/B.13
<free text> (Other requirement 1): define*)	—	—	—	—	—	Table A.14/B.14
<free text> (Other requirement 2): define*)	—	—	—	—	—	Table A.14/B.14
...	—	—	—	—	—	Table A.14/B.14
* The columns or cells that are marked with an asterisk (i.e. any cell involving a specific national/regional						

[3] Suspected erratum in (EN) ISO 52018-1:2017 here corrected.

element) shall be marked with a numbered reference. A clear explanation and motivation shall be given for each of these new elements below the table.

Explanation:

(a) If applicable, specify for the energy "need" for heating:

— with the real or with a predefined fictitious ventilation system;

— including/excluding the amount of heat needed for active preheating of the incoming hygienic ventilation air (if present);

— including/excluding the latent heat need (i.e. the sensible heat need only or not);

— still other aspects.

(b) If applicable, specify for the energy "need" for cooling:

— with the real or with a predefined fictitious ventilation system;

— including/excluding the amount of cold needed for active precooling of the incoming hygienic ventilation air (if present);

— including/excluding the latent cold need (i.e. the sensible cold need only or not);

— still other aspects.

Specifications according to each of the numbered references:

It is left to the national/regional procedure for the EP certificate (but in line with 11.2 of EN ISO 52003-1) to specify further details, including exceptions

~~The following types of requirement mixes are distinguished.~~

~~— Type Mix A: building categories that do NOT generally have active space cooling (in the region where the regulation applies). For example, dwellings in cold climates.~~

~~— Type Mix B: building categories that generally have NEITHER active space cooling NOR active space heating (in the region where the regulation applies). For example, many building categories in regions with a mild winter and mild summer climate.~~

~~— Type Mix C: building categories that do NOT generally have active space heating (in the region where the regulation applies). For example, most building categories in tropical climates.~~

~~— Type Mix D: building categories that commonly have BOTH active space cooling and active space heating (in the region where the regulation applies). For example, office buildings in moderate climates.~~

Numbered references:

(1) See **Table UU.4bis** for details on the thermal comfort score.

(~~1~~2) The energy need for heating is determined as specified in **Table UU.5**. ~~with the real ventilation system and includes, if applicable, the amount of heat needed for active preheating of the incoming hygienic ventilation air. Any latent heat need (on space level or for the incoming hygienic ventilation air) is not included in the heating need.~~

(~~2~~3) The energy need for cooling is determined as specified in **Table UU.6.** ~~the real ventilation system and includes, if applicable, the amount of cold needed for active precooling of the incoming hygienic ventilation air. Any latent cold need (on space level or for the incoming hygienic ventilation air) is not included in the cooling need.~~

(4) The energy need for lighting is determined as specified in **Table UU.7**

~~(3) Exception is allowed for 1 % of the envelope area that is subject to the requirements. (Note that this exception with respect to the U_{max} values does not imply that these thermal envelope elements may be neglected in the further EPB assessments. All thermal envelope elements shall still be taken into account in all further EPB assessments.) Designers also should heed the possible impact on indoor environment of any lesser insulated elements (notably the possible consequences of low internal surface temperatures).~~

~~(4) The air tightness measurement shall be performed according to ISO 9972 and its method 3, with specifications consistent with the treatment of infiltration/exfiltration in the EPB assessment method, e.g. open combustion devices shall be sealed if the air flow through them is already separately taken into account in the EPB assessment method. The final result shall be reported as the mean of the pressurization and~~

depressurization regression curves at the reference pressure needed for the EPB assessments.

Motivation for the chosen requirement mix:

See U-CERT D3.2 report.

(in bottom-up order):

— The mandatory measurement of the airtightness of the thermal envelope (upon sufficient completion of the works) creates a strong regulatory stimulus that due attention be paid to this aspect by all actors in the construction process (designers and contractors alike). The stimulus is all the stronger if the result of the measurement is properly valued in the EPB assessment methods. Not setting an actual, quantitative requirement avoids a too strict or too lax requirement for a given project. (It may be difficult to determine in a general manner in a regulation a differentiated, cost-optimal requirement, which depends upon the construction type, the state of know-how and the experience of the specific project team, etc.). It also avoids much contentious public discussion on the actual strictness of the requirement.

— The requirement on the thermal insulation of all individual elements of the thermal envelope (apart from the possible odd exception, corresponding to no more than 1 % of the thermal envelope area) ensures, first of all, that sufficiently high internal surface temperatures are achieved under winter conditions. Any minor area(s) that fall(s) within the exception rule does not waive the design team of its responsibility with respect to the potential issues related to low internal surface temperatures in these areas.

Further, it guarantees that the thermal envelope, executed immediately at the time of the initial construction, conforms to the full technical requirements and is, economically speaking, state-of-the-art. (The thermal envelope is, generally speaking, practically and economically difficult to upgrade later on and it thus largely predestines the energy performance of the building over its entire lifetime.)

— For the more integral requirements, a differentiation between four situations is made. The combination of separate winter and summer requirements (instead of a combined "needs" requirement) provides a certain assurance that a balanced design between both situations is achieved. Solar gains (influenced by window area and orientation, choice of glazing and solar protection devices, etc.) are a crucial point of attention in this respect, in particular for the summer situation. Each type of requirement mix has been chosen such that it corresponds to the actual situation of the majority of new projects in a certain building category. For instance, no heating and/or cooling need requirement is set if there is usually no such active conditioning, thus avoiding the potential misunderstanding that such active conditioning is considered standard. And no summer or winter thermal comfort requirement is set if reasonable comfort levels cannot be achieved under free floating conditions anyway.

~~— — Mix A. For building categories for which active space cooling is not standard (for instance in cold climates), a requirement on the summer thermal comfort seems appropriate. As explained in Clause 7, it is advised to complement it with the concept of (probability weighted) fictitious cooling above a strict threshold, so that a further stimulus for good summer design (better than the requirement) is integrated in the overall EPB assessment. The winter situation can be dealt with by means of a requirement on the heating "need".~~

~~— — Mix B. In situations where reasonable year round thermal comfort can be obtained with neither active space heating nor active space cooling, a requirement on the summer comfort and another on the winter thermal comfort seem advised, in combination with (probability weighted) fictitious cooling and heating in the overall EPB assessment.~~

~~— — Mix C. In situations where active space heating is not standard (e.g. in relatively warm climates), a requirement on the winter thermal comfort combined with (probability weighted) fictitious heating above a strict threshold appears a good approach. The summer situation can then be covered by a requirement on the cooling "need".~~

~~— — Mix D. For building categories for which both active space heating and active space cooling are common in new construction, separate heating and cooling need requirements may be appropriate.~~

UU.3.3 Application: existing buildings

Clause UU.3 on Existing buildings
Type: Post-processing

The U-CERT proposal is to make no distinction in numerical indicators for new or existing buildings. Specific numerical indicators for new buildings are also used as basis for requirements.
Whether such requirements are also applicable to existing buildings is outside the scope of EN ISO 52018-1.

Consequently, Clause UU.4.2 becomes obsolete.

U-CERT Choice: Replace Table UU.2b by a sentence with explanation as such.

Existing buildings: same as new buildings. Specific numerical indicators for new buildings are also used as basis for requirements. Whether such requirements are also applicable to existing buildings is outside the scope of this document.

~~**Table UU.2b — Choices with respect to the partial EPB requirements related to thermal energy balance and fabric features (see Clause 6)**~~

~~**Application: Works on existing buildings**~~			
~~**Partial energy performance feature**~~	~~**Requirement?**~~	~~**Exceptions*?**~~	~~**Details in**~~
~~Summer thermal comfort~~	~~—~~	~~—~~	~~Table A.3/B.3~~
~~Winter thermal comfort~~	~~—~~	~~—~~	~~Table A.4/B.4~~
~~Energy "need" for heating: give further specifications (a)*~~	~~—~~	~~—~~	~~Table A.5/B.5~~
~~Energy "need" for cooling: give further specifications (b)*~~	~~—~~	~~—~~	~~Table A.6/B.6~~
~~Combined energy "need" for heating and cooling (and possibly still other quantities): define precisely*~~	~~—~~	~~—~~	~~Table A.7/B.7~~
~~Overall thermal insulation of the envelope~~	~~—~~	~~—~~	~~Table A.8/B.8~~
~~Thermal insulation of individual elements of the~~	~~X (1)~~	~~X (2)~~	~~Table A.9/B.9~~

thermal envelope			
Thermal bridges	—	—	Table A.10/B.10
Window energy performance	—	—	Table A.11/B.11
Airtightness of the thermal envelope: mandatory measurement: give further specifications*	—	—	Table A.12/B.12
Airtightness of the thermal envelope: quantitative requirement: give further specifications*	—	—	Table A.12/B.12
Solar control	X (3)	—	Table A.13/B.13
<free text> Other requirement 1; define*)	—	—	Table A.14/B.14
<free text> Other requirement 2; define*)	—	—	Table A.14/B.14
…	—	—	Table A.14/B.14

* The columns or cells that are marked with an asterisk (i.e. any cell involving a specific national/regional element) shall be marked with a numbered reference. A clear explanation and motivation shall be given for each of these new elements below the table.

Specifications and motivations:

Explanation:

(a) If applicable, specify for the energy "need" for heating:

— with the real or with a predefined fictitious ventilation system;

— including/excluding the amount of heat needed for active preheating of the incoming hygienic ventilation air (if present);

— including/excluding the latent heat need (i.e. the sensible heat need only or not);

— still other aspects.

(b) If applicable, specify for the energy "need" for cooling:

— with the real or with a predefined fictitious ventilation system;

— including/excluding the amount of cold needed for active precooling of the incoming hygienic ventilation air (if present);

— including/excluding the latent cold need (i.e. the sensible cold need only or not);

— still other aspects.

Specifications according to each of the numbered references:

(1) When elements of the thermal envelope (e.g. window, roof, wall, etc.) are completely replaced or when new elements are added to the thermal envelope (e.g. in an extension), maximum U-values apply.

(2) Exception is allowed for 1 % of the envelope area that is subject to the requirements.

NOTE 1 This exception with respect to the U_{max} values does not imply that these thermal envelope elements may be neglected in the further EPB assessments. All thermal envelope elements shall still be taken into account in all further EPB assessments.

Designers also should heed the possible impact on indoor environment of any lesser insulated elements (notably the possible consequences of low internal surface temperatures).

NOTE 2 For regulators, as in the case of some renovations, very small areas may be involved, the 1 % exception rule does not give much leeway for these cases. So, the requirements should be set such that in principle they are feasible for all possible cases, unless other explicit exceptions are defined.

(3) Before active cooling is installed in a room of an existing building, all transparent elements shall comply with solar control requirements.

~~**Motivation for the chosen requirement mix:**~~

~~For reasons of practicality in the context of renovations, requirements are only set on element level and not on combinations of elements (which may involve existing elements).~~

~~For extensive renovations (e.g. full stripping of, a large part of, the building), further reaching requirements may be appropriate.~~

UU.4 Partial energy performance requirements

UU.4.1 Application: new and existing buildings

Table UU.3 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor in particular if EP is calculated on basis of actual (and possible undersized or absent) heating system.

See explanation box on **Table UU.2b**: no distinction between new and existing buildings.

ALDREN report D2.2 [11] proposes the use of a thermal comfort score, distinguishing a heating, cooling and intermediate season, from the perspective of clothing adapted to the running weather conditions. The procedure to assess the score from the hourly external air and indoor operative temperatures has been fully worked out in Table 10 of [11] and is based on EN 16798-1. There are plans to propose this procedure in the context of the revision of EN 16798-1:2019.
The U-CERT proposal is to follow these ALDREN recommendation:

➔ **LINKED CHOICES:**
- **EN ISO 52000-1, Table UU.19**: principle of assumed or presence of system
- **EN ISO 52000-1, Table UU.16**: choice of thermal comfort as one of the key indicators
- The design values of the operative temperature as given in **Table UU.2 of EN 16798-1** are used to assess the thermal comfort score in case of mechanical heating and cooling.
- The design values of the adaptive operative temperature as given in **Table UU.4 of EN 16798-1** are used to assess the thermal comfort score in case of no mechanical cooling (with indoor temperature criteria adapted to the actual and previous outdoor temperatures).
- **Table UU.2** above: choice for thermal comfort indicator
- **Table UU.4** below: same choice, for winter.

U-CERT Choice: Add, to the default choice of Table B.3, the thermal comfort score based on ALDREN, as explained above in this explanation box.

Table UU.3~~a~~ is applicable ~~for requirement mixes A and B:~~

Table UU.3~~a~~ — Numeric indicator used for the requirement or key information on the summer thermal comfort (see Clause 7)

Application: New and existing constructions	
Numeric indicator	**Choice**
Time above a fixed reference temperate [h]	--
Temperature weighted time above a fixed reference temperature [K·h]	X
~~<free text> Other indicator; define*)~~ Thermal comfort score	~~Not applicable~~ X

...	

* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:

Description in case of other indicator:

The thermal comfort score is determined according to the procedures in Table 10 of the ALDREN report D2.2, Methodology note on energy rating procedures, Sept. 30, 2020
https://aldren.eu/wp-content/uploads/2021/11/D2_2.pdf

Table UU.4 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor in particular if EP is calculated on basis of actual (and possible undersized or absent) heating system.

➔LINKED CHOICES:
Table UU.2 (List of key indicators)
See also explanation box on the previous table (**Table UU.3**)

U-CERT Choice: Add, to the default choice of Table B.3, the thermal comfort score based on ALDREN.
The necessary specifications are (to be) added (see explanation box on **Table UU.54bis**).

Table UU.4~~a~~ is applicable ~~for requirement mixes B and C:~~

Table UU.4~~a~~ — Numeric indicator used for the requirement or key information on the winter thermal comfort (see Clause 8)

Application: New and existing constructions	
Numeric indicator	**Choice**
Time below a fixed reference temperate [h]	--
Temperature weighted time below a fixed reference temperature [K·h]	X
~~<free text> Other indicator; define*)~~ Thermal comfort score	~~Not applicable~~ X
...	

* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:

Description in case of other indicator:

The thermal comfort score is determined according to the procedures in Table 10 of the ALDREN report D2.2, Methodology note on energy rating procedures, Sept. 30, 2020
https://aldren.eu/wp-content/uploads/2021/11/D2_2.pdf

Table UU.4a-bis and surrounding text

See also **Table UU.3** and **Table UU.4**.

➔LINKED CHOICES:
See **Table UU.2**: extra Table for **overall** (ALDREN: *summer*, *winter plus spring/autumn*) thermal comfort score.

U-CERT Choice: Instead of the default choice of Table B.4 an alternative method is chosen: based on EN 16798-1. The necessary specifications are (to be) added (see explanation box on **Table UU.54bis**).

Table UU.4bis — Numeric indicator used for the requirement or key information on the combined summer and winter thermal comfort (see Clause 8)

Application: New and existing constructions	
Numeric indicator	**Choice**
Time below a fixed reference temperate [h]	--
Temperature weighted time below a fixed reference temperature [K·h]	~~X~~ --
~~<free text> Other indicator; define*)~~ Thermal comfort score	~~Not applicable~~ X
...	
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method: **Description in case of other indicator:**	
The thermal comfort score is determined according to the procedures in Table 10 of the ALDREN report D2.2, Methodology note on energy rating procedures, Sept. 30, 2020 https://aldren.eu/wp-content/uploads/2021/11/D2_2.pdf It includes a score (1=best - 4=worst) for the overall thermal comfort, composed of the heating and cooling season thermal comfort scores.	

Table UU.5 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for comparing against minimum EP requirement or benchmark.

It has not been investigated within the U-CERT project in detail which assumptions are proposed in ALDREN [11] for the calculation of energy need for heating and if these are the best option. Compare the "Description" in Table B.5 (see below in Table UU.5).

➔LINKED CHOICES:
See **Table UU.2**: List of key indicators

U-CERT Choice: Table B.5a is adopted but with necessary more detailed specifications added, as discussed above in this explanation box.

Table UU.5~~a~~ is applicable ~~for requirement mixes A and D:~~

Table UU.5~~a~~ — Numeric indicator used for the requirement or key information on the energy "need" for heating (see Clause 9)

Application: New and existing constructions

Numeric indicator	Choice
Total "need" [kWh]	
"Need" per useful floor area [kWh/m²]	
Ratio (define*)	X (1)
<free text> Other indicator; define*)	
…	

* If a ratio or another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:

Description in case of ratio or other indicator:

(1) The ratio is called H-level, symbol H, and is defined as:

$$H = 100 \times \frac{Q_{\mathrm{H;nd;tot}}}{Q_{\mathrm{H;nd;tot;ref}}} \qquad \text{(B.1)}$$

Where

H	is the ratio called H-level;
$Q_{\mathrm{H;nd;tot}}$	is the total heat need, in kWh;
$Q_{\mathrm{H;nd;tot;ref}}$	is the reference value for the total heat need, in kWh.

The result is rounded upwards to the nearest integer value.

NOTE 1 The factor 100 ensures that the H-level has a sufficiently fine scale without the need for a decimal point.

The reference value is determined by means of either a formula or a notional reference building and shall for each building category closely reflect the cost optimal value (at the time of its definition and for a given scenario of the future energy price), making allowance for a reasonable amount of window area. The requirement is then initially 100 and may be lowered in a stepwise manner over time.

NOTE 2 The advantages and drawbacks of such ratio approach are discussed in a general manner in ISO 52003-1 and ISO/TR 52003-2[6].

Note also the specific details provided in Table UU.2a for this requirement:

The energy need for heating is determined **<< to be further investigated& discussed >>** with the real ventilation system and includes, if applicable, the amount of heat needed for active preheating of the incoming hygienic ventilation air. Any latent heat need (on space level or for the incoming hygienic ventilation air) is not included in the heating need.

Table UU.6 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Similar as Table UU.5.
Important factor if used for comparing against minimum EP requirement or benchmark.

It has not been investigated within the U-CERT project in detail which assumptions are proposed in ALDREN [11] for the calculation of energy need for cooling and if these are the best option. Compare the "Description" in Table B.6 (see below in Table UU.6).

➔ **LINKED CHOICES:**
See **Table UU.2**: List of key indicators
Link with chosen (differentiation in) climatic data and conditions of use, ..; see **Table UU.16 of EN ISO 52000-1**

U-CERT Choice: Table B.6 is adopted but with necessary more detailed specifications added, as discussed above in this explanation box.

Table UU.6~~a~~ is applicable ~~for requirement mixes C and D:~~

Table UU.6~~a~~ — Numeric indicator used for the requirement or key information on the energy "need" for cooling (see Clause 10)

Application: New and existing constructions	
Numeric indicator	**Choice**
Total "need" [kWh]	
"Need" per useful floor area [kWh/m²]	
Ratio (define*)	X (1)
<free text> Other indicator; define*)	
...	

* If a ratio or another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:

Description in case of ratio or other indicator:

(1) The ratio is called C-level, symbol C, and is defined as:

$$C = 100 \times \frac{Q_{C;nd;tot}}{Q_{C;nd;tot;ref}} \quad \text{(B.2)}$$

Where

C is the ratio called C-level;

$Q_{C;nd;tot}$ is the total cooling need, in kWh;

$Q_{C;nd;tot;ref}$ is the reference value for the total cooling need, in kWh.

The result is rounded upwards to the nearest integer value.

Further, the same considerations as for heating (above) apply.

Note also the specific details provided in Table UU.2a for this requirement:

The energy need for cooling is determined **<< to be further investigated& discussed >>** with the real ventilation system and includes, if applicable, the amount of cold needed for active precooling of the incoming hygienic ventilation air. Any latent cold need (on space level or for the incoming hygienic ventilation air) is not included in the cooling need.

Table UU.7 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Similar as **Table UU.5 and Table UU.6**.
Important factor if used for comparing against minimum EP requirement or benchmark.

There is no Table B.7, so any content of Table UU.7 differs from Table B.7 and is therefore in blue font.

Indicator for energy need for lighting:

See the ALDREN D2.2 report [11]. Not fully investigated within U-CERT are the procedures to calculate the energy need for lighting, as well as the adequacy of the reference values for the energy needs for heating, cooling and lighting, as proposed in ALDREN D2.2 Annex C [12] as function of climate zone. And in particular the abrupt change when crossing from one climate zone to the next.

➔ **LINKED CHOICES:**
See **Table UU.2**: an indicator of the combined heating and cooling (and lighting?*) needs is used as one of the main EP requirements.
*): See discussion on set of EP requirements in the explanation box on **Table UU.2 of EN ISO 52003-1.**

U-CERT Choice: in contrast to Annex B a numeric indicator is used for the requirement on the combined energy "need" for heating and cooling (and optionally lighting; to be discussed

~~Table UU.7a is not applicable for any of the requirement mixes A to D.~~

Table UU.7 — Numeric indicator used for the requirement or key information on the combined energy "need" for heating and cooling (and possibly still other quantities) (see Clause 11)

Application: New and existing constructions	
Numeric indicator	**Choice**
Total "need" [kWh]	…
"Need" per useful floor area [kWh/m²]	…
Ratio (define*)	X *)
<free text> Other indicator; define*)	…
…	…

* If a ratio or another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:

Description in case of ratio or other indicator:

*) See ALDREN D2.2 report and EPB certificate template:

Jana Bendžalová, Ligier, Simon, et al, *ALDREN report D2.2, Methodology note on energy rating procedures*, Sept. 30, 2020

Jana Bendžalová, Zirngibl, Johann, et al, ALDREN report D2.2, Annex C, Methodology note on energy rating procedures, Annex C, European Voluntary Certificate, Sept. 30, 2020

It includes a scale and a reference value ("Ref_{NZEB} ").

Table UU.8 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for comparing against minimum EP requirement or benchmark.

There is no Table B.8, so any content of Table UU.8 differs from Table B.8 and is therefore in blue font.

➔ **LINKED CHOICES:**
See **Table UU.2**: No numerical indicator for information or requirement on the overall thermal insulation of the thermal envelope

U-CERT Choice: in line with Annex B: not applicable, so empty table

Table UU.8a is not applicable ~~for any of the requirement mixes A to D~~.

Table UU.8 — Numeric indicator used for the requirement or key information on the overall thermal insulation of the thermal envelope (see Clause 12)

Application: New and existing constructions	
Numeric indicator	**Choice**
Overall transmission heat transfer coefficient H_{tr} [W/K]	…
Mean thermal transmittance U_{mn} [W/(m²·K)]	…
Ratio; define*)	…
<free text> Other indicator; define*)	…
…	…
* If a ratio or another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method: **Description in case of a ratio or other indicator:**	
<free text>	

Table UU.9 and surrounding text
Type: Post-processing. Policy choice.

Not important for the calculated EP, because restricted to individual elements.

➔ **LINKED CHOICES:**
See **Table UU.2:** No numerical indicator for information or requirement on the thermal insulation of individual elements of the thermal envelope.

U-CERT Choice: In contrast to Table B.9a: not applicable, so empty table

Table UU.9~~a~~ is not applicable ~~for all requirement mixes A to D:~~

Table UU.9~~a~~ — Numeric indicator used for the requirement or key information on the thermal insulation of individual elements of the thermal envelope (see Clause 13)

Application: New and existing constructions	
Numeric indicator	**Choice**
Minimum temperature factor f_{Rsi} [-]	
Thermal transmittance U [W/(m²·K)]	~~X~~ --
Total thermal resistance R_{tot} [m²K/W]	
Intrinsic element thermal resistance $R_{c;op}$ [m²K/W]	
<free text> Other indicator; define*)	
…	
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method: **Description in case of other indicator:**	

Not applicable.

~~But note the specific details provided in Table UU.2a for exceptions for this requirement:~~

~~Exception is allowed for 1 % of the envelope area that is subject to the requirements. (Note that this exception with respect to the U_{max} values does not imply that these thermal envelope elements may be neglected in the further EPB assessments. All thermal envelope elements shall still be taken into account in all further EPB assessments.) Designers also should heed the possible impact on indoor environment of any lesser insulated elements (notably the possible consequences of low internal surface temperatures).~~

Table UU.10 and surrounding text
Type: Post-processing. Policy choice.

Not important for the calculated EP, because restricted to individual elements.

➔ **LINKED CHOICES:**
See **Table UU.2:** No numerical indicator for information or requirement on thermal bridges.
There is no Table B.10, so any content of Table UU.10 differs from Table B.10 and is therefore in blue font.

No numerical indicator for information or requirement on the thermal bridges.

U-CERT Choice: In line with Annex B: not applicable, so empty table

Concerning Table UU.10~~a~~, Thermal bridges: no explicit requirement, but integrated into the EPB assessments in a practical manner that stimulates "good solutions", as discussed in ISO/TR 52018-2[11].

Table UU.10 — Numeric indicator used for the requirement or key information on the thermal bridges (see Clause 14)

Application: New and existing constructions	
Numeric indicator	**Choice**
Minimum temperature factor f_{Rsi} [-]	…
Linear thermal transmittance Ψ [W/(m·K)], possibly differentiated per type of junction	…
Point thermal transmittance χ [W/K], possibly differentiated per type of three dimensional thermal bridge	…
Relative importance of thermal bridges compared to the overall heat transfer coefficient [-] $(\Sigma\Psi l + \Sigma\chi)/H_{tr}$	…
<free text> Other indicator; define*)	…
…	…
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:	
Description in case of other indicator:	
<free text>	

Table UU.11 and surrounding text
Type: Post-processing. Policy choice.

Not important for the calculated EP, because restricted to individual elements.

➔ **LINKED CHOICES:**
See **Table UU.2:** No numerical indicator for information or requirement on window energy performance.
There is no Table B.11, so any content of Table UU.11 differs from Table B.11 and is therefore in blue font.

U-CERT Choice: in line with Annex B: not applicable, so empty table

Table UU.11~~a~~ is not applicable ~~for any of the requirement mixes A to D~~.

Table UU.11 — Numeric indicator used for the requirement or key information on the window energy performance (see Clause 15)

Application: New and existing constructions	
Numeric indicator	**Choice**
Heating energy performance $P_{E;H;w}$ [kWh/m²]	…
Cooling energy performance $P_{E;C;w}$ [kWh/m²]	…
Combination of heating and cooling energy performance $P_{E;H+C;w}$ [kWh/m²]	…
For glazing only: energy balance value E [W/(m²·K)]	…
Minimal window area in certain types of rooms: specify*	…
<free text> Other indicator; define*)	…
…	…
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:	
Description in case of other indicator:	
<free text>	

Table UU.12 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for comparing against minimum EP requirement or benchmark. Also important because it requires air tightness assessment.

➔ **LINKED CHOICES:**
See **Table UU.2:** No numerical indicator for information or requirement on thermal envelope air tightness.
There is no Table B.12, so any content of Table UU.12 differs from Table B.12 and is therefore in blue font.

U-CERT Choice: in line with Annex B: not applicable, so empty table

Table UU.12~~a~~ is not applicable. ~~for all requirement mixes, A to D:~~

Table UU.12~~a~~ — Numeric indicator used for the requirement or key information on the thermal envelope air tightness (see Clause 16)[1]

Application: New and existing constructions	
Numeric indicator	**Choice**
Specific leakage rate per thermal envelope area q_{Epr} [m³/h/m²]	—

Air change rate n_{pr} [h^{-1}]	—
Specific leakage rate per useful floor area q_{Fpr} [$m^3/h/m^2$]	~~x~~ —
<free text> Other indicator; define*)	—
...	—
Specify for the chosen method of the air tightness measurement: — the precise definition of the reference area or volume for the indicator used; — the reference pressure, pr; — result of pressurization, depressurization or mean; — other, if needed.	
Specification (if method 1, 2 or 3):	
~~The reference pressure difference is 50 Pascal.~~ ~~The leakage rate is assessed as the mean of pressurization and depressurization. The useful floor area is specified as for the whole set of EPB standards.~~ ~~Note the specific details provided in Table UU.2a for this requirement:~~ ~~The air tightness measurement shall be performed according to ISO 9972 and its method 3, with specifications consistent with the treatment of infiltration/exfiltration in the EPB assessment method, e.g. open combustion devices shall be sealed if the air flow through them is already separately taken into account in the EPB assessment method. The final result shall be reported as the mean of the pressurization and depressurization regression curves at the reference pressure needed for the EPB assessments.~~	
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method: **Description in case of other indicator:**	
<free text>	

Table UU.13 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for comparing against minimum EP requirement or benchmark.

➔ **LINKED CHOICES:**
See **Table UU.2:** No numerical indicator for information or requirement on the solar control.
There is no Table B.13, so any content of Table UU.13 differs from Table B.13 and is therefore in blue font.

U-CERT Choice: in line with Annex B: not applicable, so empty table

Table~~s~~ UU.13~~a to UU.14 a are~~ is not applicable ~~for any of the requirement mixes A to D~~.

Table UU.13 — Numeric indicator used for the requirement or key information on the solar control (see Clause 17)

Application: New and existing constructions	
Numeric indicator	**Choice**
Solar factor g or g_{tot} or F_{npss} [−]	...
<free text> Other indicator; define*)	...
...	...
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:	

Description in case of other indicator:
<free text>

Table UU.14 and surrounding text
Type: Post-processing. Important factor for calculated EP. Policy choice.

Important factor if used for comparing against minimum EP requirement or benchmark.

➔ **LINKED CHOICES:**
See **Table UU.2:** No numerical indicator for information or requirement on other features.
There is no Table B.14, so any content of Table UU.14 differs from Table B.14 and is therefore in blue font.

U-CERT Choice: in line with Annex B: not applicable, so empty table

Table UU.14 is not applicable.

Table UU.14 — Numeric indicator used for other requirements or key information (see Table A.2/B.2)

Application: New and existing constructions	
EPB feature	**Numeric indicator**
<free text> Other requirement 1; define*)	Not applicable
<free text> Other requirement 2; define*)	Not applicable
…	
* All EPB features and their corresponding indicator shall be clearly described and precise reference shall be made to their definition and their assessment method. The numbers (1), (2), ... refer to the numbers of other requirements in Table A.2/B.2.	
Specification:	
Other requirement 1: ... Not applicable Other requirement 2: ... Not applicable <free text>	

UU.4.2 Application: existing buildings

Tables UU.3 – 14 and surrounding text / National Annex for existing buildings:
Type: Post-processing

Existing buildings: same as new buildings. See Explanation at Clause UU.3.3.
➔ **LINKED CHOICES:**
See **Table UU.2:** Ahas been made applicable for new and existing buildings

U-CERT Choice: Not applicable, because no difference in numerical indicators for new and existing buildings

Tables B.3b to B.~~8~~14b are not applicable because no difference is made in numerical indicators for new and existing buildings ~~there are no requirements set in Table UU.2b for these EPB features~~.

Table UU.9b — Numeric indicator used for the requirement on the thermal insulation of individual elements of the thermal envelope (see Clause 13)

Application: Works on existing buildings	
Numeric indicator	**Choice**
Minimum temperature factor f_{Rsi} [-]	
Thermal transmittance U [W/(m²·K)]	X
Total thermal resistance R_{tot} [m²K/W]	
Intrinsic element thermal resistance $R_{c,op}$ [m²K/W]	
<free text> Other indicator; define*)	
…	
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method:	
Description in case of other indicator:	
Not applicable.	
But note the specific details provided in Table UU.2b for this requirement:	
When elements of the thermal envelope (e.g. window, roof, wall, etc.) are completely replaced or when new elements are added to the thermal envelope (e.g. in an extension), maximum U-values apply.	
Note also the specific details provided in Table UU.2a for the exceptions for this requirement:	
Exception is allowed for 1 % of the envelope area that is subject to the requirements.	
NOTE 1 This exception with respect to the U_{max} values does not imply that these thermal envelope elements may be neglected in the further EPB assessments. All thermal envelope elements shall still be taken into account in all further EPB assessments.	
Designers also should heed the possible impact on indoor environment of any lesser insulated elements (notably the possible consequences of low internal surface temperatures).	
NOTE 2 For regulators, as in the case of some renovations, very small areas may be involved, the 1 % exception rule does not give much leeway for these cases. So, the requirements should be set such that in principle they are feasible for all possible cases, unless other explicit exceptions are defined.	

Tables B.10b, B.11b and B.12b are not applicable because there are no requirements set in Table UU.2b for these EPB features.

Table UU.13b — Numeric indicator used for the requirement on the solar control (see Clause 17)

Application: Works on existing buildings	
Numeric indicator	**Choice**
Solar factor g or g_{tot} or F_{npss} [-]	X
<free text> Other indicator; define*)	Not applicable
…	
* If another indicator is used, it shall be clearly described below. And precise reference shall be made to its definition and its assessment method: **Description in case of other indicator:**	
Not applicable. But note the specific details provided in Table UU.2a for this requirement: Before active cooling is installed in a room of an existing building, all transparent elements shall comply with solar control requirements.	

Table UU.14b is not applicable because there are no requirements set in Table UU.2b for other EPB features.

7 For ISO 52032-1

Annex UU of ISO 52032-1:2021, Energy performance of buildings — Energy requirements and efficiencies of heating, cooling and DHW distribution systems — Part 1: Calculation procedures

Annex UU
(informative)

Input and method selection data sheet — ~~Default~~ U-CERT choices

UU.1 General

The template in this Annex shall be used to specify the choices between methods, the required input data and references to other standards.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 The template in Annex A is applicable to different applications (e.g. the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g. small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a Table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b.

The shaded fields in the tables are part of the template and consequently not open for input.

UU.2 References

The references, identified by the EPB module code number, are given in Table UU.1.

Table UU.1:
Type: References

See Explanation at EN ISO 52000-1, Table UU.1

Table UU.1 — References

Reference	Reference document [a]	
	Number	Title
M1-6	ISO 17772 1	*Energy performance of buildings – Indoor environmental quality – Part 1: Indoor environmental input parameters for the design and assessment of energy performance of buildings*
	EN 16798–1	*Energy performance of buildings — Ventilation of buildings — Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (Module M1–6)*
M1-9	ISO 52000-1	Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures
M2-2	ISO 52016 1	*Energy performance of buildings – Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads – Part 1: Calculation procedures*
M3-1	EN 15316–1	*Energy performance of buildings – Method for calculation of system energy*

Reference	Reference document [a]	
	Number	Title
		requirements and system efficiencies – Part 1: General and Energy performance expression, Module M3–1, M3–4, M3–9, M8–1, M8–4
M3-5	ISO 52031	*Energy performance of buildings — Method for calculation of system energy requirements and system efficiencies — Space emission systems (heating and cooling)*
	EN 15316–2	*Energy performance of buildings – Method for calculation of system energy requirements and system efficiencies – Part 2: Space emission systems (heating and cooling), Module M3–5, M4–5*
M4-1	EN 16798–9	*Energy performance of buildings –Ventilation for buildings – Part 9: Calculation methods for energy requirements of cooling systems (Modules M4-1, M4-4, M4-9) – General*
M4-5	EN 15316–2	See M3–5
M8-1	EN 15316–1	See M3–1
M8-2	EN 12831–3	*Energy performance of buildings – Method for calculation of the design heat load – Domestic hot water systems heat load and characterization of needs, Module M8–2, M8–3*

[a] If a reference comprises more than one document, the references can be differentiated.

[b] Informative

UU.3 Input correlations to the length of pipes in zones (buildings)

UU.3.1 Space heating and space cooling systems

UU.3.1.1 Correlations

For a block building, the length of the pipes for each section is given by Table UU.2 for a two-pipe-system and Table UU.3 for a one-pipe system. If the building has more than one zone, the length, width, floor height and number of floors should be taken into account. In these tables are also included the correlations for surrounding temperatures in each section.

These correlations are valid for the boundary conditions given in UU.3.1.2

Table UU.2:
Type: Less crucial detail for calculation methodology

For this and the following tables it is not always clear if the requested values (Annex A) and given values (Annex B) are assumed to be default values or mandatory values. Therefore it is better to explicitly indicate that the values are **default values** (meaning: the use of more specific values is allowed).

U-CERT Choice: Adopt Table B.2 without changes, but add that the values are intended as default values.

Default values are given in Table UU.2.

Table UU.2 — Two-Pipe-System (see 6.4.8.2)

Values	Result	Unit	Section V (from the generator to the shafts)	Section S (vertical shafts)	Section A (connection pipes)

Mean surrounding temperature	$\theta_{ah;H}$, $\theta_{ah;C}$	°C	13 respectively 20	20	20
Pipe length in case of shafts in outside walls	L_i	m	$2 \times L + 0{,}016\ 25 \times L \times B^2$	$0{,}025 \times L \times B \times H_{fl} \times n_{fl}$	$0{,}55 \times L \times B \times n_{fl}$
Pipe length in case of shafts inside the building	L_i	m	$2 \times L + 0{,}032\ 5 \times L \times B + 6$	$0{,}025 \times L \times B \times H_{fl} \times n_{fl}$	$0{,}55 \times L \times B \times n_{fl}$

Table UU.3:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.3 without changes, but add that the values are intended as default values.

Default values are given in Table UU.3.

Table UU.3 — One-Pipe-System (see6.4.8.2)

Values	Result	Unit	Section V (from the generator to the shafts)	Section S (vertical shafts)	Section A (connection pipes)
Pipe length in case of shafts inside of the building	L	m	$2 \times L + 0{,}032\ 5 \times L \cdot B + 6$	$0{,}025 \times L \times B \times H_{fl} \cdot n_{fl} + 2 \times (L + B) \times n_{fl}$	$0{,}1 \times L \times B \times n_{fl}$

The maximum length L_{max} from the generator to the most distant emission system is given by Table UU.4:

Table UU.4:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.4 without changes, but add that the values are intended as default values.

Default values are given in Table UU.4.

Table UU.4 — Maximum length L_{max} (see 6.4.8.2)

Parameter	Symbol	Unit	Formula
Maximum length from the generator to the most distant emission system	L_{max}	m	$L_{max} = 2 \cdot \left(L + \frac{B}{2} + n_{fl} \cdot H_{fl} + l_c \right)$ (UU.1) where l_c [m] 10 m for two-pipe distribution systems; $L + B$ for one-pipe distribution systems.

UU.3.1.2 Boundary conditions

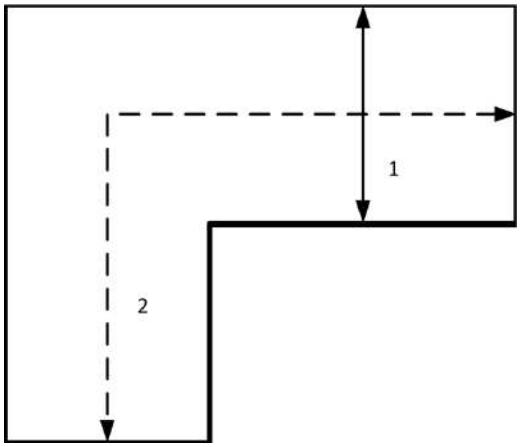
NOTE This subclause is open for free text.

Clause UU.3.1.2:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Clause 3.1.2 without changes, but add that the procedure is intended as default procedure.

Correlations (Table UU.3, Table UU.4 and Formula UU.1) ~~are valid~~ may be used as default procedures if the shape of the building is rectangular.

For the following shapes length and width are measured according to schemes in Figure UU.1.



Key

1 *B*

2 *L*

Figure UU.1 — Use of correlations Table UU.3, Table UU.4 and Formula (UU.1) with special building shape

For other shapes, correlations cannot be used and the length of the pipes shall be determined specifically.

UU.3.2 Domestic hot water systems

UU.3.2.1 Correlations

Table UU.5:
Type: Less crucial detail for calculation methodology

The term “default values” is indeed intended to present default values, so the term “default values” shall not be replaced by “U-CERT values”
(in contrast to the situation in Annex B where “default” means: a suggestion for mandatory national values).

U-CERT Choice: Adopt Table B.5 without changes, but add “default” in the text.

For a block building, the default length of the pipes for each section is given by the Table UU.5. In this table are also included the correlations for surrounding temperatures in each section.

These correlations are valid for the boundary conditions given in UU.3.2.2.

Table UU.5 — Default values for calculation of thermal losses from DHW circulation loop and DHW distribution pipes (see6.4.8.3)

Parameters	Symbol	Unit	Section L_V	Section L_S	Section L_A
Ambient temperature outside the heating period	$\theta_{ah,w}$	°C	22 °C		
Ambient temperature	$\theta_{ah,w}$	°C	13 °C in an unheated space and 20 °C in a heated space	20 °C in a heated space	
Length of circulation loop	L	m	$2 \cdot L + 0{,}012\,5 \times L \times B$	$0{,}075 \times L \times B \times n_{fl} \times H_{fl}$	—
Length of main distribution pipe	L	m	$L + 0{,}062\,5 \times L \times B$	$0{,}038 \times L \times B \times n_{fl} \times H_{fl}$	—
Length of individual branching pipe, only for transfer into adjacent rooms with a common installation wall	L	m	—	—	$0{,}05 \times L \times B \times n_{fl}$
Length of individual branching pipe, for all other cases	L	m	—	—	$0{,}075 \times L \times B \times n_{fl}$

The maximum length L_{max} from the boiler or storage tank to the most distant tap is given by Table UU.6:

Table UU.6:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.6 without changes, but add that the formula is intended as default formula.

Default values are given in Table UU.6.

Table UU.6 — Maximum length L_{max} (see6.4.8.3)

Parameter	Symbol	Unit	Formula
Maximum length from the boiler or storage tank to the most distant tap	L_{max}	m	$L_{max} = 2 \cdot L + 2{,}5 + n_{fl} \cdot H_{fl}$ [m] (UU.2)

UU.3.2.2 Boundary conditions

NOTE This subclause is open for free text.

Clause UU.3.2.2:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Clause 3.2.2 without changes, but add that the procedure is intended as default procedure.

Correlations (Table UU.6 and Formula UU.2) ~~are valid~~ may be used as default procedures if the shape of the building is rectangular.

For the following shapes length and width are measured according to schemes in 6.4.8.3, Figure 2.

For other shapes, correlations cannot be used and the length of the pipes shall be determined specifically.

UU.4 Input correlations to linear thermal transmittance of pipes in zones (buildings)

UU.4.1 General

Thermal losses of distribution subsystems are calculated by summing the losses of each homogeneous section according to the specific formulae (see6.4.3). This clause identifies:

— Typical values of linear thermal transmittance of pipes in each section.

UU.4.2 Network for space heating, space cooling and domestic hot water systems

UU.4.2.1 Sections

The type of network, shown in6.4.8, Figure 1 and Figure 2, is divided in the following sections:

— **A**: connection of radiators to vertical shafts;

— **S**: vertical shafts;

— **V**: base distributor/collector.

UU.4.2.2 Input data to the correlation

There are no special input data required.

UU.4.2.3 Correlations

Table UU.7:
Type: Less crucial detail for calculation methodology

The term “default values” is indeed intended to present default values, so the term “default values” shall not be replaced by “U-CERT values”
(in contrast to the situation in Annex B where “default” means: a suggestion for mandatory national values).

U-CERT Choice: Adopt Table B.7 without changes.

For each section of the network default values for the linear thermal transmittance of pipes are given in Table UU.7 depending on the age or the class of the building.

Table UU.7 — Typical values of linear thermal transmittance of pipes for new and existing buildings

	Ψ [W/mK]		
Age/class of building	**Section L_V**	**Section L_S**	**Section L_A**
From 1995 – assumed that insulation thickness is approximately equal to the pipe external diameter	0,2	0,3	0,3
1980 to 1995 – assumed that insulation thickness is approximately equal to half of the pipe external diameter	0,3	0,4	0,4

	Ψ [W/mK]		
Up to 1980	0,4	0,4	0,4
Non-insulated pipes exposed			
A ≤ 200 m^2	1,0	1,0	1,0
200 m^2 < A ≤ 500 m^2	2,0	2,0	2,0
A > 500 m^2	3,0	3,0	3,0
Non-insulated pipes installed in external walls		total/usable [a]	
External wall non-insulated		1,35 / 0,80	
External wall with external insulation		1,00 / 0,90	
External wall without insulation but characterized by a low thermal transmittance (U = 0,4 W/m^2K)		0,75 / 0,55	

[a] Total = total thermal losses of the pipe, usable = recoverable thermal losses.

Table UU.8:
Type: Less crucial detail for calculation methodology

The phrasing in Table B.8 ("mostly used value") clearly shows that the value is intended as default value.

U-CERT Choice: Adopt Table B.8 without changes, but add that the values are intended as default values.

~~The~~ A default value for the outer total surface coefficient of heat transfer (convection and radiation) h_a, is given by Table UU.8:

Table UU.8 — Outer total surface coefficient of heat transfer h_a (see6.4.3)

Parameter	Symbol	Unit	Value
Outer total surface coefficient of heat transfer (convection and radiation)	h_a	W/(m^2K)	~~mostly used value:~~ 8

UU.5 Input correlations to constants for distribution pumps

UU.5.1 General

The calculation of the auxiliary energy of distribution pumps depends on the expenditure energy factor of distribution pumps $\varepsilon_{X;dis}$. The influence of the control system is characterized by constants based on a unique efficiency curve of pumps.

UU.5.2 Constants for the calculation of the expenditure energy factor of distribution pumps

Table UU.9:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.9 without changes, but add that the values are intended as default values.

Default values for the ~~The~~ constants are given in Tables UU.9 to UU.11 corresponding to the identifier HEAT_DISTR_CTRL_PMP.

Table UU.9 — Constants C_{P1} and C_{P2} for space heating distribution pumps (see6.4.5)

Pump control *HEAT_DISTR_CTRL_PMP*	C_{P1}	C_{P2}
0 = uncontrolled	0,25	0,75
3 = Δp_{const}	0,75	0,25
4 = $\Delta p_{variable}$	0,90	0,10

Table UU.10:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.10 without changes, but add that the values are intended as default values.

Default values are given in Table UU.10.

Table UU.10 — Constants C_{P1} and C_{P2} for space cooling distribution pumps (see6.4.5)

Pump control *HEAT_DISTR_CTRL_PMP*	C_{P1}	C_{P2}
0 = uncontrolled	0,25	0,75
3 = controlled	0,85	0,15

Table UU.11:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.11 without changes, but add that the values are intended as default values.

Default values are given in Table UU.11.

Table UU.11 — Constants C_{P1} and C_{P2} for DHW distribution circulation pumps (see6.4.5)

Pump control *HEAT_DISTR_CTRL_PMP*	C_{P1}	C_{P2}
0 = uncontrolled	0,25	0,94
3 = controlled	0,50	0,63

UU.6 Input correlations to additional resistances and resistance ratio

UU.6.1 Introduction

The calculation of the auxiliary energy of distribution pumps depends on the differential pressure of a pipe system $\Delta p_{HC;,des}$. The additional resistances can be calculated by a simplified method taking into account a resistance ratio or by adding additional typical resistances.

UU.6.2 Network for space heating, space cooling and domestic hot water systems

UU.6.2.1 Correlations for pressure loss per length

Table UU.12:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.12 without changes, but add that the values are intended as default values.

Default values are given in Table UU.12.

Table UU.12 — Pressure loss per length (see6.4.5)

Pressure loss per length[a]	R [kPa/m]
Standard networks in buildings	0,10
Networks in buildings with swaged sockets	0,15
District heating/cooling networks between buildings	0,20
a Rows may be changed and additional rows may be added for alternative network descriptions	

UU.6.2.2 Correlations for resistance ratio

To take into account all the resistances of components within the network (i.e. valves, flanges, fittings) the factor f_{comp} can be set depending on network design. A common assumption is given in Table UU.13.

Table UU.13:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.13 without changes, but add that the values are intended as default values.

Default values are given in Table UU.13.

Table UU.13 — Resistance ratio (see6.4.5)

Resistance ratio	f_{comp} [-]
for common networks	0,3
for networks with many changes of direction	0,4

UU.6.2.3 Correlations additional resistances

Table UU.14:
Type: Less crucial detail for calculation methodology

Should “can” not be “may”?

U-CERT Choice: Adopt Table B.14 without changes, but add that the values are intended as default values.

To take into account the resistances of components at the start and end of the network (i.e. emitter, generator) default values for the Δp_{add} ~~can~~ may be taken from Table UU.14.

Table UU.14 — Additional resistances (see6.4.5)

Type of resistance[a]		Δp_{add} [kPa]
Type of Emitter		
Radiator		2
Floor heating system		4,5
Heat meter		10,0
Type of heat generator		
Generator with water content > 0,15 l/kW		1
Generator with water content ≤ 0,15 l/kW	$\Phi_{H,out;max}$ < 35 kW	$20 \cdot \left(\dot{V}_{des} \right)^2$
	$\Phi_{H,out;max}$ ≥ 35 kW	80
a Rows may be changed and additional rows may be added for other types		

UU.6.2.4 Correlations correction factor of the distribution system

Table UU.15:
Type: Less crucial detail for calculation methodology

Should “can” not be “may”?

U-CERT Choice: Adopt Table B.15 without changes.

The largest correction factor for special design conditions of the distribution system, $f_{HCW;corr}$ is the hydraulic balance. But in special cases the factor for the hydraulic balance ~~can~~ may by multiplied with a special factor. See Table UU.15.

Table UU.15 — Factors for hydraulic balance (see Error! Reference source not found.**6.4.5)**

Factor	
Correction factor for special design conditions of the distribution system, $f_{HCW,corr}$	$f_{HCW,corr} = f_{HB} \cdot f_{special}$
Factor for hydraulic balance of the network, f_{HB}	
Balanced	1,00
Not balanced	1,15
Special factor, $f_{special}$	1

UU.7 Correlations factor for recoverable auxiliary energy

Table UU.16:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.16 without changes, but add that the values are intended as default values.

Default values are given in Table UU.16.

Table UU.16 — Factor for recoverable auxiliary energy (see6.4.7)

Factor for recoverable auxiliary energy	$f_{aux,rbl}$
Pump with insulation	0,10
Pump without insulation	0,25
Pump (dry running meter)	1,00

UU.8 Input data - Energy efficiency index of real water-pumps

Table UU.17:
Type: Less crucial detail for calculation methodology

U-CERT Choice: Adopt Table B.17 without changes, but add that the value is intended as default value.

The procedure for assessing the energy efficiency index, *EEI*, for real pumps is given in Table UU.17.

Table UU.17 — Energy efficiency index *EEI* for real pumps (see6.4.5)

Energy efficiency index	*EEI*
Measurement procedures	EU regulation Nr. 622/2012
Standard value(s)	
- for distribution pumps in heating circuits (default value)	0,23
a Rows may be changed and additional rows may be added for other types	

8 For EN 15316-4-2 (outdated)

Annex UU of EN 15316-4-2:2017, Energy performance of buildings - Method for calculation of system energy requirements and system efficiencies - Part 4-2: Space heating generation systems, heat pump systems, Module M3-8-2, M8-8-2,

with EN 15316-4-2:2017/AC, Oct. 2017

Grey shading:

Concerning Annex B as basis for Annex UU for EN 15316-4-2:

In this U-CERT document, the cells in the tables have been grey shaded when it is part of the template of Annex A.

In one or two cases also the text between the tables is grey shaded, when it has to be made clear what is part of the template (Annex A) and what has been added in Annex B.

So only the non-shaded elements are allowed to be edited to stay in line with the standard (in casu: in line with the normative template of Annex A). and what has been added in Annex B (and adopted or changed in this U-CERT National Datasheet).

The common Clause A.1/B.1 (General) is absent in this standard.

The common Clause A.2/B.2 (References) is also absent in this standard.

Moreover, in several Clauses the format of the Table in Annex B differs from the format of the corresponding table in Annex A…… Also the surrounding text is sometimes different in such a way that it may lead to different interpretations. In these cases the original text from Annex A has been (re-)introduced, by using blue font, with the text from Annex B in blue font-strike-through, which is in accordance with the colour codes used throughout this document to indicate deviations from Annex B.

Disclaimer:

Because neither Annex A nor Annex B of this standard contains any shading of cells in the tables, it was not always fully clear whether the texts in the tables are examples of normative texts.

!! Revised version in preparation; see next section: For prEN 15316-4-2:2022

A revised version of this standard (EN 15316-4-2:2017) is in preparation:
draft, **prEN 15316-4-2:2022**.

That is good news for the preparation of National Annexes / National Datasheets, because many of the Tables in Annex A and Annex B of EN 15316-4-2:2017 are not about national choices and are not well-edited. See explanation on the next pages.

Consequently, the effort has been repeated on this new version as soon as the draft version was available. See next chapter.

It is advised to ignore this section on EN 15316-4-2:2017
and to use the new prEN 15316-4-2:2022 instead. ***Link:*** For prEN 15316-4-2:2022

Nevertheless, we should keep the explanation given here on the 2017 version for the record, because this explanation may help the review of some of the improvements in the new draft.

Annex UU
(informative)

~~Default~~ U-CERT values

See introduction to this section:
it is advised to skip this section on EN 15316-4-2:2017 and to use the prEN 15316-4-2:2022 version instead (next section)

GENERAL, on EN 15316-4-2

All choices in Annex B are "**default**", so the use of the term "default" in Annex B is confusing, unless the term "default" is also used in Annex A.
Otherwise, the term "default" needs to be replaced by "U-CERT".

UU.1 Heat pump description data

UU.1.1 Heat pump type and use

UU.1.1.1 Heat pump

Table UU.1 and surrounding text:
Type: Other (just default example?!)

Has nothing to do with a national choice….
It is just a qualitative description of the heat pump.

In the revised version, prEN 15316-4-2: 2021 this is not even an option: which source and sink and technologies are covered is embedded in the normative text.
In the revised version, prEN 15316-4-2, this table does not exist anymore: the user will specify independently source, sink and technology of her/his heat pump among available options.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A

U-CERT Choice: changes as explained in this explanation box and add sentence to Table B.1: "No national choice involved."

The identifier for the heat pump type (HP_TYPE) is selected from data in Table A.1.
~~The default value for the heat pump type is~~

Table UU.1 — Identifiers for Heat pump type- HP type

~~**Identifiers for Heat pump type**~~

Code	Selection~~Default Value~~
HP_TYPE_ AIR_WATER	HP_TYPE_AIR_WATER
HP_TYPE_WATER_WATER	--
HP_TYPE_BRINE_WATER	--

There is no national choice involved in Table UU.1.

UU.1.1.2 Type of energy use (services)

Table UU.2 and surrounding text:
Type: Other (just default example?!)

Has nothing to do with a national choice….
These are just possible inputs to describe your heat pump.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A

U-CERT Choice: changes as explained in this explanation box and add sentence to Table B.2: "No national choice involved."

The identifier for the heat pump end use energy (HP_USE) is selected ~~form~~from data in Table A.2.~~The default value for the type of use is indicated in Table B.2~~

Table UU.2 — Identifiers for heat pump use HP_USE

Code	Meaning	Selection~~Default value~~
HP_USE_H	Space heating	HP_USE_H_W
HP_USE_W	Domestic hot water	
HP_USE_STO	Heating storage	
HP_USE_ALL	All uses	

NOTE The codes for the services are the subscripts defined in the overarching standard.

There is no national choice involved in Table UU.2.

UU.1.1.3 Heat pump fuel

Table UU.3 and surrounding text:
Type: Other (just default example?!)

Has nothing to do with a national choice….
These are just a list of acceptable energy carriers that shall be consistent with EN ISO 52000-1.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A

U-CERT Choice: changes as explained in this explanation box and add sentence to Table B.3: "No national choice involved."

The identifier for the heat pump fuel (HP_FUEL) is selected from Table A.3. ~~The default value for the type of fuel used is indicated in Table B.3.~~

Table UU.3 — Identifiers for fuel type

Code	Meaning	Selection~~Default value~~
HP_FUEL-EL	Electricity	HP_FUEL_EL
HP_FUEL_GAS	Natural gas	
HP_FUEL_LPG	Liquid gas	
HP_FUEL_OIL	Oil	

HP_FUEL_BM	Biomass	
HP_FUEL_OTH	Other	

NOTE The codes for the fuels are the subscripts defined in the overarching standard.

There is no national choice involved in Table UU.3.

UU.1.1.4 CE-marking

Table UU.4 and surrounding text:
Type: Other (just default example?!)

Has nothing to do with a national choice….
These are just the possible values to describe your heat pump.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A

U-CERT Choice: changes as explained in this explanation box and add sentence to Table B.4: "No national choice involved."

The identifier for CE marking is selected from Table A.4.~~The default choice for CE marking is given in Table B.4~~

Table UU.4 — Identifiers for CE-marking

Code	Meaning	Selection~~Default value~~
HP_CE-YES	HP is CE marked	**HP_CE_YES**
HP_CE-NO	HP is not CE marked	

There is no national choice involved in Table UU.4.

UU.1.1.5 Information for back-up system

Table UU.5 and surrounding text:
Type: Other (just default example?!)

Has nothing to do with a national choice….
These are just a list of acceptable energy carriers that shall be consistent with EN ISO 52000-1.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A

U-CERT Choice: changes as explained in this explanation box and add sentence to Table B.5: "No national choice involved."

The identifier for the fuel used for back-up (HP_FUEL) is selected from Table A.5 ~~The default choice for the fuel used for back-up (HP_FUEL) is given in Table B.5~~

Table UU.5 — Identifiers for back up fuel type

Code	Meaning	Selection

HP_FUEL-BU_EL	Electricity	~~Electricity~~ HP_FUEL_BU_EL
HP_FUEL_BU_GAS	Natural gas	
HP_FUEL_BU_LPG	Liquid gas	
HP_FUEL_BU_OIL	Oil	
HP_FUEL_BU_BM	Biomass	
HP_FUEL_BU_OTH	Other	

There is no national choice involved in Table UU.5.

UU.1.2 Heat pump technical data

UU.1.2.1 Heat pump output at full load (nominal)

Table UU.6 and surrounding text:
Type: Other (just default example?!)

Has nothing to do with a national choice….
These are just the assumed input data for the calculation example.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A

U-CERT Choice: changes as explained in this explanation box and add sentence to Table B.6: "No national choice involved."

Technical information ~~are~~ is reported according to Table A.6.

NOTE Depending of the type of standard used to establish the performance of the heat pump (EN 14825, the EN 14511 series or the EN 12309 series), ~~Table A.5~~ Table A.6 may not be fully filled.

~~The default values for the heat pump technical data are indicated in Table B.6.~~

Table UU.6 – Heat pump technical data

Characteristics	Symbol	
[in Table A.6, not in Table B.6]Standard used		EN ????
Thermal capacity at standard rating conditions at full load	$\Phi_{gen;\ ref,1}$	12
COP at standard rating conditions at full load	$COP_{gen,ref,1}$	3
Energy input at standard rating conditions at full load	$E_{gen;ref,1}$	4
Inlet temperature at standard rating conditions at full load	$\vartheta_{gen;in;ref,1}$	7
Temperature spread at the evaporator for standard rating conditions at full load	$\Delta\vartheta_{gen;in;ref,1}$	10
Outlet temperature at standard rating conditions at full load	$\vartheta_{gen,out,ref,1}$	45
Temperature spread at the condenser for standard rating conditions at full load	$\Delta\vartheta_{gen;out;ref,1}$	5
Load factor at conditions 1	LR_1	1

Thermal capacity at standard rating condition 2	$\Phi_{gen;\ ref,2}$	12
COP at standard rating condition 2	$COP_{gen,ref,2}$	3
Energy input at standard rating condition 2	$E_{gen;ref,2}$	4
Inlet temperature at standard rating condition 2	$\vartheta_{gen;ref,2}$	-7
Outlet temperature at standard rating condition 2	$\vartheta_{gen,out,ref,2}$	45
Load factor at conditions 2	LR_2	1
Thermal capacity at standard rating condition 3	$\Phi_{gen;\ ref,3}$	12
COP at standard rating condition 3	$COP_{gen,ref,3}$	3
Energy input at standard rating condition 3	$E_{gen;ref,3}$	4
Inlet temperature at standard rating condition 3	$\vartheta_{gen;ref,3}$	-7
Outlet temperature at standard rating condition 3	$\vartheta_{gen,out,ref,3}$	45
Load factor at conditions 3	LR_3	1
Thermal capacity at standard rating condition 4	$\Phi_{gen;\ ref,4}$	12
COP at standard rating condition 4	$COP_{gen,ref,4}$	3
Energy input at standard rating condition 4	$E_{gen;ref,4}$	4
Evaporator Inlet temperature at standard rating condition 4	$\vartheta_{gen;ref,4}$	-7
Outlet temperature at standard rating condition 4	$\vartheta_{gen,out,ref,4}$	45
Load factor at conditions 4	LR_4	1
Degradation coefficient	C_{cd}	1
Part of the electrical power to operate the heat pump (auxiliaries)	$f_{gen,Pn,aux,int}$	0,02
Power of auxiliary	$P_{gen,aux}$	0,24
Minimum value of the part load ratio consider for balancing ON_OFF mode to modulating mode for inverter technology	$LR_{cont,min}$	0,2
[in Table A.6, not in Table B.6]Time constant for the ON-OFF operation	τ_{eq}	?
[Not in Table A.6]Corrective factor depending on the load factor	$f_{gen,LR;cont;min}$	1
[Not in Table A.6]Corrective factor depending on thermal gains	$f_{H;rvd}$	1

There is no national choice involved in Table UU.6.

!! The following text is from Annex B, not from Annex A!

The heat pump thermal capacity at full load Φ_{Pn} shall be the value declared by the manufacturer.

Table UU.6 shall be adapted, depending of the standard used for the heat pump characteristics.

UU.1.2.2 Weighting factor for adaptation of the COP to the operating conditions

Table UU.7 and surrounding text:
Type: Less crucial detail for calculation methodology

These could be a national option. You might have different correction factors to generate a performance map using a reduced data-set for special types of heat pumps.
These values are kept the same in the revised version, prEN 15316-4-2:2022, except that some bugs were corrected.

Note that the shading in Table A.7/Table B.7 has apparently a different meaning as the general convention for the shaded cells in Annex A/B for all EPB standards. Therefore we have changed it from grey to light blue.

Note that the sentence above tells that (informative) Annex C is applicable as national choice.

U-CERT Choice: update the values (but better: replace EN 15316-4-2:2017 by prEN 15316-4-2:2022, see next chapter

The following Table A.7 is filled for each type of heat pump. ~~The default values for weighting factor used to adapt the COP depending of the operating conditions are presented in Table B.7.~~ Annex~~e~~ C presents weighting factors for other types of heat pumps.

These weighting factors may be used to generate a performance map using a reduced data-set for special types of heat pumps.

Table UU.7 – Air-Water heat pumps - Weighting factors for calculation of the COP

	$\Delta\theta_{in;ref}$	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	
Evaporator	ϑ_{in}	−15 °C	−15 °C	−7 °C	2 °C	7 °C	20 °C	20 °C	20 °C	
	Weighting factor $f_{COP,\vartheta_{in}}$	1	0,8	0,5	0,8	1	1,25	1	1,0	
	$\Delta\theta_{out;ref}$	3	3	5	5	8	10			
Condenser	ϑ_{out}	25	25	35	45	55	60			
	Weighting factor $f_{COP,\vartheta_{out}}$	1	1,1	1	0,8	0,8	0,8			

UU.1.2.3 Weighting factor for adaptation of the thermal capacity to the operating conditions

Table UU.8 and surrounding text:
Type: Less crucial detail for calculation methodology

These could be a national option. You might have different correction factors to generate a performance map using a reduced data-set for special types of heat pumps.
These values were kept the same in the revised version, prEN 15316-4-2:2022, except that some bugs were corrected.

Note that the shading in Table A.7/Table B.7 has apparently a different meaning as the general convention for the shaded cells in Annex A/B for all EPB standards. Therefore we have changed it from grey to light blue.

Note that the sentence above tells that (informative) Annex C is applicable as national choice.

U-CERT Choice: update the values (but better: replace EN 15316-4-2:2017 by prEN 15316-4-2:2022, see next chapter

The following Table A.8 is filled for each type of heat pump. ~~The default value for weighting factor used to adapt the COP depending of the operating conditions are presented in Table B.8.~~ Annexe C present weighting factors for other types of heat pumps.

These weighting factors may be used to generate a performance map using a reduced data-set for special types of heat pumps.

Table UU.8 – Air-Water heat pumps - Weighting factors for calculation of the thermal capacity at full load

Evaporator	$\Delta\vartheta_{in;ref}$	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	
	ϑ_{in}	-15 °C	-15 °C	-7 °C	2 °C	7 °C	20 °C	20 °C	20 °C	
	Weighting factor $f_{Pn,\vartheta_{in}}$	1	0,92	0,86	0,95	1	1,13	1	1	
Condenser	$\Delta\vartheta_{out;ref}$	3	3	5	5	8	10			
	ϑ_{out}	25	25	35	45	55	65			
	Weighting factor $f_{Pn,\vartheta_{out}}$	1	1,09	1	0,9	0,915	0,91			

UU.1.2.4 Auxiliary

Table UU.9 and surrounding text:
Type: Less crucial detail for calculation methodology

The values are intended as default values: share of nominal input for auxiliaries. It determines the correction for part load in path A.
Is also available in the revised version, prEN 15316-4-2:2022.

NOTE: In Table A.9 the two values are already filled in. Is this a mistake?

U-CERT Choice: adopt Table B.9 and surrounding text without changes

Information for auxiliary is given according to Table A.9. ~~The default data for auxiliary are presented in Table B.9.~~

Table UU.9— Calculation factor for auxiliary energy ~~Calculation factor for auxiliary energ~~y

	Electrically driven heat pump	Combustion engine driven heat pumps
$f_{gen,Pn,aux,int}$	0,0	0,015

UU.1.3 Operation at part load

Table UU.10 and surrounding text:
Type: Less crucial detail for calculation methodology

Default correction profile for ON-OFF absorption heat pumps.
Is kept unchanged in the revised version, prEN 15316-4-2:2022.

It's important because most operation of heat pumps is at part load.

Note that there are two choices to be filled in outside the Table. We have grey shaded the text that belongs to the template of Annex A.

U-CERT Choice: adopt Table B.10 and surrounding text, but make clear that the values are intended as default values

The calculation of energy delivered at part load is based on physical characteristics of the heat pump which shall be obtained from the test results at part load (EN 14825) based on values from the EN 14511 series.

~~Default values are~~The following default values may be used:

$f_{LR\text{cont;min}}$ ~~$LR_{\text{cont;min}}$~~ = 1 for ON-OFF technology (HP_ONOF)

$f_{LR\text{cont;min}}$ ~~$LR_{\text{cont;min}}$~~ = 0,2 for inverter technology (HP_TECH)

For combustion engine driven heat pump the following tables are ~~table is~~ used (default values)

Table UU.10 — f_{LR} for on-off absorption heat pumps

LR	0,10	0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90	1,00
f_{LR}	0,68	0,77	0,84	0,89	0,92	0,95	0,97	0,99	1,00	1,00

Table UU.11 and surrounding text:
Type: Less crucial detail for calculation methodology

Default correction profile for modulating absorption heat pumps.
Is kept unchanged in the revised version, prEN 15316-4-2:2022.

It's important because most operation of heat pumps is at part load.

Note that there are two choices to be filled in outside the Table. We have grey shaded the text that belongs to the template of Annex A.

U-CERT Choice: adopt Table B.11 and surrounding text, but make clear if values are intended as default values

The following default values may be used:

Table UU.11 — f_{LR} for modulating absorption heat pumps

LR	0,10	0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90	1,00
f_{LR}	0,72	0,81	0,88	0,93	0,97	0,99	1,00	1,00	1,00	1,00

UU.2 System design data

UU.2.1 Factors for emitters

Table UU.11bis: duplicate numbering Table UU.11 in both Annex A and in Annex B. So we added "bis"
Type: Less crucial detail for calculation methodology

It is a default value (also in Annex A the phrase "default values" is used), intended for ON-OFF operation in path A.
Is kept unchanged in the revised version, prEN 15316-4-2:2022.

U-CERT Choice: adopt Table B.11bis with only editorial changes

The default values for the time constant of the emitters ~~is~~ are given below in Table UU.11bis.

Table UU.11bis — Identifiers for heat pump inertia and associated emitters

Code	Meaning	Value (s)
TAU_EQ	Inertia of the heat pump	30
TAU_OUT_EM_TYPE_H	Medium	1920
TAU_OUT_EM_TYPE_W	Domestic hot water	1560
TAU_OUT_EM_TYPE_STO	Storage	1560

UU.2.2 Factors for energy recovery

Table UU.12:
Type: Less crucial detail for calculation methodology

Default values (also in Annex A the term "default" is used), but not relevant.
This module will only state how much are the total losses and in which thermal zone they occur, so that they are possibly taken into account into the energy needs calculation.

U-CERT Choice: adopt Table B.12 without changes

The default values for energy recovery are listed in Table UU.12

Table UU.12 - Factors for energy recovery

Description	Label	Default value
Recoverable fraction of stand-by losses	$f_{gen,env}$	0,50
Recovered fraction of heat losses for auxiliary	$f_{gen,aux,ls,rvd}$	0,25
Recoverable fraction of heat losses for auxiliary	$f_{rbl,aux}$	0,75
part of the nominal electrical power transmitted to the distribution sub-system	$f_{gen,aux,ls}$	0,75
Recovery factor to the ambient	b_{gen}	0,70

UU.2.3 Control type

Table UU.13 and surrounding text:
Type: Other (Just a listing)

Has nothing to do with a national choice.
Just a list of which types of data are needed for operation.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A. On the other hand, in Table A.13 (here in blue font) the content of the first and second columns is mixed up.
Also unclear if the first and second column should be grey (=part of template) or not?

U-CERT Choice: add sentence to Table B.13 and surrounding text: "No national choice involved."

The type of power control for the heat pump and back up are identified in Table A.13.
Identifier code: HP_CTRL_POW ~~The default values for the type of control are listed in Table B.13.~~

Table UU.13 — Identifiers for control type

Code	Meaning	~~Default~~ Value
Single stage control (ON-OFF)	HP_CTRL_POW_ONOF	0 ; 1 ; 2
Back-up authorization	HP_CTRL_POW_BU_0_1_2	0 ; 1 ; 2
Back-up single stage control ON-OFF	P_CTRL_POW_BU_ONOF	0 or 1
Factor for reduced mode	f_ctrl	[0 ; 1]
Factor for recovered energy	f_H_rvd	[0 ; 1]
HP_CTRL_POW_0	Outlet temperature constant	0
HP_CTRL_POW_BU	Back-up authorization	1

There is no national choice involved in Table UU.13.

UU.2.4 System design data

Table UU.14:
Type: Other (Nothing to choose!)

Has nothing to do with a national choice.

This Table has been abolished in the revised version, prEN 15316-4-2:2022

Table A.14 is identical to Table B.14, so there is no choice at all….
In Table A.14/Table B.14 the content of the first and last columns is evidently mixed up (kept uncorrected here)

U-CERT Choice: add sentence to Table B.14: “No national choice involved.”

The data for design of the heat pump system are identified in Table A.14.

Table UU.14 — Identifiers for design temperatures

Code		Meaning
Design temperature	ϑ_{dgn}	HP_THETA_DGN
Bivalent temperature	ϑ_{biv}	HP_THETA_BIV
Operative limit temperature	ϑ_{TOL}	HP_THETA_TOL
Maximum Operating temperature	$\vartheta_{OL;max}$	HP_THETA_OL_MAX
Maximum temperature for back up	$\vartheta_{BU,max}$	HP_THETA_BU_MAX
Minimum temperature for back-up	$\vartheta_{BU,min}$	HP_THETA_BU_MIN

There is no national choice involved in Table UU.14.

UU.2.5 Localization

Table UU.15 and surrounding text:
Type: Other (just an example!)

Has nothing to do with a national choice.
This option will rather be: in which of the thermal zones in the building is the heat pump located.

Note that the format and text of Annex B differs from Annex A, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A. On the other hand, in Table A.15 (here in blue font) the content of the first and second columns is evidently mixed up (kept uncorrected here).

U-CERT Choice: add sentence to Table B.15: "No national choice involved."

The identifier for the location of the heat pump is identified in Table A.15. ~~The default value for the location of the heat pump is presented in Table B.15.~~

Table UU.15 — Identifiers for heat pump localization

Code	Meaning
Boiler room HP_LOC_BLR	HP_LOC_BOIL Boiler room
Unconditioned space	HP_LOC_UNC
External room	HP_LOC_EXT

There is no national choice involved in Table UU.15.

UU.2.6 Control of priority

Table UU.16 and surrounding text:
Type: Other (just an example!)

Has nothing to do with a national choice….
It describes the priority between services. In practice DOMESTIC HOT WATER first, then heating.

Note that the content of Table B.16 differs from Table A.16, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A.

U-CERT Choice: add sentence to Table B.16 and surrounding text: "No national choice involved."

The priority between the different subsystems is made according to Table A.16. ~~The default values for prioritising the energy subsystems are given in Table B.16.~~

Table UU.16— Priority levels for sub-systems ~~Identifiers for priority~~

Code	Value
GEN_PRIO_H ~~HP_CTRL_PRIO_H~~	2
GEN_PRIO_STO ~~HP_CTRL_PRIO_STO~~	3
GEN_PRIO_W ~~HP_CTRL_PRIO_W~~	1

There is no national choice involved in Table UU.16.

UU.3 Operating conditions

UU.3.1 Input for method A and method B

Table UU.17 and surrounding text:
Type: Other (just an example!)

Has nothing to do with a national choice….
This list, without values, should be in the core text of the standard, with values per individual project.

Note that the content of Table B.16 differs from Table A.16, which makes it impossible to use Annex B as basis for the choice. The changes made here, in comparison with Annex B (so: in blue font), show what the text is in Annex A.

U-CERT Choice: add sentence Table B.17 and surrounding text: "No national choice involved."

The priority between the different subsystems is made according to Table A.17. ~~Table B.17 presents default values for the operating conditions Operating conditions~~

Table UU.17 - Operating conditions data list

Name	Symbol	Unit	Value	Origin Module
Operating conditions				
Heat output to the heating distribution sub-systems	$Q_{H,gen,out}$	kWh	5	M3-1
Required flow temperature for heating	$\vartheta_{H;gen;,flw}$	°C	45	M3-6
Heat output to the DHW distribution sub-system(s)	$Q_{W;gen;dis;out}$	kWh	3	M3-6
Required flow temperature for domestic hot water	$\vartheta_{W;gen;,flw}$	°C	55	M8-6
Heat output to the storage sub-system(s)	$Q_{sto;gen;dis;out}$	kWh	0	M3-6
Required flow temperature for storage	$\vartheta_{sto;gen,,flw}$	°C	55	M8-6
Temperature difference at the inlet side (evaporator)	$\Delta\vartheta_{H;in}$	K	3	Local
Temperature difference at the outlet side (condenser)	$\Delta\vartheta_{H,out}$	K	5	M3-6
Calculation interval	t_{ci}	h	1	M1-9
Ambient temperature	$\vartheta_{H,amb}$	K	16	M3-6
External temperature of the calculation interval	ϑ_{ext}	°C	12	M1-13

There is no national choice involved in Table UU.17.

UU.3.2 ~~Additional input for method B~~ Additional input data for monthly and annual calculation

Table UU.18A and surrounding text:
Type: Other (just an example!)

Has nothing to do with a national choice….
Besides: Climatic data is not a topic of this standard.

Note that the Title of B.3.2 and format and content of Table B.18 differs from Title of A.3.2 and format and content of Table A.18, which makes it impossible to use Annex B as basis for the choice.
The two versions are shown below successively: Table UU.18A and Table UU.18B.
In the end: if we choose hourly calculations, this Clause is not relevant anyway….

U-CERT Choice: add sentence to Table B.18A and surrounding text: "No national choice involved."

Table UU.18A - Structure of weather data applicable to monthly or annual calculation

	Number of hours within the class of temperature												
External Temperature ϑ_{ext} - °C	01	02	03	04	05	06	07	08	09	10	11	12	sum
$\vartheta_{ext;min}$:													
$\vartheta_{ext;j}$				NB_xx_ϑ_{ext}									
$\vartheta_{ext;max}$													

NB_XX_$\vartheta_{ext;I}$ is the number of hours in month MM or per year when the temperature ϑ_{ext} is comprised equal or superior to $\vartheta_{ext;I}$ and lower than $\vartheta_{ext;i+1}$.

There is no national choice involved in Table UU.18A.

Table UU.18B and surrounding text:
Type: Other (just an example!)

Has nothing to do with a national choice….
Besides: hourly calculation and not BIN calculation is chosen.

U-CERT Choice: add sentence to Table B.18B and surrounding text: “Not relevant for hourly calculation method”

Table UU.18B presents additional input data to be used for annual calculation.

Table UU.18B - Example of weather data applicable to annual calculation

Theta_in °C		**NB_H Climate 1**
−10	$\vartheta_{ext;min}$	1
−9		25
−8		23
−7		24
−6		27
−5		68
−4		91
−3		89
−2		165
−1		173
0		240
1		280
2		320

3		357
4		356
5		303
6		330
7		326
8		348
9		335
10		315
11		215
12		169
13		151
14		105
15	$\vartheta_{ext;max}$	74
16		

Table UU.18B is not relevant for hourly calculations.

9 For prEN 15316-4-2:2022

Annex UU of prEN 15316-4-2:2022, Energy performance of buildings — Method for calculation of system energy requirements and system efficiencies — Part 4-2: Space heating generation systems, heat pump systems, Module M3-8-2, M8-8-2

Revised version of EN 15316-4-2 (still in preparation):

This chapter is based on Annex B of the draft revised version of EN 15316-4-2:2017.

The previous chapter on the 2017 version is kept *for the record*, because that explanation may help the review of some of the improvements in this new draft. Moreover, prEN 15316-4-2:2022 is still under development.

Disclaimer:

At the time of writing this chapter (August 2021), draft prEN 15316-4-2 was not yet reviewed by the CEN Management Centre for distribution, so it is subject to editorial changes.

prEN 15316-4-2 has been distributed by the CEN Management Centre to CEN national members as a draft standard for public consultation and has been approved in may 2022, but will probably be further developed and subject to second Public Enquiry. See also: https://epb.center/support/documents/en-15316-4-2/

Annex UU
(informative)

~~Default~~ U-CERT values

UU.1 General

The template in Annex A shall be used to specify the choices between methods, the required input data and references to other documents.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations.

If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a National Annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g., the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g., small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a Table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b;

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, …).

NOTE 4 In the section “Introduction” of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

UU.2 References

Table UU.1:
Type: references

See Explanation at EN ISO 52000-1, Table UU.1

The references, identified by the module code number, are given in Table UU.1.

Table UU.1 — References (See Clause 2)

Reference	Reference document	
	Number	Title

Reference	Reference document	
	Number	Title
M1–1	EN ISO 52000-1	*Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures*
M1–7	See M1–1	See M1–1
M1-2	See M1–1	See M1–1
M1-9	See M1–1	See M1–1
M1-13	EN ISO 52010-1	*Energy performance of buildings — External climatic conditions — Part 1: Conversion of climatic data for energy calculations*
M2-2	~~EN ISO 52016~~ EN ISO 52016-1	*Energy performance of buildings. Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads. Calculation procedures*
M3-1	EN 15316-1	*Energy performance of buildings. Method for calculation of system energy requirements and system efficiencies. General and Energy performance expression, Module M3-1, M3-4, M3-9, M8-1, M8-4*
M8-1	See M3-1	*See M3-1*
M5-8	EN 16798-5	*Energy performance of buildings. Ventilation for buildings. Calculation methods for energy requirements of ventilation systems (Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8). Method 2: Distribution and generation*
M3-8	EN 15316-4-X	*Energy performance of buildings. Method for calculation of system energy requirements and system efficiencies. Space heating generation systems.*
M3-9	Not available	*There is no specific calculation method for this topic in the available modules to supplement the default models available in this standard.*

UU.3 Heat pump description data

UU.3.1.1 Heat pump energy carrier

Table UU.2:
Type: Less crucial detail for calculation methodology

Distinguished types with identifier. This is a national choice that shall be consistent with the identified energy carriers in EN ISO 52000-1.

U-CERT Choice: adopt Table B.2 without changes, except replace “default” by “U-CERT”

The ~~default~~ U-CERT value for the identifier of the type of energy carrier used as the main input of the heat pump HP_FUEL is indicated in Table UU.2.

Table UU.2 — Identifiers for heat pump energy carrier type

Description	Identifier value
Electricity	HP_FUEL_EL
Fossil fuel, liquid	HP_FUEL_FOS_LIQ
Fossil fuel, gaseous	HP_FUEL_FOS_GAS

Bio fuel, liquid	HP_FUEL_BIO_LIQ
Bio fuel, gaseous	HP_FUEL_BIO_GAS

UU.3.1.2 Back-up energy carrier

Table UU.3:
Type: Less crucial detail for calculation methodology

Distinguished types with identifier. This is a national choice that shall be consistent with the identified energy carriers in EN ISO 52000-1.

U-CERT Choice: adopt Table B.3 without changes, except replace “default” by “U-CERT”

The ~~default~~ U-CERT value for the identifier of the type of energy carrier used as the input for the back-up HP_FUEL_BU is indicated in Table UU.3.

Table UU.3 — Identifiers for back-up energy carrier type

Description	Identifier value
Electricity	HP_FUEL_BU_EL
Fossil fuel, liquid	HP_FUEL_ BU_FOS_LIQ
Fossil fuel, gaseous	HP_FUEL_ BU_FOS_GAS
Bio fuel, liquid	HP_FUEL_ BU_BIO_LIQ
Bio fuel, gaseous	HP_FUEL_ BU_BIO_GAS

UU.3.1.3 Type of energy taken from the source

Table UU.4:
Type: Less crucial detail for calculation methodology

Distinguished types with identifier. This is a national choice to list the possible types of cold sources (whether legally renewable or not).

U-CERT Choice: adopt Table B.4 without changes, except replace “default” by “U-CERT”

The ~~default~~ U-CERT value for the identifier of the type of energy taken from the source SRC_ENE is indicated in Table UU.4.

Table UU.4 — Identifiers for source energy type

Description	Identifier value
Environmental heat	SRC_ENE_ENV
Exhaust air	SRC_ENE_EXH
Indoor air from unheated space	SRC_ENE_UNH
Indoor air of conditioned space	SRC_ENE_INT

UU.4 Heat pump technical data

UU.4.1 Technical data for all calculation paths

Table UU.5:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.5 without changes

The default value of the part of the input power used for the internal auxiliaries $f_{gen;aux}$ is given in Table UU.5.

Table UU.5 — Default values of $f_{gen;aux;el}$

Type of heat pump	$f_{gen;aux;el}$ [-]
Electric heat pump, all	0,02
Non electric heat pumps	0

Table UU.6:
Type: Less crucial detail for calculation methodology (default value)

Default value in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.6 without changes

The default value of the minimum load ratio for continuous operation of inverter technology heat pump $LR_{cont;min}$ is given in Table UU.6.

Table UU.6 — Default value of $LR_{cont;min}$

Type of heat pump	$LR_{cont;min}$ [-]
All heat pumps	0,20

Table UU.7:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.7 without changes

The default value of the efficiency η_{bu} of the integrated back-up heater is given in Table UU.7.

Table UU.7 — Default value of η_{bu}

Type of back-up heater	η_{bu} [-]
Electric back-up	1,00

Combustion back-up	0,90

Table UU.8:
Type: Less crucial detail for calculation methodology (default value)

Default value in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.8 without changes

The default value of the degradation coefficient C_d is given in Table UU.8.

Table UU.8 — Default value of C_d

Type of heat pump	C_d [-]
ON-OFF electric heat pumps	0,20

Note This value is also used for path A when dealing with ON-OFF operation mode.

UU.4.2 Technical data for Path A

Table UU.9:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.9 without changes

The default values of the reference source temperatures as a function of the source type are given in Table UU.9.

Table UU.9 — Default value of the base source temperatures

Type of source	Reference temperatures [°C]							
External air Recovery air	-15 (1)	-7	2	7	12	20 (2)	35 (2)	
Water	5	10	15					
Brine	-5	0	5	10				
(1) For cold climate								
(2) For summer operation for domestic hot water								

NOTE: direct expansion (ground or solar panel systems) can be an extra option.

Table UU.10:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.10 without changes

The default values of the reference sink temperatures as a function of the sink type are given in Table UU.10.

Table UU.10 — Default value of the base sink temperatures

Type of sink	Reference temperatures [°C]							
Indoor air	20							
Air, ducted	15	20	25					
Technical water	25	35	45	55	65			
Domestic hot water	45	55	65					
(1) For cold climate								
(2) For summer operation for domestic hot water								

Table UU.11:
Type: Less crucial detail for calculation methodology (default value)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.11 without changes

The default value of the correction factor of COP at minimum continuous operation $f_{LR,cont,min,net}$ is given in Table UU.11.

Table UU.11 — Default value of $f_{LR,cont,min,net}$

Type of heat pump	$f_{LR,cont,min,net}$ [-]
Inverter type electric heat pumps	1,30

Table UU.12:
Type: Less crucial detail for calculation methodology (default value)

Default value in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.12 without changes

The default value of the time constant for the ON-OFF operation τ_{eq} is given in Table UU.12

Table UU.12 — Default value of τ_{eq}

Type of heat pump	τ_{eq} [s]
ON-OFF electric heat pumps	30

Table UU.13:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.13 without changes

The default value of the parameters for part load COP corrections LR_{opt}, $COP_{inc;opt}$ and $COP_{inc;min}$ are given in Table UU.13.

Table UU.13 — Default value of LR_{opt}, $COP_{inc;opt}$ and $COP_{inc;min}$

Type of heat pump	LR_{opt} [-]	$COP_{inc;opt}$ [-]	$COP_{inc;min}$ [-]
Inverter electric heat pumps	0,6	0,3	-0,5

Table UU.14:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.14 without changes

The default value of the COP correction factor f_{LR} depending on actual load ratio ~~is~~ for absorption heat pumps is given in Table UU.14.

Table UU.14 — $f_{COP;LR}$ for absorption heat pumps

ON-OFF absorption heat pumps											
LR	0,00	0,10	0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90	1,00
$f_{COP;LR}$	0,00	0,68	0,77	0,84	0,89	0,92	0,95	0,97	0,99	1,00	1,00
Modulating absorption heat pumps											
LR	0,00	0,10	0,20	0,30	0,40	0,50	0,60	0,70	0,80	0,90	1,00
$f_{COP;LR}$	0,00	0,72	0,81	0,88	0,93	0,97	0,99	1,00	1,00	1,00	1,00

UU.4.3 Technical data for Path B

Table UU.15:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.15 without changes

The default values for the temperature difference between the evaporator and the outdoor air (air to air heat pump) at bivalent outdoor temperature are given in Table UU.15.

Table UU.15 — ΔT_e (θ_{biv}) for air to air and air to water

Type of heat pump	ΔT_e (θ_{biv}), K
Air to air	6
Air to water	6

Table UU.16:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.**16** without changes

The default values of the maximum evaporating temperatures for air to air and air to water heat pumps are given in Table UU.16.

Table UU.16 — Maximum evaporating temperature, $\theta_{gen;in}$

Type of heat pump	$\theta_{gen;in}$ °C
Air to air	10
Air to water	10

Table UU.17:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term “default”

U-CERT Choice: adopt Table B.17 without changes

The default values for the temperature difference between the condenser and the indoor air (air to air heat pumps) or the leaving water (air to water heat pumps) under bivalent point are given in Table UU.17.

Table UU.17 — $\Delta T_c\ (\theta_{biv})$ air to air $\Delta T_{cw}\ (\theta_{biv})$ air to water

Type of heat pump	$\Delta T_c\ (\theta_{biv})$ air to air $\Delta T_{cw}\ (\theta_{biv})$ air to water, K
Air to air	12
Air to water	5

Table UU.18:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term “default”

U-CERT Choice: adopt Table B.18 without changes

The default values of the minimum temperature difference between the condenser and the outdoor air for air to water heat pumps are given in Table UU.18.

Table UU.18 — Minimum $\Delta T_{c_{min}}$

Type of heat pump	$\Delta T_{c_{min}}$, °C
Air to air	4

Table UU.19:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term “default”

U-CERT Choice: adopt Table B.19 without changes

The default values of the indoor (room) air is given in Table UU.19.

Table UU.19 — Indoor air temperature (dry bulb), $\theta_{i;ci}$

Type of heat pump	$\theta_{i;ci}$, °C
Air to air	20
Air to water	20

Table UU.20:
Type: Less crucial detail for calculation methodology (default value)

Default value in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.20 without changes

The default values of the minimum leaving water temperature for air to water heat pumps are given in Table UU.20.

Table UU.20 — Minimum leaving water temperature, $\theta_{lw_{min}}$

Type of heat pump	$\theta_{lw_{min}}$, °C
Air to water	25

Table UU.21:
Type: Less crucial detail for calculation methodology (default values)

Default values in absence of data from a specific product, so keep the term "default"

U-CERT Choice: adopt Table B.21 without changes

The default values of the degradation coefficient, C_d, for air to air and air to water heat pumps is given in Table UU.21.

Table UU.21 — Indoor air temperature (dry bulb), $\theta_{i;ci}$

Type of heat pump	C_d, -
Air to air	0,25
Air to water	0,9

UU.4.4 Performance map for Path B

Table UU.22:
Type: Other (template/example)

No national choice involved!

U-CERT Choice: adopt Table B.22 without changes

An example of the performance map table is given below:

Table UU.22 — Performance mapping for air to air and air to water units for the reference heating seasons

Unit power, kW	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$	$\Phi_{gen,LR}(\theta_{biv}) \times LR_{map}$
LR_{map}, %	100	90	80	70	60	50	40	30	20	10	1
$\theta_{e;ci}$, C°	Mapped Parameter										
-15	Only for colder climate										
-14											
-13											
-12											
-11											
-10											
-9											
-8		A[1]									
-7											
-6											
-5											
-4											
-3											
-2											
-1											
0											
1											
2					B[1]						
3											
4											
5											
6											
7							C[1]				
8											
9											
10											
11											

12										D[1]	
13											
14											
15											

[1] Part load condition points A to D for average climate conditions. Points E and F are determined according to EN 14825.

Table UU.23:
Type: Other (template/example)

No national choice involved!

U-CERT Choice: adopt Table B.23 without changes

Table UU.23 — Performance mapping for air-to-air and air to water units for calculating the capacity ratio

LR_{map}, %	100	90	80	70	60	50	40	30	20	10	1
Capacity Demand	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$	$\Phi_{gen,LR}(\theta_{biv})\ x\ LR_{map}$
Unit Capacity											
CR											

Unit capacity is calculated by linearly interpolating from the calculated values and corresponding capacity values at part load conditions A to G, where applicable, as specified by EN 14825. For outdoor air temperature above the outdoor air temperature at condition D, the values of the unit capacities are linearly extrapolated from the declared leaving water temperature, θ_{lw}, values and corresponding capacity values at part load conditions C and D.

UU.5 System design data

UU.5.1 Time constant of distribution and emitters

Table UU.24:
Type: Less crucial detail for calculation methodology (default values)

Default values, so keep the term “default”

U-CERT Choice: adopt Table B.24 without changes

The default values of the time constant of distribution and emitters $\tau_{out;em;type}$ is given in Table UU.24.

Table UU.24 — Default values of the time constant of distribution and emitters

Type of distribution and emitters	$\tau_{out;em;type}$ [s]

Wet system with coverage higher than 10 min (based on the EN 1264 series)	1920
Wet system with coverage lower or equal to 10 min	1370
Air handling unit, heating and cooling ceiling (low inertia), fan coil unit	360
Air systems	120
Domestic hot water	1560

UU.6 Calculation parameters

UU.6.1 Extrapolation matrix coefficients

UU.6.1.1 Air to water, electrically driven heat pumps

Table UU.25a:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.25a, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of power output for electrically driven air to water heat pumps are given in Table UU.25a.

Table UU.~~25~~25a — Correction coefficients of power output for electrically driven air to water heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$	$\theta_{src,3}$		
		-15 °C	-7 °C	2 °C	7 °C	12 °C	20 °C	30 °C		
		$\Phi_{gen;out;LR100}$ [kW]								
$\theta_{snk,-2}$	20 °C								1,00	$f_{\Phi;snk,-2}$
$\theta_{snk,-1}$	25 °C								1,09	$f_{\Phi;snk,-1}$
$\theta_{snk,0}$	35 °C								1,00	$f_{\Phi;snk,-0}$
$\theta_{snk,1}$	45 °C								0,90	$f_{\Phi;snk,1}$
$\theta_{snk,2}$	55 °C								0,91	$f_{\Phi;snk,2}$
$\theta_{snk,3}$	65 °C								0,91	$f_{\Phi;snk,3}$
$\theta_{snk,4}$	70 °C								0,91	$f_{\Phi;snk,4}$
		0,920	0,905	0,950	1,000	1,040	1,050	1,000		
		$f_{\Phi;src,-3}$	$f_{\Phi;src,-2}$	$f_{\Phi;src,-1}$	$f_{\Phi;src,0}$	$f_{\Phi;src,1}$	$f_{\Phi;src,2}$	$f_{\Phi;src,3}$		

Table UU.26a:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.26a, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of COP for electrically driven air to water heat pumps are given in Table UU.26a.

Table UU.~~26~~26a — Correction coefficients of COP for air to water electrically driven heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$	$\theta_{src,3}$		
		-15 °C	-7 °C	2 °C	7 °C	12 °C	20 °C	30 °C		
		$COP_{LR100,j,k}$ [-]								
$\theta_{snk,-2}$	20 °C								1,00	$f_{COP;snk,-2}$
$\theta_{snk,-1}$	25 °C								1,10	$f_{COP;snk,-1}$
$\theta_{snk,0}$	35 °C								1,00	$f_{COP;snk,-0}$
$\theta_{snk,1}$	45 °C								0,80	$f_{COP;snk,1}$
$\theta_{snk,2}$	55 °C								0,80	$f_{COP;snk,2}$
$\theta_{snk,3}$	70 °C								0,80	$f_{COP;snk,3}$
$\theta_{snk,4}$	70 °C								1,00	$f_{COP;snk,4}$
		0,80	0,63	0,80	1,00	1,10	1,14	1,00		
		$f_{COP;src,-3}$	$f_{COP;src,-2}$	$f_{COP;src,-1}$	$f_{COP;src,0}$	$f_{COP;src,1}$	$f_{COP;src,2}$	$f_{COP;src,3}$		

NOTE The reference values for power output and COP are for $\theta_{src} = \theta_{src,0}$ and $\theta_{snk} = \theta_{snk,0}$.

UU.6.1.2 Exhaust air to water, electrically driven heat pumps

Table UU.25b:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.25b, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of power output for electrically driven exhaust air to water heat pumps are given in Table UU.25b.

Table UU.~~27~~25b — Correction coefficients of power output for electrically driven exhaust air to water heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$		
		5 °C	10 °C	15 °C	20 °C	25 °C	30 °C		
		$\Phi_{gen;out;LR100}$ [kW]							
$\theta_{snk,-3}$	15 °C							1,28	$f_{\Phi;snk,-3}$
$\theta_{snk,-2}$	25 °C							1,19	$f_{\Phi;snk,-2}$
$\theta_{snk,-1}$	35 °C							1,10	$f_{\Phi;snk,-1}$
$\theta_{snk,0}$	45 °C							1,00	$f_{\Phi;snk,-0}$
$\theta_{snk,1}$	55 °C							0,92	$f_{\Phi;snk,1}$
$\theta_{snk,2}$	65 °C							0,84	$f_{\Phi;snk,2}$
$\theta_{snk,3}$	70 °C							1,00	$f_{\Phi;snk,3}$
		0,89	0,90	0,95	1,000	1,05	1,10		
		$f_{\Phi;src,-3}$	$f_{\Phi;src,-2}$	$f_{\Phi;src,-1}$	$f_{\Phi;src,0}$	$f_{\Phi;src,1}$	$f_{\Phi;src,2}$		

Table UU.26b:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.26b, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of COP for exhaust air to water electrically driven heat pumps are given in Table UU.26b.

Table UU.~~28~~26b — Correction coefficients of COP for exhaust air to water electrically driven heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$		
		5 °C	10 °C	15 °C	20 °C	25 °C	30 °C		
		$COP_{LR100,j,k}$ [-]							
$\theta_{snk,-3}$	15 °C							1,08	$f_{\Phi;snk,-3}$
$\theta_{snk,-2}$	25 °C							1,09	$f_{\Phi;snk,-2}$
$\theta_{snk,-1}$	35 °C							1,10	$f_{\Phi;snk,-1}$
$\theta_{snk,0}$	45 °C							1,00	$f_{\Phi;snk,-0}$
$\theta_{snk,1}$	55 °C							0,90	$f_{\Phi;snk,1}$
$\theta_{snk,2}$	65 °C							0,90	$f_{\Phi;snk,2}$
$\theta_{snk,3}$	70 °C							1,00	$f_{\Phi;snk,3}$
		0,87	0,90	0,90	1,00	1,10	1,10		
		$f_{COP;src,-3}$	$f_{COP;src,-2}$	$f_{COP;src,-1}$	$f_{COP;src,0}$	$f_{COP;src,1}$	$f_{COP;src,2}$		

NOTE The reference values for power output and COP are for $\theta_{src} = \theta_{src,0}$ and $\theta_{snk} = \theta_{snk,0}$.

UU.6.1.3 Water or brine to water, electrically driven heat pumps

Table UU.25c:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.25c, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of power output for electrically driven water or brine to water heat pumps are given in Table UU.25c.

Table UU.~~29~~25c — Correction coefficients of power output for electrically driven water or brine to water heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$		
		2 °C	2 °C	2 °C	10 °C	15 °C	20 °C		
		$\Phi_{gen;out;LR100}$ [kW]							
$\theta_{snk,-3}$	15 °C							1,08	$f_{\Phi;snk,-3}$
$\theta_{snk,-2}$	25 °C							1,09	$f_{\Phi;snk,-2}$
$\theta_{snk,-1}$	35 °C							1,10	$f_{\Phi;snk,-1}$
$\theta_{snk,0}$	45 °C							1,00	$f_{\Phi;snk,-0}$
$\theta_{snk,1}$	55 °C							0,915	$f_{\Phi;snk,1}$
$\theta_{snk,2}$	65 °C							0,91	$f_{\Phi;snk,2}$
$\theta_{snk,3}$	70 °C							1,00	$f_{\Phi;snk,3}$
		1,00	1,00	0,90	1,000	1,07	1,07		
		$f_{\Phi;src,-3}$	$f_{\Phi;src,-2}$	$f_{\Phi;src,-1}$	$f_{\Phi;src,0}$	$f_{\Phi;src,1}$	$f_{\Phi;src,2}$		

Table UU.26c:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.26c, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of COP for water or brine to water electrically driven heat pumps are given in Table UU.26c.

Table UU.~~30~~26c — Correction coefficients of COP for water or brine to water electrically driven heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$		
		2 °C	2 °C	2 °C	10 °C	15 °C	20 °C		
		$COP_{LR100,j,k}$ [-]							
$\theta_{snk,-3}$	15 °C							1,15	$f_{\Phi;snk,-3}$
$\theta_{snk,-2}$	25 °C							1,17	$f_{\Phi;snk,-2}$
$\theta_{snk,-1}$	35 °C							1,20	$f_{\Phi;snk,-1}$
$\theta_{snk,0}$	45 °C							1,00	$f_{\Phi;snk,-0}$

$\theta_{snk,1}$	55 °C							0,80	$f_{\Phi;snk,1}$
$\theta_{snk,2}$	65 °C							0,75	$f_{\Phi;snk,2}$
$\theta_{snk,3}$	70 °C							1,00	$f_{\Phi;snk,3}$
		1,00	1,00	0,90	1,00	1,10	1,09		
		$f_{COP;src,-3}$	$f_{COP;src,-2}$	$f_{COP;src,-1}$	$f_{COP;src,0}$	$f_{COP;src,1}$	$f_{COP;src,2}$		

NOTE The reference values for power output and COP are for $\theta_{src} = \theta_{src,0}$ and $\theta_{snk} = \theta_{snk,0}$.

UU.6.1.4 Air to water, combustion engine driven heat pumps

Table UU.25d:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.25d, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of power output for combustion engine driven air to water heat pumps are given in Table UU.25d.

Table UU.~~31~~25d — Correction coefficients of power output for combustion engine driven air to water heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$		
		-15 °C	-7 °C	2 °C	7 °C	20 °C	20 °C		
		$\Phi_{gen;out;LR100}$ [kW]							
$\theta_{snk,-3}$	30 °C							1,00	$f_{\Phi;snk,-3}$
$\theta_{snk,-2}$	30 °C							1,00	$f_{\Phi;snk,-2}$
$\theta_{snk,-1}$	35 °C							1,00	$f_{\Phi;snk,-1}$
$\theta_{snk,0}$	45 °C							1,00	$f_{\Phi;snk,-0}$
$\theta_{snk,1}$	50 °C							1,00	$f_{\Phi;snk,1}$
$\theta_{snk,2}$	60 °C							1,00	$f_{\Phi;snk,2}$
$\theta_{snk,3}$	60 °C							1,00	$f_{\Phi;snk,3}$
		1,00	1,03	1,06	1,000	0,90	1,00		
		$f_{\Phi;src,-3}$	$f_{\Phi;src,-2}$	$f_{\Phi;src,-1}$	$f_{\Phi;src,0}$	$f_{\Phi;src,1}$	$f_{\Phi;src,2}$		

Table UU.26d:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.26d, but add that it is not default but U-CERT choice.

The U-CERT correction coefficients of COP for combustion engine driven air to water heat pumps are given in Table UU.26d.

Table UU.~~3226~~d — Correction coefficients of COP for combustion engine driven air to water heat pumps

		$\theta_{src,-3}$	$\theta_{src,-2}$	$\theta_{src,-1}$	$\theta_{src,0}$	$\theta_{src,1}$	$\theta_{src,2}$		
		-15 °C	-7 °C	2 °C	7 °C	20 °C	20 °C		
		$COP_{LR100,j,k}$ [-]							
$\theta_{snk,-3}$	30 °C							1,00	$f_{\Phi;snk,-3}$
$\theta_{snk,-2}$	30 °C							1,05	$f_{\Phi;snk,-2}$
$\theta_{snk,-1}$	35 °C							1,15	$f_{\Phi;snk,-1}$
$\theta_{snk,0}$	45 °C							1,00	$f_{\Phi;snk,-0}$
$\theta_{snk,1}$	50 °C							0,95	$f_{\Phi;snk,1}$
$\theta_{snk,2}$	60 °C							0,80	$f_{\Phi;snk,2}$
$\theta_{snk,3}$	60 °C							1,00	$f_{\Phi;snk,3}$
		0,95	0,85	0,95	1,00	1,15	1,00		
		$f_{COP;src,-3}$	$f_{COP;src,-2}$	$f_{COP;src,-1}$	$f_{COP;src,0}$	$f_{COP;src,1}$	$f_{COP;src,2}$		

NOTE The reference values for power output and COP are for $\theta_{src} = \theta_{src,0}$ and $\theta_{snk} = \theta_{snk,0}$.

UU.6.1.5 Maximum extrapolation

Clause UU.6.1.5:
Type: Less crucial detail for calculation methodology

National choice. At national level different parameters may be selected, according to the national experience and intent.

U-CERT Choice: adopt Clause B.6.1.5, but add that it is not default but U-CERT choice.

The U-CERT value of the maximum extrapolation $\theta_{ex;max}$ is 7 °C from the nearest source or sink temperature.

A warning should be issued if this threshold is exceeded.

UU.6.2 Default parameters for source temperature modelling

Table UU.27:
Type: Less crucial detail for calculation methodology (default values)

Data is climate dependent
Default values, so keep the term “default”

U-CERT Choice: adopt Table B.27 without changes

Table UU.~~3327~~ — Default parameters for equation (4)
Ground heat exchanger, horizontal, water or brine

Description	$\theta_{base;ghor}$ [°C]	$f_{\theta e;ghor}$ [-]
All cases	- 0,5	0,15

Table UU.28:
Type: Less crucial detail for calculation methodology (default values)

Default values, so keep the term “default”

U-CERT Choice: adopt Table B.28 without changes

Table UU.~~34~~28 — Default parameters for equation (5)
Ground heat exchanger, vertical, water or brine

Description	$\theta_{base;gver}$ [°C]	$f_{\theta e;gver}$ [-]
All cases	+ 0,5	0,15

Table UU.29:
Type: Less crucial detail for calculation methodology (default values)

Default values, so keep the term “default”

U-CERT Choice: adopt Table B.29 without changes

Table UU.~~35~~29 — Default parameters for equation (6)
Ground heat exchanger, direct expansion

Description	$\theta_{base;gdx}$ [°C]	$f_{\theta e;gdx}$ [-]
All cases	+ 0,5	0,15

Table UU.30:
Type: Less crucial detail for calculation methodology (default values)

Default values, so keep the term “default”

U-CERT Choice: adopt Table B.30 without changes

Table UU.~~36~~30 — Default parameters for equation (7)
Ground water

Description	$\theta_{base;gw}$ [°C]	$f_{\theta e;gw}$ [-]
All cases	+ 10,0	0,0

Table UU.31:
Type: Less crucial detail for calculation methodology (default values)

Default values, so keep the term “default”.
The variety is quite large (a two digit effect is quite possible), but the values are only default, which is clearly stated below the table.

U-CERT Choice: adopt Table B.31 without changes

Table UU.~~37~~31 — Default parameters for equation (8)
Surface water

Description	$\theta_{base;sw}$ [°C]	$f_{\theta e;sw}$ [-]
Sea	+ 15,0	3,0
Lake	+ 12	6,0
River	+12	8,0

NOTE These are sample, values. The base temperature is very sensitive to local climate and elevation especially for lakes and rivers.

UU.7 Calculation path choices

Table UU.32:
Type: Important factor for the calculated energy performance

The choice affects the method (and corresponding set of input data)

National choice. At national level a different calculation path for each heat pumps configuration may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.32, but add that it is not default but U-CERT choice.

The U-CERT source temperature calculation path is given in Table UU.32.

Table UU.~~38~~32 — Source temperature calculation path

Source description	Source identifier	Type of source	Calculation path
External air	HP_SRC_A_EXT	All	Clause 6.6.2
Recovery air	HP_SRC_A_REC	All	Clause 6.6.3
Ground heat exchanger, horizontal, water or brine	HP_SRC_G_HOR	All	Clause 6.6.4
Ground heat exchanger, vertical, water or brine	HP_SRC_G_VER	All	Clause 6.6.5
Ground, direct expansion	HP_SRC_G_DX	All	Clause 6.6.6
Ground water	HP_SRC_W_GND	All	Clause 6.6.7
Surface water	HP_SRC_W_SURF	All	Clause 6.6.8

NOTE: the column "type of source is provided to allow optional differentiation for specific cases, such as different types of heat recovery.

Table UU.33:
Type: Important factor for the calculated energy performance

The choice affects the method (and corresponding set of input data)

National choice. At national level a different calculation path for each heat pumps configuration may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.33, but add that it is not default but U-CERT choice.

The U-CERT sink temperature calculation path is given in Table UU.33.

Table UU.~~39~~33 — Sink temperature calculation path

Sink description	Sink identifier	Type of sink	Calculation path
Indoor air	HP_SINK_A_INT	All	Clause 6.8.1
Ducted air (ventilation)	HP_SINK_A_DUCT	All	Clause 6.8.2
Technical water (*)	HP_SINK_W_SYS	All	Clause 6.8.3
Domestic hot water (**)	HP_SINK_W_DHW	All	Clause 6.8.4
(*) Water in the installation, heating medium (**) Heated potable (drinkable, tapping) water			

NOTE: the column "type of sink is provided to allow optional differentiation for specific cases, such as different types of indoor air depending on location.

Table UU.34:
Type: Important factor for the calculated energy performance

The choice affects the method (and corresponding set of input data)

National choice. At national level a different calculation path for each heat pumps configuration may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.34, but add that it is not default but U-CERT choice.

Tables ~~40, 41 and 42~~ 34, 35 and 36 indicate the U-CERT selected calculation path depending on:

— Type of sink (columns), which is specified by an identifier given in table 8
— Type of heat pump technology (blocks of rows), which is specified by an identifier given in table 9
— Type of source (rows), which is specified by an identifier given in table 7

Table UU.~~40~~34 — Calculation path for full load heat power output

Heat pump technology	Source (evaporator)	Sink (condenser)			
		HP_SINK_A_INT	HP_SINK_A_DUCT	HP_SINK_W_SYS	HP_SINK_W_DHW
HP_TECH_EL	HP_SRC_A_EXT	PERF_MAP_B_AA	PERF_MAP_A_INT	PERF_MAP_B_AW	PERF_MAP_A_EXT
	HP_SRC_A_REC				
	HP_SRC_G_HOR	PERF_MAP_A_INT		PERF_MAP_A_INT	
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				
	HP_SRC_G_DX				
HP_TECH_ABS	HP_SRC_A_EXT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT
	HP_SRC_A_REC				
	HP_SRC_G_HOR				
	HP_SRC_G_VER				
	HP_SRC_W_GND				

Heat pump technology	Source (evaporator)	Sink (condenser)			
		HP_SINK_A_INT	HP_SINK_A_DUCT	HP_SINK_W_SYS	HP_SINK_W_DHW
	HP_SRC_W_SURF				
	HP_SRC_G_DX				
HP_TECH_ENG	HP_SRC_A_EXT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT
	HP_SRC_A_REC				
	HP_SRC_G_HOR				
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				
	HP_SRC_G_DX				

Table UU.35:
Type: Important factor for the calculated energy performance

The choice affects the method (and corresponding set of input data)

National choice. At national level a different calculation path for each heat pumps configuration may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.35, but add that it is not default but U-CERT choice (see explanation box on Table UU.34.

Table UU.~~41~~35 — Calculation path for energy input and auxiliary energy

Heat pump technology	Source (evaporator)	Sink (condenser)			
		HP_SINK_A_INT	HP_SINK_A_DUCT	HP_SINK_W_SYS	HP_SINK_W_DHW
HP_TECH_EL	HP_SRC_A_EXT	PERF_MAP_B_AA	PERF_MAP_A_INT	PERF_MAP_B_AW	PERF_MAP_A_EXT
	HP_SRC_A_REC				
	HP_SRC_G_HOR	PERF_MAP_A_INT		PERF_MAP_A_INT	
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				
	HP_SRC_G_DX				
HP_TECH_ABS	HP_SRC_A_EXT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT
	HP_SRC_A_REC				
	HP_SRC_G_HOR				
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				
	HP_SRC_G_DX				
HP_TECH_ENG	HP_SRC_A_EXT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT	PERF_MAP_A_INT
	HP_SRC_A_REC				
	HP_SRC_G_HOR				

Heat pump technology	Source (evaporator)	Sink (condenser)			
		HP_SINK_A_INT	HP_SINK_A_DUCT	HP_SINK_W_SYS	HP_SINK_W_DHW
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				
	HP_SRC_G_DX				

Table UU.36:
Type: Important factor for the calculated energy performance

The choice affects the method (and corresponding set of input data)

National choice. At national level a different calculation path for each heat pumps configuration may be selected, according to the national experience and intent.

U-CERT Choice: adopt Table B.36, but add that it is not default but U-CERT choice (see explanation box on Table UU.34.

Table UU.~~42~~36 — Calculation path for part load correction factor of COP (path A)

Heat pump technology	Source (evaporator)	Sink (condenser)			
		HP_SINK_A_INT	HP_SINK_A_DUCT	HP_SINK_W_SYS	HP_SINK_W_DHW
HP_TECH_EL	HP_SRC_A_EXT	CALC_A_LR_PRF_DEF2	CALC_A_LR_PRF_DEF2	CALC_A_LR_PRF_DEF1	CALC_A_LR_PRF_DEF1
	HP_SRC_A_REC				
	HP_SRC_G_HOR				
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				
	HP_SRC_G_DX				
HP_TECH_ABS	HP_SRC_A_EXT	CALC_A_LR_PRF_DEF2			
	HP_SRC_A_REC				
	HP_SRC_G_HOR				
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				
	HP_SRC_G_DX				
HP_TECH_ENG	HP_SRC_A_EXT	CALC_A_LR_PRF_DEF2			
	HP_SRC_A_REC				
	HP_SRC_G_HOR				
	HP_SRC_G_VER				
	HP_SRC_W_GND				
	HP_SRC_W_SURF				

Heat pump technology	Source (evaporator)	Sink (condenser)			
		HP_SINK_A_INT	HP_SINK_A_DUCT	HP_SINK_W_SYS	HP_SINK_W_DHW
	HP_SRC_G_DX				

UU.8 Priority management

Table UU.37:
Type: Less crucial detail for calculation methodology (default values)

Default values, so keep the term “default”

U-CERT Choice: adopt Table B.37 without changes

Table UU.~~43~~37 — Default priority list (sequence)

Priority order	Priority 1	Priority 2	Priority 3	Priority 4	Reference
PRIO_CRIT_DEF	Domestic hot water W	Space heating H	None	None	Clause 6.11.2
(a) priority levels 3 and 4 are intended for future expansion to direct storage heating and/or cooling					

Table UU.38:
Type: Less crucial detail for calculation methodology (default values)

Default values, so add the term “default”

U-CERT Choice: adopt Table B.38, but add “default”

Default time allocation criteria are given in Table UU.38.

Table UU.~~44~~38 — Time allocation criterion

Time allocation criterion	Priority 1	Priority 2	Priority 3	Priority 4	Reference
PRIO_CRIT_DEF	Full load	Use all remaining time	None	None	Clause 6.11.2

10 For EN 16798-7

Annex UU of EN 16798-7:2017, Energy performance of buildings – Ventilation for buildings – Part 7: Calculation methods for the determination of air flow rates in buildings including infiltration (Module M5–5)

Grey shading:

Concerning Annex B as basis for Annex UU for EN 16798-7:

In this U-CERT document, the cells in the tables and the text between the tables have been grey shaded when it is part of the template of Annex A. This was needed, because the lay out of the template in Annex A does not only ask for choices in the tables, but also choices in the text between the tables.

So only the non-shaded elements are allowed to be edited to stay in line with the standard (in casu: in line with the normative template of Annex A). and what has been added in Annex B (and adopted or changed in this U-CERT National Datasheet).

Clause A.1/B.1 has not been grey shaded, but shall not be edited in any case.

Disclaimer:

Because neither Annex A nor Annex B of this standard contains any shading of cells in the tables, it was not always fully clear whether the texts in the tables are examples of normative texts.

Annex UU
(informative)

Input and method selection data sheet – ~~Default~~ U-CERT choices

UU.1 General

The template in Annex A of this document shall be used to specify the choices between methods, the required input data and references to other documents.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national/regional regulations. If the default values and choices of Annex B are not adopted because of the national/regional regulations, policies or national traditions, it is expected that:

— national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

— by default, the national standards body will add or include a national annex (Annex NA) to this document, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g., the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g., small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

— by adding columns or rows (one for each application), if the template allows;

— by including more than one version of a table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b;

— by developing different national/regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, …).

NOTE 4 In the section “Introduction” of a national/regional data sheet information can be added, for example about the applicable national/regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

UU.2 References

The references, identified by the module code number, are given in Table UU.1.

Table UU.1:
Type: References

See Explanation at EN ISO 52000-1, Table UU.1

Table UU.1 —References

Reference	Reference document
M1-6	EN 16798–1 *Energy performance of buildings - Part 1: Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics - Module M1-6*
M1-9	EN ISO 52000-1 *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures*
M1-13	EN ISO 52010-1 *Energy performance of buildings — Overarching assessment procedures for external environment conditions — Part 1: Conversion of measured hourly weather data to input for energy calculations*
M2-2	EN ISO 52016-1 *Energy performance of buildings — Calculation of the energy needs for heating and cooling, internal temperatures and heating and cooling load in a building or building zone — Part 1: Calculation procedures*
M2-6	EN ISO 52016-1 *Energy performance of buildings — Calculation of the energy needs for heating and cooling, internal temperatures and heating and cooling load in a building or building zone — Part 1: Calculation procedures*
M3-3	EN 12831-1 *Heating systems and water based cooling systems in buildings — Method for calculation of the design heat load — Part 1: Space heating load*
M3-5	EN 15316-2 *Heating systems and water based cooling systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 2: Space emission systems (heating and cooling)*
M4-5	EN 15316-2 *Heating systems and water based cooling systems in buildings - Method for calculation of system energy requirements and system efficiencies - Part 2: Space emission systems (heating and cooling)*
M5-6-1	EN 16798-5-1 *Energy performance of buildings - Part 5: Ventilation for buildings - Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8 - Calculation methods for energy requirements of ventilation and air conditioning systems (revision of EN 15241) – method 1*
M5-6-2	EN 16798-5-2 *Energy performance of buildings - Part 5: Ventilation for buildings - Modules M5-6, M5-8, M6-5, M6-8, M7-5, M7-8 - Calculation methods for energy requirements of ventilation and air conditioning systems (revision of EN 15241) – method 2*

Clause UU.3 and UU.4
The choice between Method 1 and Method 2 is not requested in Annex A??!!!
Air flow rate calculations may be done using 2 methods:
— method 1 estimates the air flow rates based on detailed building characteristics; and
— method 2 specifies rules to fulfil to apply a statistical approach to be defined at national level for the determination of air flow rates including infiltration. It may be based on calculations with method 1 or on measurements. So it is not really a described method, and therefore no input data can be provided either.

The proposed choice is therefore compulsory.

This choice has been reviewed by prof. Gerhard Zweifel (EPB Center expert on the EPB ventilation and cooling standards).
Because the choice between these methods has a big impact on the required input data and the required tool, one of the methods needs to be chosen.
Because method 2 can only be developed at national or regional level, we choose method 1.
Therefore we write here, different from Annex B

Note: this is additional information compared to Annex A, and still in line with the standard, so not in conflict with Annex A or any other parts of the standard.

For U-CERT: Method 1 is chosen as the method that shall be used. Method 2 shall not be used.

UU.3 Input data method 1

All choices in Clause A/B.3 concern technical details.

The choices for Clause UU.3 have been reviewed by prof. Gerhard Zweifel (EPB Center expert on the EPB ventilation and cooling standards).

UU.3.1 Product description data

Not applicable.

UU.3.2 Product technical data

Clause UU.3.1:
According to 6.3.2.2 of the standard: "The product data shall be the value declared by the manufacturer according to certified measurements performed according to the relevant product standards. If values declared by the manufacturer are not available, then values shall be defined in accordance with the template given in Annex A; default values are given in informative Annex B."

For clarity the U-CERT proposal is to add to Clause B.3.1 (in bold), in deviation from Annex B but in line with Annex A:

The values in UU.3 are intended to be default values. If applicable, these values may be overruled by declared values of the actually applied products.

UU.3.2.1 Discharge coefficient for vents, air terminal devices, windows

Clause 3.2.1:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause 3.2.1 without changes

The values for the discharge coefficients are:

$C_{D;vent}$ = 0,6

$C_{D;ATD}$ = 0,6

$C_{D;w}$ = 0,67

UU.3.2.2 Airflow exponent for vents, air terminal devices, windows

Clause 3.2.2:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause 3.2.2 without changes

The values for the air flow exponents are:

n_{vent} = 0,5

n_{ATD} = 0,5

n_{w} = 0,5

UU.3.2.3 Combustion air flows factors

Table UU.2:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.2 without changes

The combustion appliance system factor is given in Table UU.2.

Table UU.2 — Data for appliance system factor

Combustion air supply situation	Flue gas exhaust situation	Typical combustion appliance system	Appliance system factor f_{as}
Combustion air is taken from room air	Flue gases are exhausted into room	• Kitchen stove • Gas appliance according to CEN/TR 1749 Type A	0
Combustion air is taken from room air	Flue gases are exhausted into separate duct	• Open fire place • Gas appliance according to CEN/TR1749 Type B	1
Combustion air is taken from room air	Flue gases are exhausted in duct simultaneously with mechanical ventilation exhaust air	• Specific gas appliance	See note
Combustion air is delivered directly from outside in a separate duct, sealed from room air	Flue gases are exhausted into a separate duct	• Gas appliance according to CEN/TR 1749 Type C (room air sealed systems) • Closed fire place (wood, coal or wood/coal-effect gas fire)	0
NOTE: Considered as a mechanical extraction system, but with variable air flow, depending of both the exhaust and the combustion appliance.			

For residential buildings, the fuel flow factors for combustion air flow are given in Table UU.2.

Table UU.3:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.3 without changes

Table UU.3 — Data for fuel flow factor

Fuel type	Wood	Gas				Oil	Coal
Appliance type	open fire place	Closed with built in fan	open gas with flue balancer	open gas kitchen stove	open gas/wood/coal effect gas fire	closed fire	closed fire

Fuel flow factor, f_{ff} [l/s per kW]	2,8	0,38	0,78	3,35	3,35	0,32	0,52

UU.3.2.4 Mechanical ventilation

Table UU.4:
Type: Less crucial detail for calculation methodology

The concept of a constant factor f_{ctrl} in an hourly method is a problem, e.g. in case of ventilation dependent on occupancy, such as in case of demand-controlled ventilation.

There was a solution in a earlier draft of the standard which was refused by the project leader at that time.
$f_{ctrl} = f_{occ} + f_{dev} \cdot (1 - f_{occ})$
The deviation factor f_{dev} may depend on the control quality (class?). It means that the flow rate will not exactly follow the occupation, but be somewhere between this and 1.

It is intended to put this in the Swiss National Annex, but the definitive value of f_{dev} is not yet determined. Currently, f_{dev} = 0,5 is in the focus. This may be a compromise for UU-CERT.

U-CERT Choice: replace content of Table B.4 by the proposal in this explanation box.

For the calculations of the mechanical system ventilation air flow rates, the values are as follows:

f_{ctrl} see Table UU.4

Table UU.4 — Values for f_{ctrl}

Criteria					f_{ctrl}
Sensor type (see note 1)	**Additional specifications on control system (see note 2)**	**Building type / occupation scenario**	**Climate**	**Calculation interval**	
~~People count or CO2 sensors~~	~~All~~	~~Non-residential~~	~~All~~	~~All~~	~~0,8~~
~~Occupancy sensor~~	~~All~~	~~Non-residential~~	~~All~~	~~All~~	~~0,9~~
~~All other sensors~~	~~All~~	~~Non-residential~~	~~All~~	~~All~~	~~1,0~~
~~All~~	~~All~~	~~Residential~~	~~All~~	~~All~~	~~1,0~~

~~NOTE 1: Aside from constant air volume system, control strategies can be based on, for example, presence detection, people count, CO_2 concentration, relative humidity. The value of f_{ctrl} depends on control strategy, occupation scenario, climate and calculation time interval.~~

~~NOTE 2: The value of f_{ctrl} depends on the quality of the sensors and the implementation of the control strategy (e.g., location of the sensors and actuators with regard to occupation and pollutant loads in the various rooms of the zone, management of hysteresis, setup values, equilibrium supply/exhaust, …).~~

For the hourly calculation method, a variable control factor is needed for ventilation dependent on occupancy (e.g. in case of demand-controlled ventilation) .The following simple default rule may be used:

$f_{ctrl} = f_{occ} + f_{dev} \cdot (1 - f_{occ})$

Where:

f_{dev} is the deviation factor, with default value f_{dev} = 0,5.

NOTE The deviation factor f_{dev} actually depends on the control quality. It means the flow rate will not exactly follow the occupation, but be somewhere between this and 1.

Table UU.5:
Type: Less crucial detail for calculation methodology

Probably many countries don't have a certification scheme for ventilation systems, in which case the first two options in the Table can be ignored…

U-CERT Choice: adopt Table B.5 without changes

f_{sys} see Table UU.5

Table UU.5 — Values for f_{sys}

Sensor type	f_{sys}
Certified system with $f_{ctrl} < 1$	1,0
Certified system with $f_{ctrl} = 1$	1,1
Non-certified system	1,2
…	

UU.3.3 System design data

UU.3.3.1 Supply air temperature control

Note that there is no choice offered here.
The clause A/B.3.3.1 simply exists, because the structure was to follow the standard's structure.

U-CERT Choice: nothing to choose

Not applicable.

UU.3.3.2 Exposure to wind

Table UU.6:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.6 without changes

SHIELD_CLASS identifier indicates the exposure to wind of an air flow path on a facade.

Table UU.6 gives meaning for identifiers for SHIELD_CLASS.

Table UU.6 — Identifiers for SHIELD_CLASS

Code	Meaning
Open	No obstruction

Normal	Partially shielded from wind
Shielded	Shielded from wind

UU.3.3.3 Pressure coefficients associated to an air flow path

Table UU.7:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.7 without changes

Table UU.7 gives C_p values for ventilation zone that can be cross-ventilated (f_{cros} = 1) depending on the height of the air flow path on the façade and its shielding class.

Table UU.7 — Dimensionless wind pressures coefficients

Height of air flow path on façade	Shielding class	Dimensionless wind pressures C_p				
		Windward Cp1	Leeward Cp2	Roof (depending on slope) Cp3		
				< 10°	10°-30°°	> 30°
Low h_{path} < 15 m	Open	+ 0,50	- 0,70	- 0,70	- 0,60	- 0,20
	Normal	+ 0,25	- 0,50	- 0,60	- 0,50	- 0,20
	Shielded	+ 0,05	- 0,30	- 0,50	- 0,40	- 0,20
Medium	Open	+ 0,65	- 0,70	- 0,70	- 0,60	- 0,20
15 ≤ h_{path} < 50 m	Normal	+ 0,45	- 0,50	- 0,60	- 0,50	- 0,20
	Shielded	+ 0,25	- 0,30	- 0,50	- 0,40	- 0,20
High h_{path} ≥ 50 m	Open	+ 0,80	- 0,70	- 0,70	- 0,60	- 0,20
…						

NOTE: The wind pressure coefficients given are valid for a wind sector of approx. ± 60° to the facade axis. The wind direction is not considered more specifically.

Table UU.8 gives C_p values for ventilation zone that cannot be cross-ventilated (f_{cros} = 0) .

Table UU.8:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.8 without changes

Table UU.8 — Dimensionless wind pressures for ventilation zone that cannot be cross-ventilated (f_{cros} = 0)

Windward	Leeward	Roof
0,05	- 0,05	0

UU.3.3.4 Difference of wind pressure coefficients

Clause UU.3.3.4:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.3.4 without changes

The value for the difference of wind pressure coefficients between the windward and the leeward sides of the ventilation zone is estimated using one of the options below:

— values from B.1.3.3; or

— a constant value, which by default is set to $\Delta C_p = 0{,}75$

UU.3.3.5 Pressure coefficient of the cowl at roof height

Clause UU.3.3.5:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.3.5 without changes

The value for the pressure coefficient of the cowl at roof height is:

$C_{p;cowl;roof} = 0$.

UU.3.3.6 Correction coefficient for accounting for height of cowl above roof level

Table UU.9:
Type: Less crucial detail for calculation methodology

Actually we would like to replace the term “Examples” by “Default values” but this would be violating the template of Annex A.

U-CERT Choice: adopt Table B.9, but add that these values may be replaced by more detailed values.

Table UU.9 provides default values for $\Delta C_{cowl;height}$ values. By default, these values do not depend on the distance to the roof top and the wind angle of attack.

Table UU.9 — Examples of $\Delta C_{cowl;height}$ values

Between the top of the roof and the roof outlet in m	$\Delta C_{cowl;height}$
< 0,5	- 0,0 (default value)
0,5 –1,0	- 0,1 (default value)
> 1	- 0,2 (default value)

These default values may be replaced by more detailed values, depending on the distance to the roof top and the wind angle of attack.

UU.3.3.7 Ventilation effectiveness

Clause UU.3.3.7:
Type: Important factor for the calculated energy performance

This choice can strongly influence the flow rate. E.g. for displacement ventilation it could reduce against the “ideally mixed” case (= 1).

In 6.3.3.1 of the standard this quantity is labelled as “may vary over time”.
For instance, depending on supply temperature, the stratification with displacement ventilations is stable or not.
But it would be hard to define some other default choice generally applicable.

U-CERT Choice: adopt Clause B.3.3.7 without changes, but add that it is a default value.

$\Delta\varepsilon_V$ = 1 (default value)

UU.3.3.8 Airing factor

Clause UU.3.3.8:
Type: Less crucial detail for calculation methodology

Observations:
1) Note in the standard: “Using a fixed airing factor gives a very rough estimate of the air flow rates through windows openings; however, this approach can be practical for heating energy calculation and when there is no ventilation system other than manual window opening.”
2) Quote from the scope: “The definition of window opening scenarios is not covered by EN 16798-7.”
3): Text in A/B 3.3.8: “This factor has to be defined at national level especially if a window opening is considered as a possible ventilation system alone”.

Ergo:
First it has to be decided if this simplified method is acceptable (or only the two more detailed calculations using wind velocity and temperature difference or internal pressure as input).
And if accepted: which value for the airing factor.

So the Annex B value can be accepted, because in case the indoor air quality only relies on windows opening there is no reliable estimate to make. The simplified approach uses the required air flow rate as basis, with the airing factor as multiplication factor. The value in Annex B is from energetic perspective a conservative value.

U-CERT Choice: adopt Clause B.3.3.8 without changes

This factor has to be defined at national level especially if a window opening is considered as a possible ventilation system alone.

The value is:

f_{arg} = 1,8.

UU.3.3.9 Cross-ventilation factor

Table UU.10:
Type: Less crucial detail for calculation methodology

Building types should be consistent with the building (and space…) categorization in EN ISO 52000-1.

➔ **LINKED CHOICES:**
Table UU.7 of EN ISO 52000-1: space categories

U-CERT Choice: Change building types into space categories of Table UU.5 of EN ISO 52000-1. Not worked out in Table UU.10.

Cross-ventilation may be considered in a ventilation zone if doors can be opened between two facades with different orientations of the external envelope of the ventilation zone.

Table UU.10 gives default values for the cross-ventilation factor based on building categories.

Table UU.10 — Cross-ventilation factor

Building type	Cross-ventilation factor, f_{cros}
Single family houses of different types	1
Apartment block (1) at least half of the floor area of the ventilation zone can be cross-ventilated	1
Apartment block (2) other case	0
Office buildings	0
Educational buildings	1
Hospitals	0
Hotels and restaurants	0
Sport facilities	1
Wholesale and retail trade services buildings	1
Other types of energy consuming buildings	0

UU.3.3.10 Number of window divisions

Clause UU.3.3.10:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.3.10 without changes

The value for the number of window divisions is:

$N_{w;div} = 1$

UU.3.3.11 Stack effect in passive and hybrid duct

Clause UU.3.3.11:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.3.11 without changes

The useful height of stack effect depends on air transfers between levels of the ventilation zone:

If there is no air transfer between levels of the ventilation zone or its height is smaller or equal to 3 m:

$$h_{pdu;st} = h_{pdu} + 2 \quad \text{(UU.1)}$$

Else:

$$h_{pdu;st} = h_z + 2 \quad \text{(UU.2)}$$

UU.3.3.12 Distribution of vents

Clause UU.3.3.12:
Type: Less crucial detail for calculation methodology

Note that Formula (UU.3) is not from Annex A, but from Annex B

U-CERT Choice: adopt Clause B.3.3.12 without changes

The distribution is based on a vent coefficient for the ventilation zone estimated with:

$$C_{\text{vent}} = \sum_{\text{all vents}} C_{\text{vent;path},i} \qquad \text{(UU.3)}$$

The distribution of vents is given by Table UU.11.

Table H.11 — Distribution of vents

Air flow path height	Windward facade	Leeward facade
0,25 hz	$C_{\text{vent;path}} = 0{,}25\ C_{\text{vent}}$	$C_{\text{vent;path}} = 0{,}25\ C_{\text{vent}}$
0,75 hz	$C_{\text{vent;path}} = 0{,}25\ C_{\text{vent}}$	$C_{\text{vent;path}} = 0{,}25\ C_{\text{vent}}$
...		

UU.3.3.13 Reference pressure for the envelope airtightness index

Clause UU.3.3.13:
Type: Less crucial detail for calculation methodology

In 6.3.5 of the standard the reference pressure is given as a constant = 50 Pa.
The reason for the choice here is that the reference pressure in the countries is not the same overall. It may be 50 or 4 Pa (or even a different value?).
It is used in Formula (UU.1) in UU.3.3.15 below.

U-CERT Choice: adopt Clause B.3.3.13 without changes

The value is:

$\Delta p_{\text{lea;ref}} = 50$ Pa

UU.3.3.14 Flow exponent through leaks

Clause UU.3.3.14:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.3.14 without changes

The value is:

$n_{\text{lea}} = 0{,}667$

UU.3.3.15 Leakage coefficient of the ventilation zone

Clause UU.3.3.15:
Type: Less crucial detail for calculation methodology

This formula does not really belong here, it should be in the normative text.
It may have been placed here because alternatively C_{lea} could be given as tabulated values instead of the formula; but this has not been pushed through consequently.

U-CERT Choice: Add to Clause B.3.3.15 that there is no national choice involved.

$$C_{\text{lea}} = q_{\text{V;}\Delta p_{\text{lea,ref}}} \frac{A_{\text{lea}}}{\Delta p_{\text{lea,ref}}^{n_{\text{lea}}}} \qquad \text{(H.1)}$$

There is no national choice involved in UU.3.3.15.

UU.3.3.16 Envelope leakage distribution

Clause UU.3.3.16 and Table UU.12:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.3.16 and table B.12 without changes

The envelope leakage distribution is based on:

— the leakage coefficient of the ventilation zone

— the leakage coefficient of the façades, which is estimated to be proportional to the ratio of surface area of the façade to that of the facades plus the roof

— the leakage coefficient of the roof, which is estimated to be proportional to the ratio of surface area of the roof to that of the facades plus the roof

The leakage coefficient of the façade is estimated with:

$$C_{\text{lea;fde}} = C_{\text{lea}} \cdot \frac{A_{\text{fde}}}{A_{\text{fde}} + A_{\text{roof}}} \quad \text{(H.5)}$$

The leakage of the roof is given by:

$$C_{\text{lea;roof}} = C_{\text{lea}} \cdot \frac{A_{\text{roof}}}{A_{\text{fde}} + A_{\text{roof}}} \quad \text{(H.6)}$$

The leakage distribution is given in Table UU.12.

Table UU.12 — Envelope leakage distribution

Air flow path height	Windward facade	Leeward façade	Roof
0,25 hz	0,25 $C_{\text{lea;fde}}$	0,25 $C_{\text{lea;fde}}$	-
0,75 hz	0,25 $C_{\text{lea;fde}}$	0,25 $C_{\text{lea;fde}}$	-
hz	-	-	$C_{\text{lea;roof}}$

UU.3.3.17 Typical internal doorway area

Clause UU.3.3.17:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.3.17 without changes

$A_{\text{door;min}} = 1{,}4\text{m}^2$

UU.3.4 Operating conditions data

UU.3.4.1 Maximum wind speed for cross-ventilation calculation

Clause UU.3.4.1:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.3.4.1 without changes

$u_{10;;site;max}$= 3 m/s

UU.3.4.2 Wind speed correction factors

Clause UU.3.4.2
Type: Less crucial detail for calculation methodology

In 6.4.2.2 of the standard it is clearly stated that these are only default values, therefore:

U-CERT Choice: adopt Clause B.3.4.1 without changes, but add explicitly that these are default values

The following default values may be used (see 6.4.2.2):

$C_{top;site,}$= 1

$C_{rgh;site}$= $C_{rgh;10;site}$

$C_{top;10;site,}$= 1

$C_{rgh;met}$=1

$C_{top;met}$=1

Table UU.13 gives values for the roughness coefficient at the building site at a height of 10 m.

Table UU.13 — Correction factor $C_{rgh;10;site}$

Terrain class, TER_CLASS	$C_{rgh;10;site}$
Open terrain	1,0
Country	0,9
Urban/City	0,8

UU.3.4.3 Ventilation system operation

Table UU.14:
Type: Other (typology)

The EPB standard uses these four categories in the normative calculation procedures, so the only choice is the specification of the meaning, which is not a meaningful national choice…

U-CERT Choice: adopt Table B.14 without changes

Tables B.14 gives identifiers for VENT_SYS_OP.

Table UU.14 — Identifiers for VENT_SYS_OP

Code	Meaning
BALANCED_OP	Air is supplied to and exhausted from the space mechanically
EXTRACT_OP	Air is exhausted from the space mechanically; air is supplied naturally to the space
SUPPLY_OP	Air is supplied to the space mechanically; air is exhausted naturally from to the space
NATURAL_OP	Air is naturally supplied to and exhausted from the space

UU.4 Input data method 2

Clause UU.4:
There are no choices in Annex A for method.
But it will help to state explicitly the choice for Method 1.

U-CERT Choice: add sentence to Clause B.4, as suggested in this explanation box.

There is no default value for this method.

For U-CERT: Method 1 is chosen as the method that shall be used. Method 2 shall not be used.

11 For EN 16798-5-1

Annex UU of EN 16798-5-1:2017, Energy performance of buildings – Ventilation for buildings – Part 5–1: Calculation methods for energy requirements of ventilation and air conditioning systems (Modules M5–6, M5–8, M6–5, M6–8, M7–5, M7–8) – Method 1: Distribution and generation

Grey shading:

Concerning Annex B as basis for Annex UU for EN 16798-5-1:

In this U-CERT document, the cells in the tables have been grey shaded when it is part of the template of Annex A.

In one or two cases also the text between the tables is grey shaded, when it has to be made clear what is part of the template (Annex A) and what has been added in Annex B.

So only the non-shaded elements are allowed to be edited to stay in line with the standard (in casu: in line with the normative template of Annex A). and what has been added in Annex B (and adopted or changed in this U-CERT National Datasheet).

Clause A.1/B.1 has not been grey shaded, but shall not be edited in any case.

Disclaimer:

Because neither Annex A nor Annex B of this standard contains any shading of cells in the tables, it was not always fully clear whether the texts in the tables are examples of normative texts.

Annex UU

(informative)
Input and method selection data sheet – ~~Default~~ U-CERT choices

UU.1 General

The template in Annex A to this standard shall be used to specify the choices between methods, the required input data and references to other standards.

NOTE 1 Following this template is not enough to guarantee consistency of data.

NOTE 2 Informative default choices are provided in Annex B. Alternative values and choices can be imposed by national / regional regulations. If the default values and choices of Annex B are not adopted because of the national / regional regulations, policies or national traditions, it is expected that:

– national or regional authorities prepare data sheets containing the national or regional values and choices, in line with the template in Annex A; or

– by default, the national standards body will add or include a national annex (Annex NA) to this standard, in line with the template in Annex A, giving national or regional values and choices in accordance with their legal documents.

NOTE 3 The template in Annex A is applicable to different applications (e.g. the design of a new building, certification of a new building, renovation of an existing building and certification of an existing building) and for different types of buildings (e.g. small or simple buildings and large or complex buildings). A distinction in values and choices for different applications or building types could be made:

– by adding columns or rows (one for each application), if the template allows;

– by including more than one version of a Table (one for each application), numbered consecutively as a, b, c, … For example: Table NA.3a, Table NA.3b.

– by developing different national / regional data sheets for the same standard. In case of a national annex to the standard these will be consecutively numbered (Annex NA, Annex NB, Annex NC, …).

NOTE 4 In the section "Introduction" of a national / regional data sheet information can be added, for example about the applicable national / regional regulations.

NOTE 5 For certain input values to be acquired by the user, a data sheet following the template of Annex A, could contain a reference to national procedures for assessing the needed input data. For instance, reference to a national assessment protocol comprising decision trees, tables and pre-calculations.

The shaded fields in the tables are part of the template and consequently not open for input.

UU.2 References

The references, identified by the module code number, are given in Table UU.1.

Table UU.1:
Type: References

See Explanation at EN ISO 52000-1, Table UU.1

Table UU.1 —References

Reference	Reference document
M1-9	EN ISO 52000-1 *Energy performance of buildings — Overarching EPB assessment — Part 1: General framework and procedures (ISO 52000-1)*
M1-13	EN ISO 52010-1 *Energy performance of buildings — Overarching assessment procedures for external environment conditions — Part 1: Conversion of measured hourly weather data to input for energy calculations (ISO 52010-1)*
M2-2	EN ISO 52016-1 *Energy performance of buildings — Calculation of the energy needs for heating and cooling, internal temperatures and heating and cooling load in a building or building zone — Part 1: Calculation procedures (ISO 52016-1)*
M3-1	EN 15316-1 *Heating systems and water based cooling systems in buildings — Method for calculation of system energy requirements and system efficiencies — Part 1: General and Energy performance expression*
M4-1	EN 16798-9 *Energy performance of buildings — Module M4-1, M4-4, M4-9 — Ventilation for buildings — Calculation methods for energy requirements of cooling systems — Part 9: General and Energy performance expression*
M5-4	EN 16798-3 *Energy performance of buildings — Part 3: Ventilation for non-residential buildings — Performance requirements for ventilation and room-conditioning systems*
M5-5	EN 15316-7 *Energy performance of buildings — Part 7: Ventilation for buildings — Module M5-5 — Calculation methods for the determination of air flow rates in buildings including infiltration*
M6-2	EN ISO 52016-1 *Energy performance of buildings — Calculation of the energy needs for heating and cooling, internal temperatures and heating and cooling load in a building or building zone — Part 1: Calculation procedures (ISO 52016-1)*
M7-2	EN ISO 52016-1 *Energy performance of buildings — Calculation of the energy needs for heating and cooling, internal temperatures and heating and cooling load in a building or building zone — Part 1: Calculation procedures (ISO 52016-1)*

UU.3 Product description data

Table UU.2:
Type: Other (just default example?!)

Has nothing to do with a national choice….!

U-CERT Choice: add sentence to Table B.2: “No national choice involved.”

The product description data are given in Table UU.2.

Table UU.2 — Product description data

HEAT_REC_TYPE	DEFR_TYPE	HUM_TYPE
PLATE	BYPASS	CONTACT

There is no national choice involved in Table UU.2.

UU.4 Product technical data

Clause UU.4:
All choices in Clause A/B.4 concern technical details.

According to 6.3.1 of the standard: Input data about products that are required for the calculation described in this standard shall be the data supplied by the manufacturer if they are declared according to relevant EN product standards. If no such data from the manufacturer is available or if the required data are not product data, default values are given in Annex B.
For clarity the U-CERT proposal is to add (in bold), in deviation from Annex B but in line with Annex A:

The values in UU.4 are intended to be default values. If applicable, these values may be overruled by declared values of the actually applied products.

UU.4.1 Duct tightness class

Table UU.3:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.3 without changes

The duct tightness classes according to EN 12237 (circular ducts) and EN 1507 (rectangular ducts) are given in Table UU.3.

Table UU.3 — Duct tightness class and leakage coefficient

Building type	Duct tightness class
New	B
existing	unknown

UU.4.2 Air handling unit tightness class

Table UU.4:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.4 without changes

The air handling unit tightness classes according to EN 1886 are given in Table UU.4.

Table UU.4 —AHU tightness class and leakage coefficients

Building type	AHU tightness class
New	L2
Existing	L3

UU.4.3 Heat recovery leakage and outdoor air factors

Table UU.5:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.5 without changes

The heat recovery leakage factors for different heat recovery types and fan arrangements are given in Table UU.5.

Table UU.5 — Heat recovery leakage and outdoor air factors

SUP_FAN_LOC	ETA_FAN_LOC		HEAT_REC_TYPE				
		Leakage factor	PLATE	ROT_NH	ROT_HYG	ROT_SORP	PUMP_CIRC
UP_HR	UP_HR	*flea;hr;SUP*	1,02	1,04			1,0
		flea;hr;ETA	1,02	1,0			1,0
		fODA;hr	1,02	1,0			1,0
UP_HR	DOWN_HR	*flea;hr;SUP*	1,02	1,10			1,0
		flea;hr;ETA	1,02	1,10			1,0
		fODA;hr	1,02	1,0			1,0
DOWN_HR	UP_HR	*flea;hr;SUP*	1,02	1,10			1,0
		flea;hr;ETA	1,02	1,10			1,0
		fODA;hr	1,02	0,909			1,0
DOWN_HR	DOWN_HR	*flea;hr;SUP*	1,02	1,02			1,0
		flea;hr;ETA	1,02	1,0			1,0
		fODA;hr	1,02	0,98			1,0

UU.4.4 Nominal heat recovery temperature efficiency and constants for the velocity dependence

Table UU.6:
Type: Less crucial detail for calculation methodology

Error in column PUMP_CIRC: 0,03 should be 0,0003

U-CERT Choice: adopt Table B.6 without changes except correction of error

The nominal temperature efficiencies and values for the constants C_1 and C_2 are given in Table UU.6.

Table UU.6 — Nominal temperature efficiencies and values for the constants

		HEAT_REC_TYPE						
Parameter	Unit	PLATE		ROT_NH	ROT_HYG	ROT_SORP	PUMP_CIRC	OTHER
		cross flow	counter flow					
ηhr;nom	-	0,60	0,85	0,69	0,67	0,69	0,71	
vhr;nom	m/s	3,5						
C1		−0,0201	−0,0201	−0,0643	−0,0684	−0,0665	−0,0491	

C2		1,0						
Φhr;max	kW	n/a	n/a	from design calculation or inspection			n/a	
nrot;max	min^{-1}	n/a	n/a	20	20	20	n/a	
Phr;rot;max	kW	n/a	n/a	0,12	0,12	0,12	n/a	
pel;hr;pu;max	kWh/m^3	n/a	n/a	n/a	n/a	n/a	~~0.03~~ 0,00003	
fpl;hr;min	-	n/a	n/a	n/a	n/a	n/a	0,5	
ΔpSUP+ETA;des;hr	Pa	300	500	400			500	

UU.4.5 Humidity recovery efficiency and constants for the calculation

Table UU.7:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.7 without changes

The humidity recovery efficiencies and correction factors, depending on the heat recovery type, are given in Table UU.7.

Table UU.7 — Humidity recovery efficiency and correction factors

	HEAT_REC_TYPE			
Parameter	**ROT_NH**	**ROT_HYG**	**ROT_SORP**	**OTHER**
ηxr;nom	0,3	0,42	0,69	0
fhr;n	Annex D			0
fΔx;x	Annex D			0
fq;x	Annex D			0
fv;x	Annex D			0
fn;x	Annex D			0
fxr;other	n/a			0

UU.4.6 Value for adiabatic cooling humidifier efficiency

Clause UU.4.6:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Clause B.4.6 without changes

The value for adiabatic cooling humidifier efficiency is $\eta_{hu;ac}$ = 0,9.

UU.4.7 Values for cooling and heating coil calculation

Table UU.8:

Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.8 without changes

The values for the calculation of the cooling and heating coils are given in Table UU.8.

Table UU.8 — Cooling and heating coil calculation constants

Constant	Value
CC;1	11,9083
CC;2	4110,34
CC;3	235
fC;bf	0,1
ηcoil;C	0,8
ηcoil;H	0,8

UU.4.8 Air handling unit related default values

Table UU.9:
Type: Less crucial detail for calculation methodology

The values are indeed intended as default values (and not as default for a fixed national choice).

U-CERT Choice: adopt Table B.9 without changes

The air handling unit related default values are given in Table UU.9.

Table UU.9 — Air handling unit related default values

Variable	Unit	Value
qV;SUP;ahu;nom	m3/h	from design or inspection
qV;ETA;ahu;nom	m3/h	from design or inspection
Aahu;SUP	m2	Depending on size (*qV;SUP;ahu;nom*)
Uahu;SUP	W/m2 K	1,0
Aahu;ETA	m2	Depending on size (*qV;ETA;ahu;nom*)
Uahu;ETA	W/m2 K	1,0
ΣPel;V;ctrl	kW	0,1

UU.4.9 Specific pump energy for humidification

Table UU.10:
Type: Less crucial detail for calculation methodology

Error: all values are a factor 1000 too high.

U-CERT Choice: adopt Table B.10 with errors corrected.

The specific humidification pump energy power consumption for different humidifier types and control strategies are given in Table UU.10.

Table UU.10 — Specific humidification pump energy power consumption for different humidifier types and control strategies

HUM_TYPE	HUM_CTRL	Specific energy *pel,HU,des* kWh/m3	*qm;w;HU,des* kg/h
CONTACT	NO_CTRL	~~0,01~~ 0,00001	from design or inspection
ROT_SPRAY	NO_CTRL	~~0,20~~ 0,00020	
	ON_OFF	~~0,20~~ 0,00020	
	SPEED	~~0,20~~ 0,00020	
HI_PRES	SPEED	~~0,04~~ 0,00004	
HYBRID	ON_OFF	~~0,02~~ 0,00002	
STEAM	—	—	—
OTHER	—	—	—

UU.5 System design data

Clause UU.5:
All choices in Clause A/B.5 concern technical details.

The values in B.5 are intended to be default values.
For clarity we add (in bold), in deviation from Annex B but in line with Annex A a sentence.

U-CERT Choice: add a sentence to Clause B.5 as suggested above in this explanation box

The values in UU.4 are intended to be default values. If applicable, these values may be overruled by declared values of the actually applied systems.

UU.5.1 Qualitative process design data choices

Table UU.11:
Type: Other (just example?!)

Has nothing to do with a national choice….!

U-CERT Choice: add sentence to Table B.11: “No national choice involved.”

The process design data choices are given in Table UU.11.

Table UU.11 — Process design data choices

SUP_FAN_LOC	ETA_FAN_LOC	FAN_MOT_LOC	SYS_TYPE	AHU_LOC
DOWN_HR	DOWN_HR	IN_AIR	MULTI_ZONE	NC

There is no national choice involved in Table UU.11.

UU.5.2 Fan motor heat recovery factors

Table UU.12:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.12 without changes, but add "default"

The default fan motor heat recovery factors, depending on the placement of the fan motor, are given in Table UU.12.

Table UU.12 — Fan motor heat recovery factors

FAN_MOT_LOC	*ffan;rd*
IN_AIR	1,0
OUTS_AIR	0,6

UU.5.3 Quantitative process design data choices

Table UU.13:
Type: Important factor for the calculated energy performance

These data can have quite an impact on the ventilation energy, especially the *Δp*'s; these vary quite a lot with the national customs.
But as general default values the choices in Table B.13 are the best that could be made.

U-CERT Choice: adopt Table B.13 without changes, but add "default"

The default quantitative process design data are given in Table UU.13.

Table UU.13 — Quantitative process design data

Symbol	Unit	Simple ventilation system	Air conditioning system
Hdu;SUP;nc	W/K	0,5	
Hdu;SUP;zt	W/K	4	
Hdu;ETA;nc	W/K	0,5	
ϑSUP;set	°C	20	
vhr;des	m/s	2	
ΔpSUP;des	Pa	500	1 100
ΔpETA;des	Pa	300	700
fΔp;SUP;ctrl	-	0,4	0,3
fΔp;ETA;ctrl	-	0,67	0,5

UU.5.4 Limit values for the defrost control

Table UU.14:
Type: Less crucial detail for calculation methodology

U-CERT Choice: adopt Table B.14 without changes, but add "default"

The default limit temperature values for frost protection, depending on the building use category, are given in Table UU.14.

Table UU.14 — Temperature limit values for frost protection

DEFR_CTRL = DIRECT		DEFR_CTRL = INDIRECT		
Limit	**Value °C**	**Building use category**	**HEAT_REC_TYPE**	***ϑETA;hr;lim, °C***
$\vartheta_{e;lim1}$	−10	Residential	PLATE	5
$\vartheta_{e;lim2}$	$= \vartheta_{EHA;hr;lim}$; default −5	Residential	ROT_HYG	0
		Non residential	PLATE	0
		Non residential	ROT_HYG	−5
		Non residential	ROT_NH	−10
		Non residential	ROT_SORBT	−5
		Non residential	PUMP_CIRC	5

UU.5.5 Control options

Table UU.15:
Type: Less crucial detail for calculation methodology

The idea is to define the default setting of these issues in the absence of a system specification.
The default setting here is very conservative.

U-CERT Choice: adopt Table B.15 without changes, but add “default”

The default control options are given in Table UU.15.

Table UU.15 — Process control options

AIR_FLOW_CTRL	SUP_AIR_TEMP_CTRL	RCA_CTRL	DEFR_CTRL	FAN_CTRL	HUM_CTRL
ON/OFF_CTRL	CONST	FIX	DIRECT	NO_CTRL	ON_OFF

UU.5.6 Heat recovery control options

Table UU.16:
Type: Less crucial detail for calculation methodology

The idea is to define the default setting of these issues in the absence of a system specification.

U-CERT Choice: adopt Table B.16 without changes, but add “default”

The default heat recovery control options, depending on the heat recovery type, are given in Table UU.16.

Table UU.16 — Heat recovery control options

HEAT_REC_TYPE	Code
PLATE	BYPASS
ROT_NH	SPEED
ROT_HYG	
ROT_SORP	
PUMP_CIRC	HYDR

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