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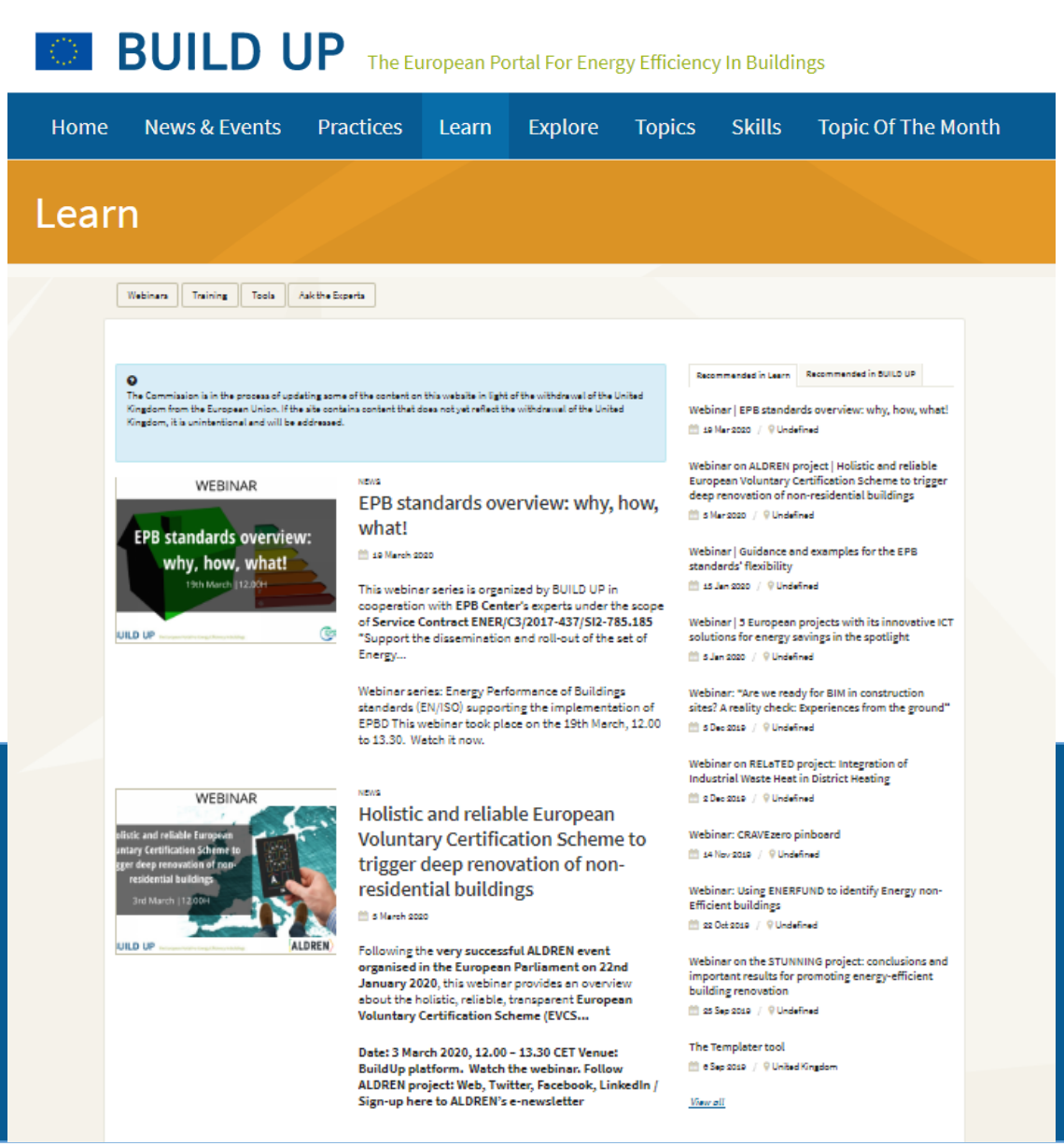


Check our Learn section!

- Webinar 1 – **4th February 2020 (**12h00-13h30 CET**) –** Guidance and examples for the EPB standards' flexibility

- Webinar 2 –**19th March 2020 (**12h00-13h30 CET**) –** EPB standards overview: why, how, what!

- **Webinar 3 –16th April 2020 (12h00-13h30 CET) –How to make good use of the outputs of the EPB assessments**

- **Webinar 4** – **26th May 2020 (**12h00-13h30 CET**)** –EPB standards hourly vs monthly methods

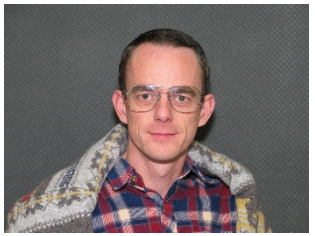
- **Webinar 5** –**16th June 2020 (**12h00-13h30 CET**)** –EPB standards linked to health and wellbeing

- **Webinar 6** – **8th September 2020 (**12h00-13h30 CET**)** –Heating systems in the EPB standards

Your service center for information and technical support on the new set of EPB standards

Overview of the relations between building & product standards & regulations

Dirk Van Orshoven



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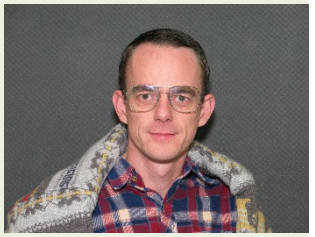
BUILD UP Webinar series
Webinar 3: *EPB postprocessing*
16 April 2020

My background



- Independent energy engineer,
  with a focus on EPB (and EE & SE, …)
- Intensely involved in the original development of the Belgian EPB regulations (1998-2012-…)
- Involved in the European EPB projects EnPeR (2001-2003) and ASIEPI (2007-2010), exchanging a lot of national EPB information
- Co-author of EN ISO 52003-1 & -2 and
  EN ISO 52018-1 & -2

INTERNATIONAL STANDARD

ISO 52003-1

First edition
2017-06

Energy performance of buildings — Indicators, requirements, ratings and certificates —

Part 1: General aspects and application to the overall energy performance

Performance énergétique des bâtiments — Indicateurs, exigences, appréciations et certificats —

Partie 1: Aspects généraux et application à la performance énergétique globale

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TECHNICAL REPORT

ISO/TR 52003-2

First edition
2017-06

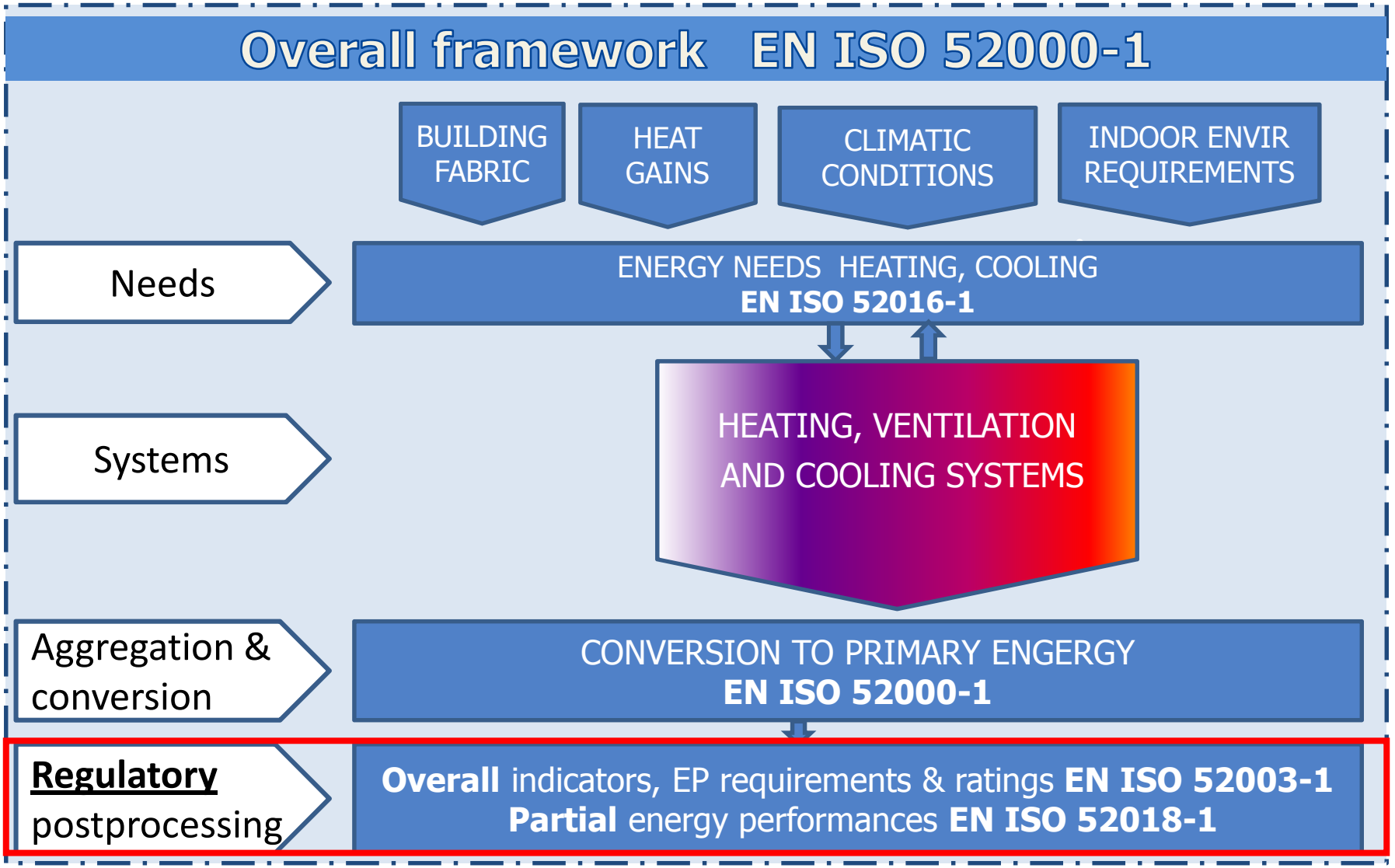
Energy performance of buildings — Indicators, requirements, ratings and certificates —

Part 2: Explanation and justification of ISO 52003-1

Performance énergétique des bâtiments — Indicateurs, exigences, classification et certificats —

Partie 2: Explication et justification de l'ISO 52003-1

Position of “postprocessing”



IMPORTANT WARNING !

- EN ISO 52003 and EN ISO 52018 make the link between the EPB assessment standards and the EPB regulations (requirements, ratings, etc.).
- All these regulatory matters are the sole responsibility of the public authorities.
- **The standards leave the full freedom to the competent public instances to take all these decisions.**
- The documents only provide supporting information and insight for the public decisions.
- The documents are of course not exhaustive!

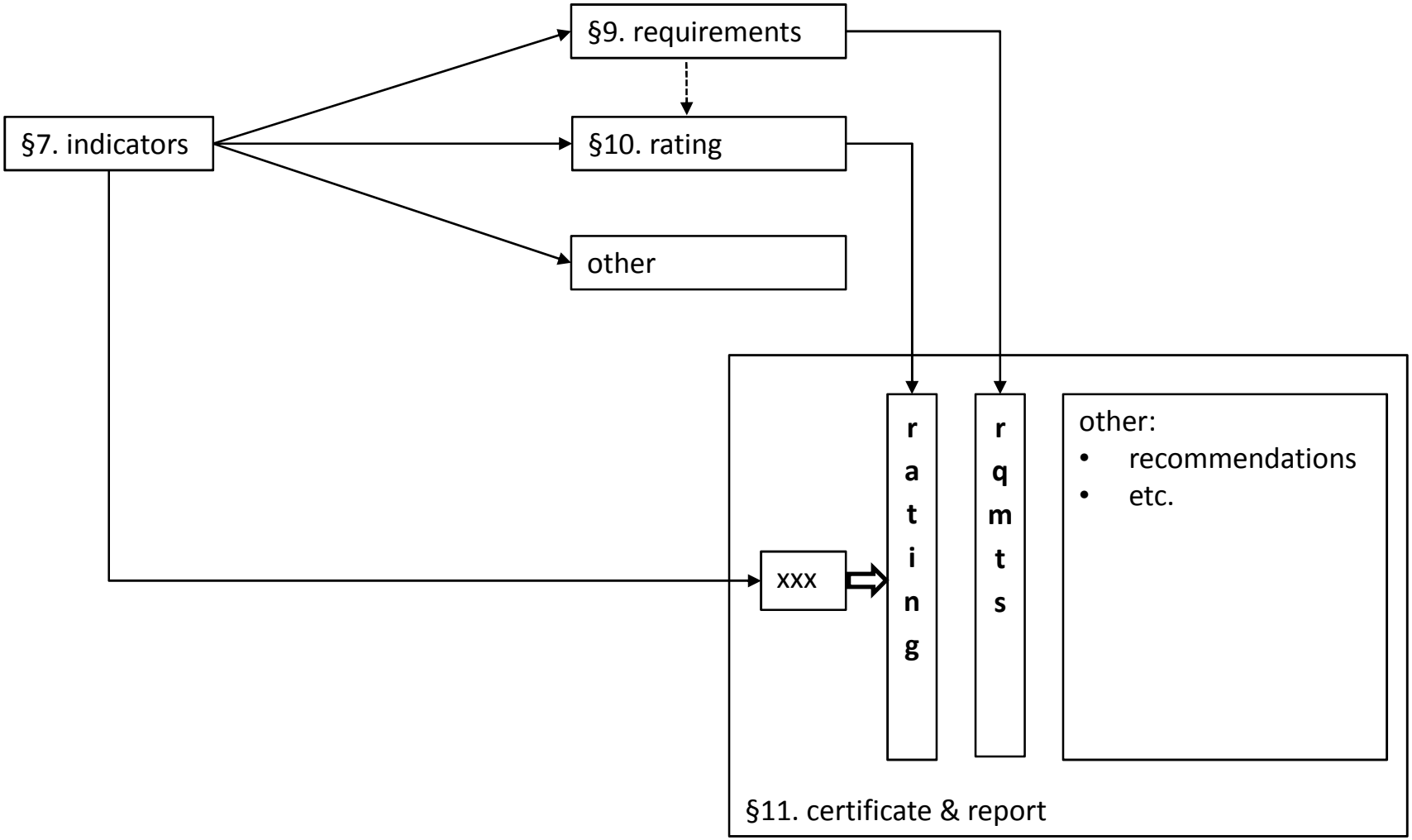
Practical aspects

- The only aspect in the standards that is normative is the FORMAT of the reporting tables. The content is left completely free (open ended, …).
  - The uniform tables can facilitate comparison of national choices made in different countries.
- These documents try to make implicit, “automatic” actions and choices explicit, so that the processes can occur in a more conscious manner.
- They can also serve as “institutional memory”, notably for novices in the field.

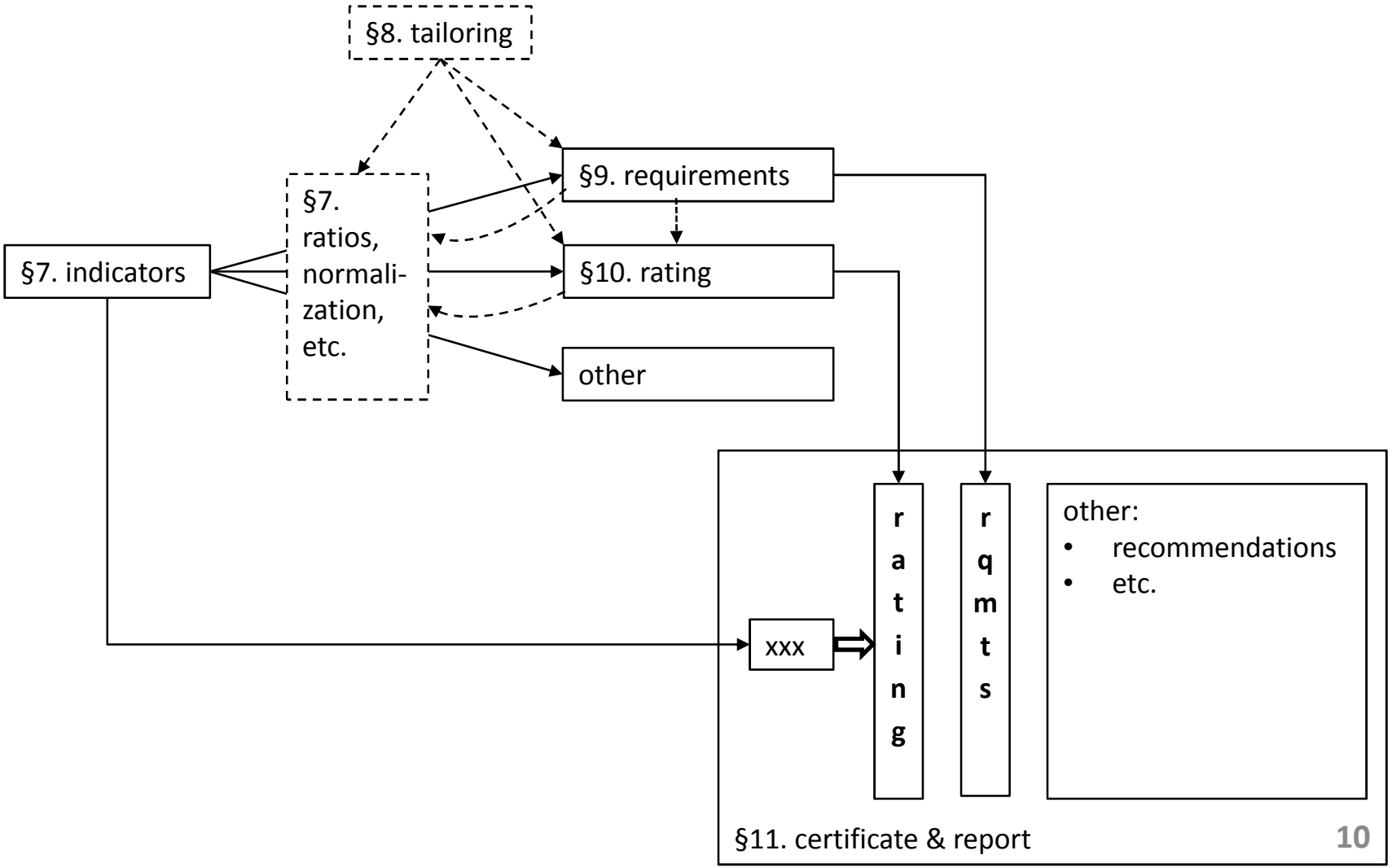
Further practical aspects

- **The standards themselves (part 1) are kept succinct, restricted to the essentials.**
  The technical reports (part 2) provide (extensive) additional considerations, illustrations, etc.
- Both parts are therefore best read in parallel, clause by clause.
- Nearly all of the content of these documents can also be relevant to private actors, but the wording in this webinar is rather for public authorities.

Simplified overview



Complete overview



clause 7	clause 7	clause 9		clause 10	-
EPB feature	indicator	requirements		rating	other uses
		new	existing		
overall energy performances					
primary energy use					
non-renewable primary energy use				X	
...					
partial energy performances					
...					
lighting	LENI				
	...				
fans					
	specific fan power				
insulation	transmittance				
component thermal insulation					
	thermal transmittance		X		
	temperature factor				
...					
product energy performances					
...					
boilers					
pumps					
fans					
...				X	
refrigerators					
televisions					
...					
vehicles					
...					

clause 7	clause 7	clause 9		clause 10	-
EPB feature	indicator	requirements		rating	other uses
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clause 7	clause 7	clause 9		clause 10	-
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primary energy use		X			
non-renewable primary energy use				X	
...					
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...	...				
lighting	LENI				
	...				
fans					
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	...				
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...					
product energy performances					
...					
boilers					
pumps					
fans					
...				X	
refrigerators					
televisions					
...					
vehicles					
...					

Overall EP (52003)

overall energy performances					
primary energy use		X			
non-renewable primary energy use				X	
...					

partial energy performances	
...	...
lighting	LENI
	...
fans	
	specific fan power
	...
systems	
	efficiency
	expenditure factor
...	...
heating need	
	...
cooling need	
	...
envelope airtightness	
	specific air leakage
	...
overall thermal insulation	mean thermal transmittance
component thermal insulation	
	thermal transmittance
	temperature factor
...	

clause 7	clause 7	clause 9		clause 10	-
EPB feature	indicator	requirements		rating	other uses
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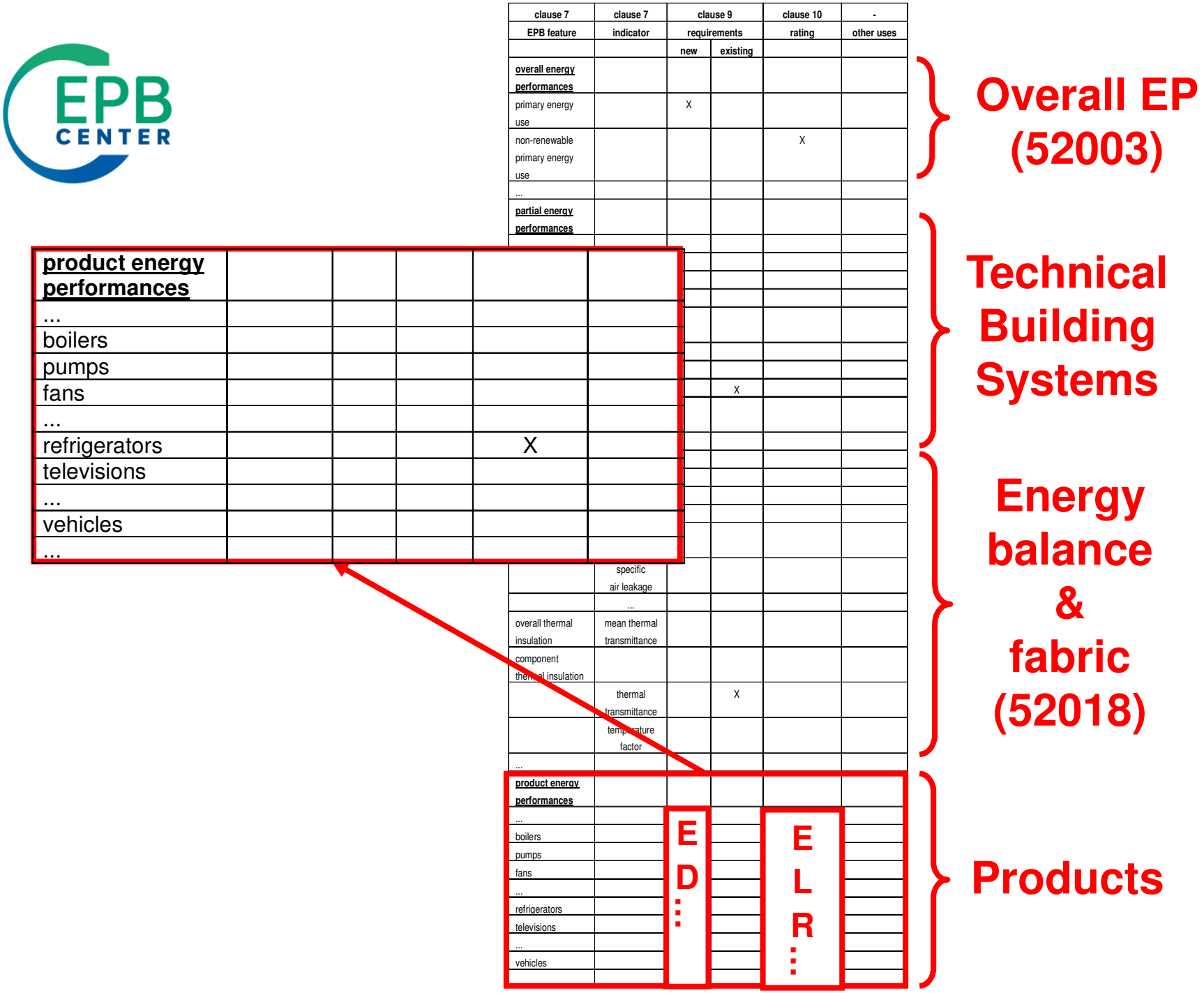
fans					
...				X	
refrigerators					
televisions					
...					
vehicles					
...					

Overall EP (52003)

Technical Building Systems

Energy balance & fabric (52018)


clause 7
EPB feature
clause 7
indicator
clause 9
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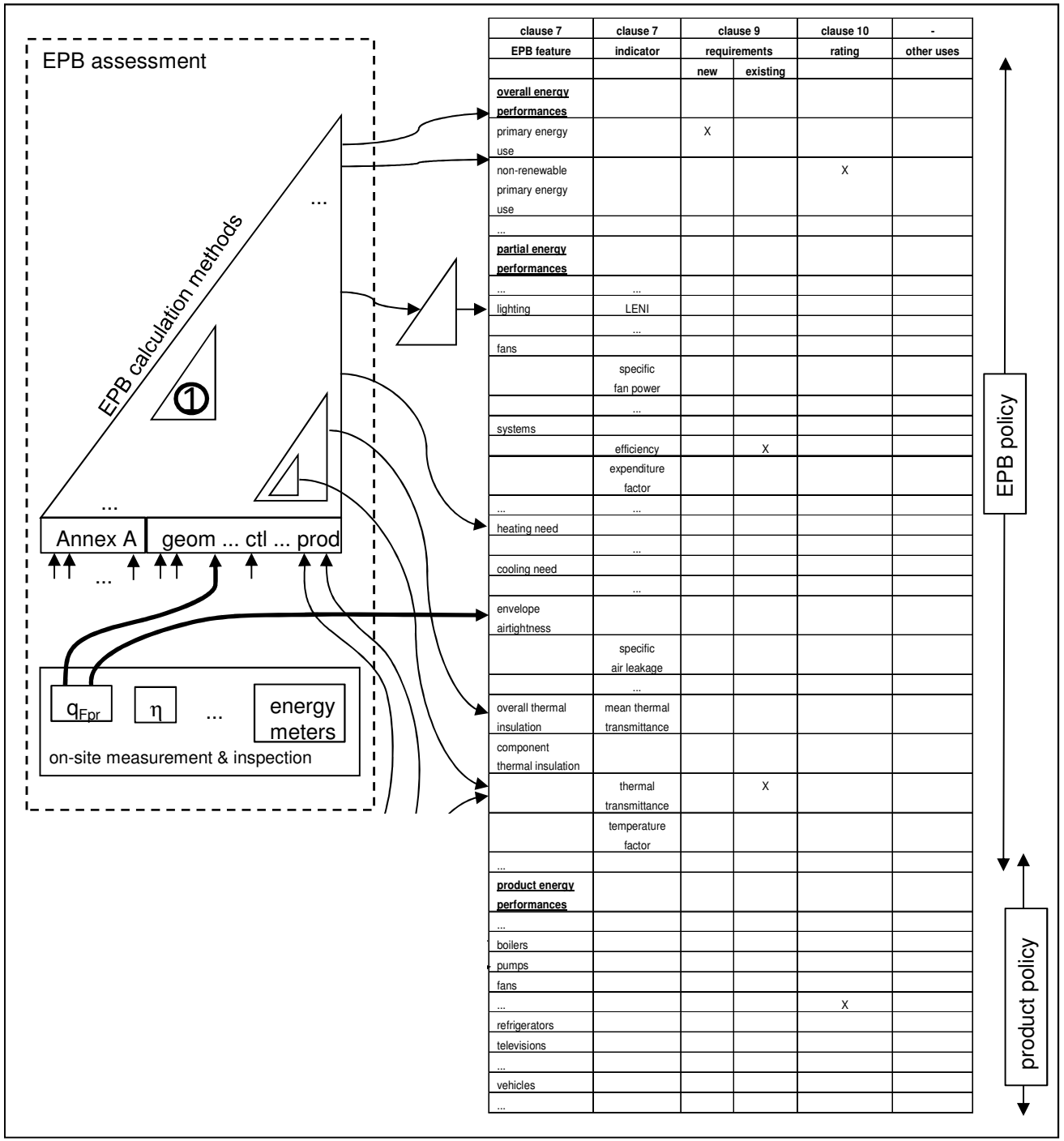
Overall EP (52003)
Technical Building Systems
Energy balance & fabric (52018)
Products



clause 7	clause 7	clause 9		clause 10	-
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televisions					
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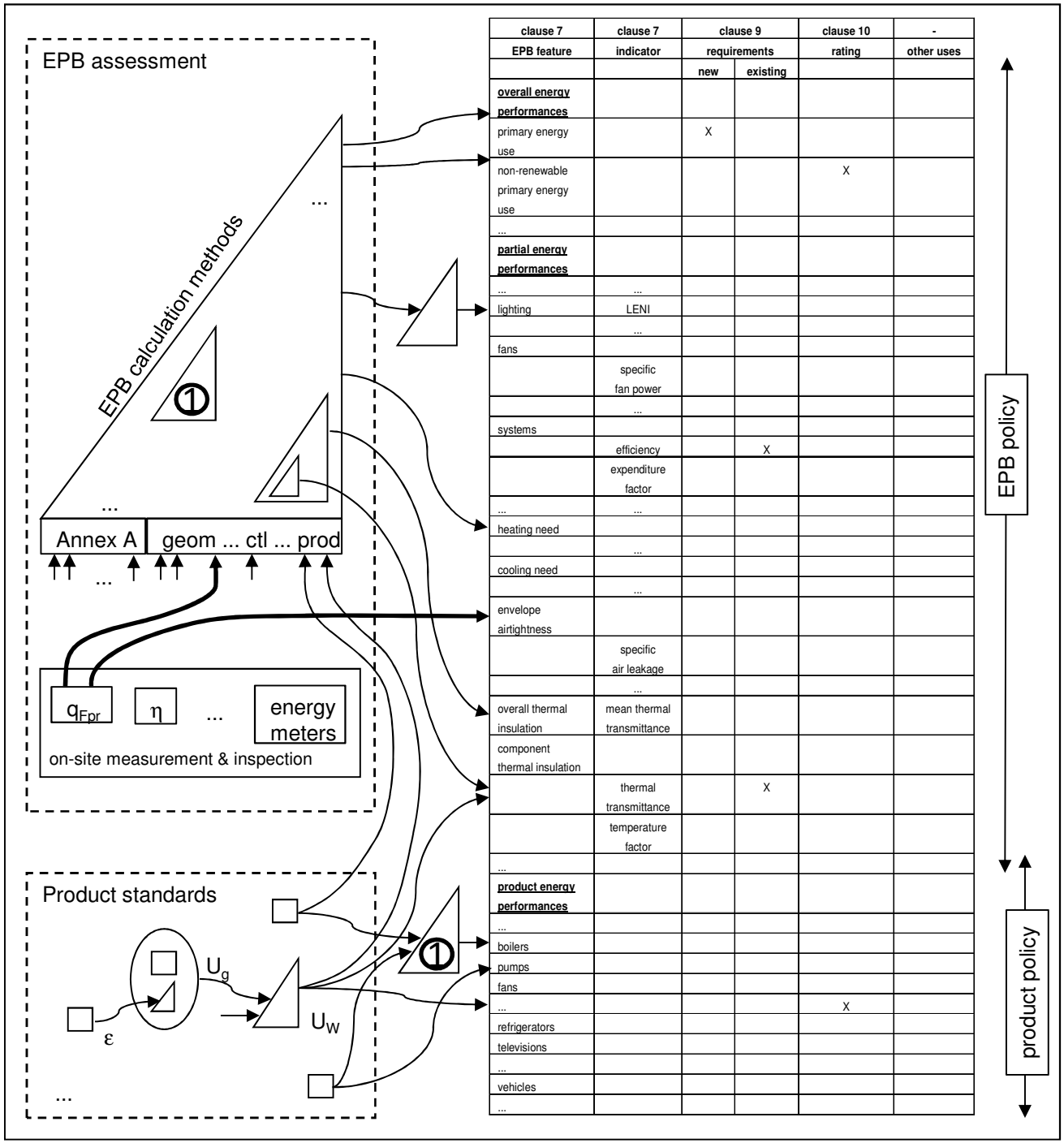
vehicles					
...					

EPB policy

product policy



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televisions					
...					
vehicles					
...					

EPB policy

product policy

Overarching		Building (as such)		Technical Building Systems										
	Descriptions		Descriptions		Descriptions	Heating	Cooling	Ventilation	Humidification	Dehumidification	Domestic Hot water	Lighting	Building automation & control	PV, wind, ..
sub1	M1	sub1	M2	sub1		M3	M4	M5	M6	M7	M8	M9	M10	M11
1	General	1	General	1	General									
2	Common terms and definitions; symbols, units and subscripts	2	Building Energy Needs	2	Needs									
3	Applications	3	(Free) Indoor Conditions without Systems	3	Maximum Load and Power									
4	Ways to Express Energy Performance	4	Ways to Express Energy Performance	4	Ways to Express Energy Performance									
5	Building Functions and Building Boundaries	5	Heat Transfer by Transmission	5	Emission & control									

ISO 52003

ISO 52018

embedded in other (CEN) standards

Thank you!

EPB Center is also 'available' for specific services requested by individual or clusters of stakeholders

More information on
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Contact: info@epb.center

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Your service center for information and technical support on the new set of EPB standards

The process of setting EPB requirements

Dick van Dijk

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Start: 21 September 2018 for 3 years

BUILD UP Webinar series
Webinar 3: *EPB postprocessing*
16 April 2020

My background

- One of the experts at EPB Center
- Involved in initiation, preparation and coordination of the set of EPB standards (2012-2017)
- Co-convenor of ISO Joint Working Group of ISO/TC 163 and ISO/TC 205
  - responsible for the overall set of EN ISO EPB standards
  - In collaboration with CEN/TC 371
- Convenor of ISO/TC 163/SC 2 WG 15 that developed a few key EPB standards (EN ISO 52016-1, EN ISO 52010-1, EN ISO 52018-1)

Defining the objectives

Before elaborating the requirements:

- identify the pursued **goals**
  can be combination of several **independent objectives**
  - a healthy and comfortable indoor environment
  - energy efficiency
  - fabric and equipment preservation *(e.g. to avoid degradation due to moisture)*
  - other goals

Motivations for choices

- A great variety of considerations may come into play
- Public authorities have full freedom to take the decisions
- Economic considerations have often proven useful in the decision process
  - maximizing the societal benefits at the lowest overall cost: *see next slide*

One of the possible goals: comparable econ. strictness

This may lead to “optimal” results because:

- there is a sense of fairness: same economic “effort” for everybody
- it better achieves an overall societal cost optimum
- there is less risk that the political decision making is weakened by the economically unprofitable cases

But economic analyses also have limitations: e.g. no perspective beyond a time horizon of 20-30 years, whereas buildings typically last …50…100… years

Objectives decided? Next step:

1) Which mix of EPB features and corresponding indicators?
   - for new buildings (or equivalent) and existing buildings/renovations
   - *e.g. overall EPB, heating needs, U-value, etc*.
2) Which ways to express requirements?
   - constant numeric value, or variable (reference building or formula)
3) Which actual strictness?
   - cost optimal (at which cost?), nzeb, etc.

Objectives decided? Next step:

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2) Which ways to express requirements?
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3) Which actual strictness?
   - cost optimal (at which cost?), nzeb, etc

strongly technical

inter-action

mainly societal-political

More on next slides….

(1) Requirement mix

- For which features?
  - and then: for which indicator?
- Considerations for new buildings (or equivalent)
  - definitely **overall EPB** requirements:
    - stimulates all aspects of the design, while leaving maximum freedom of choice
    - *E.g. primary energy per m^2 floor area*
  - additional **partial EPB** requirements?
    - as a function of the predefined objectives, e.g.
      - *"demand reduction first" (needs)*
      - *focus on long-lasting components, in particular the fabric, i.e. thermal insulation and air tightness*
    - maybe rather a limited number?
      - Otherwise risk of conflicting requirements
      - Partial requirements only as "safety net"?

(1) Requirement mix new buildings

Examples

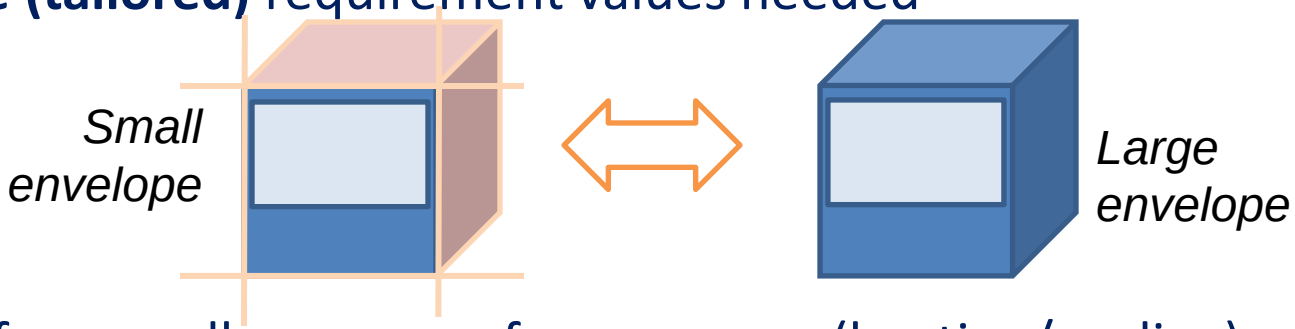
- EN ISO 52000-1, (informative) Annex H,
  Proposal of indicators for the assessment of nearly Zero-Energy Buildings
- Annexes B (default choices) of
  - EN ISO 52003-1: overall energy performance
  - EN ISO 52018-1: energy balance and fabric features

(1) Requirement mix renovations

- Much more complex: restricting boundary conditions and less design freedom
- Consequently:
  - Overall EPB requirements, based on holistic approach, not always evident
  - ➔ Often requirements on component/element level
  - Or requirements on combination of elements: more design freedom, but much more challenging to formulate in a regulation
  - Usually a long list in the regulation, but only a few requirements apply to each individual project

(2) Constant or variable numeric requirement?

- Often: constant values ⇏ desired comparable technical-economic strictness
  - Depends on indicator, e.g.
    - Thermal transmittance (*U*-value) of a single component: **constant** requirement values usually OK
    - Mean thermal transmittance of envelope: **variable (tailored)** requirement values needed



    - Similar for overall energy performances or (heating/cooling) needs

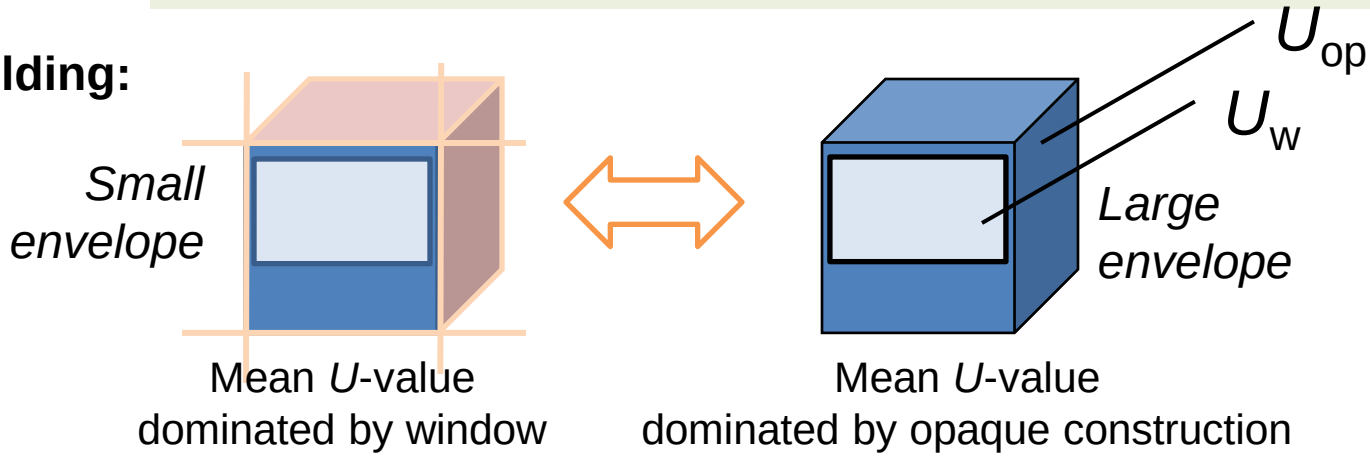
Tailoring numeric requirements *to individual buildings is illustrated and further discussed in the* ***next*** *and in the* ***final*** *presentations*

(2) Ratios as indicators

- Ratios can provide insight or greatly ease communication:
  complex things summarized in simple single & telling number
  - **Variable** value requirements can be expressed as **constant** value if the indicator is a **ratio**
  - Often, a ratio may already be a quality indicator (rating)
  - Focus on differences between energy efficient designs or measures ➔ less distraction by differences between different models (or model vs measurement)
- Challenge: adapting the indicator over time to reflect technical and economic evolutions

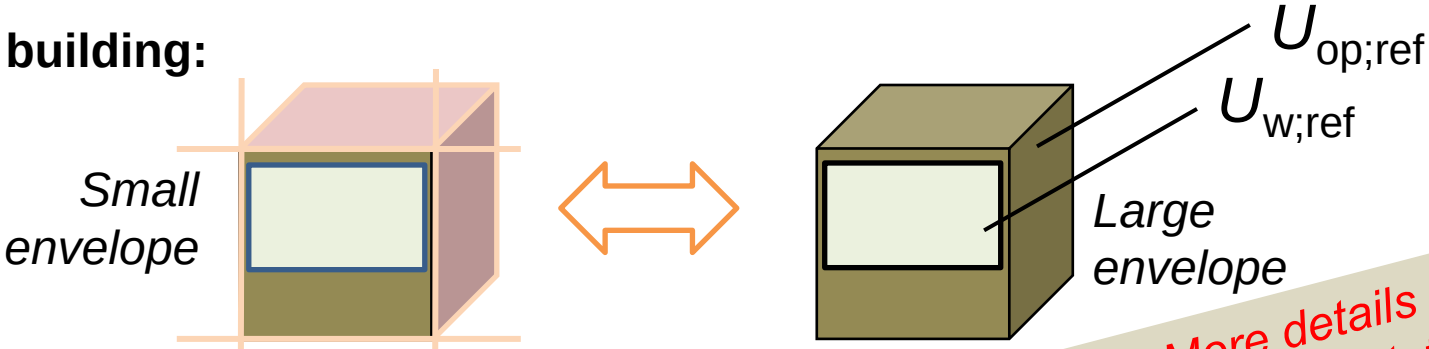
(2) Ratios: example

Actual building:



Ratio: compare U_{mean} with U_{mean} of reference building with same envelope dimensions: $\boldsymbol{U_{mean} / U_{mean;ref} < \ldots}$

Reference building:



➔ Requirement *tailored & more design freedom*

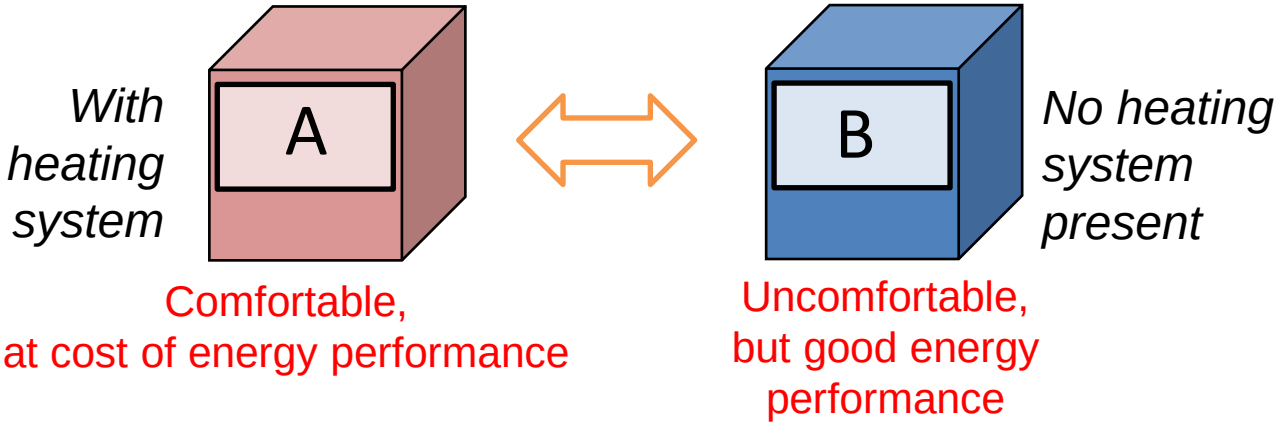
More details in next presentation!

(3) Actual strictness

- Reflects the societal-political ambition level
- If based on economic considerations: hypothesis about future energy price evolution may have important impact
- Some possible cost scenarios:
  - anticipated private market price;
  - macro-economic energy price scenarios, e.g. incorporating external costs
  - equivalent cost of (the most expensive large scale form of) renewable energy, including extra costs for the grid storage, etc.
    ➔ allows to achieve overall societal cost-optimal mix of renewable energy and energy efficiency
  - et cetera

Principle: assumed or actual presence of system

- One of (probable) policy objectives:
  a healthy and comfortable indoor environment
- Example: *compare two identical buildings:*



- Is building B a more energy efficient building?
- ➔ Policy choice: for building A and B:
  in absence of a heating system: assume a default system system
- Same for cooling, lighting, DHW, ...
- Same if system present but undersized.....

Thank you!

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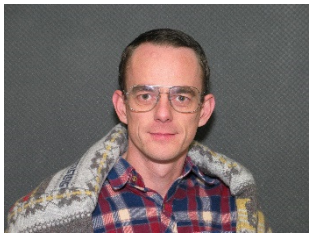
Your service center for information and technical support on the new set of EPB standards

Tailoring EPB requirements

Dirk Van Orshoven



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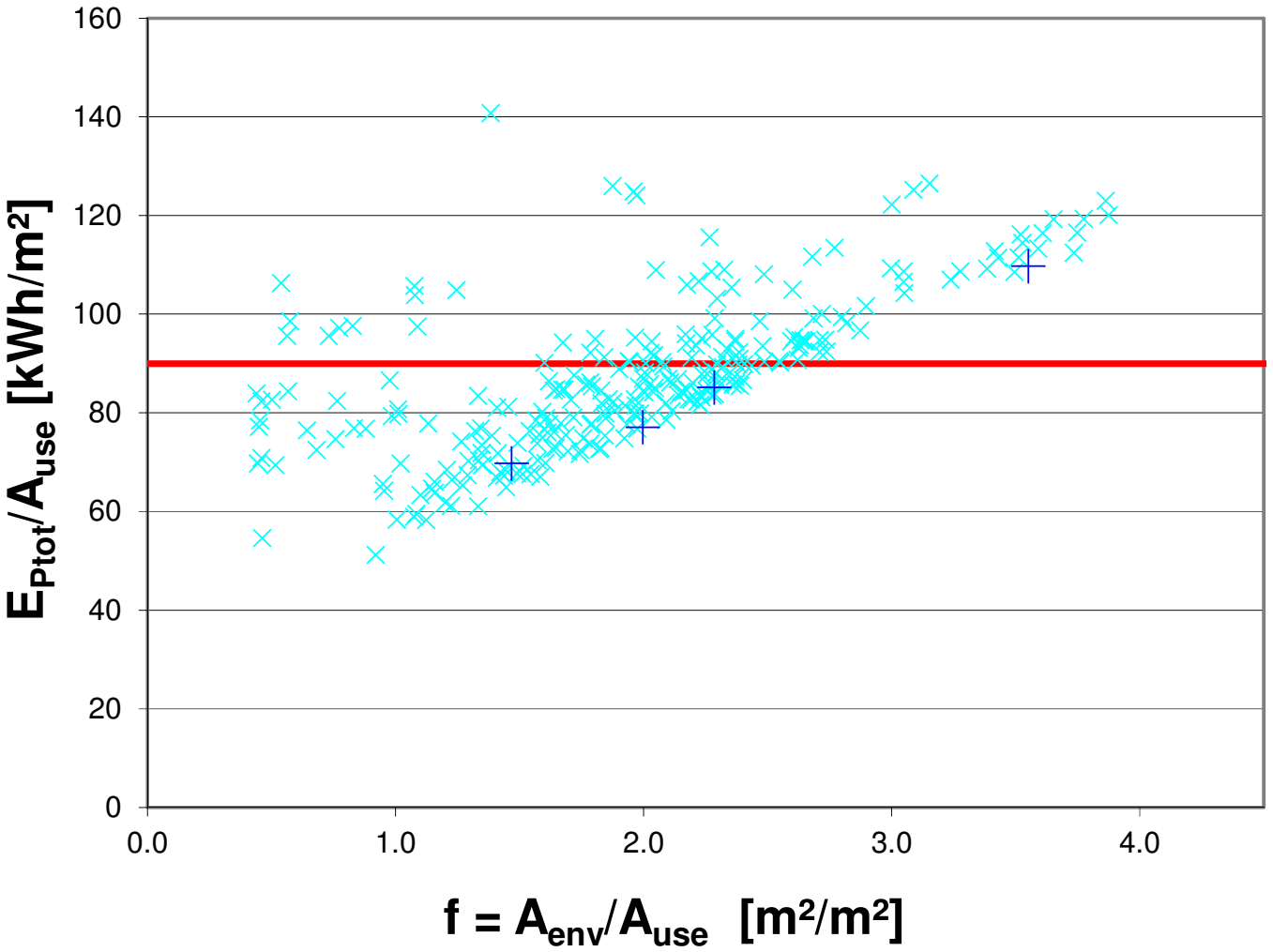
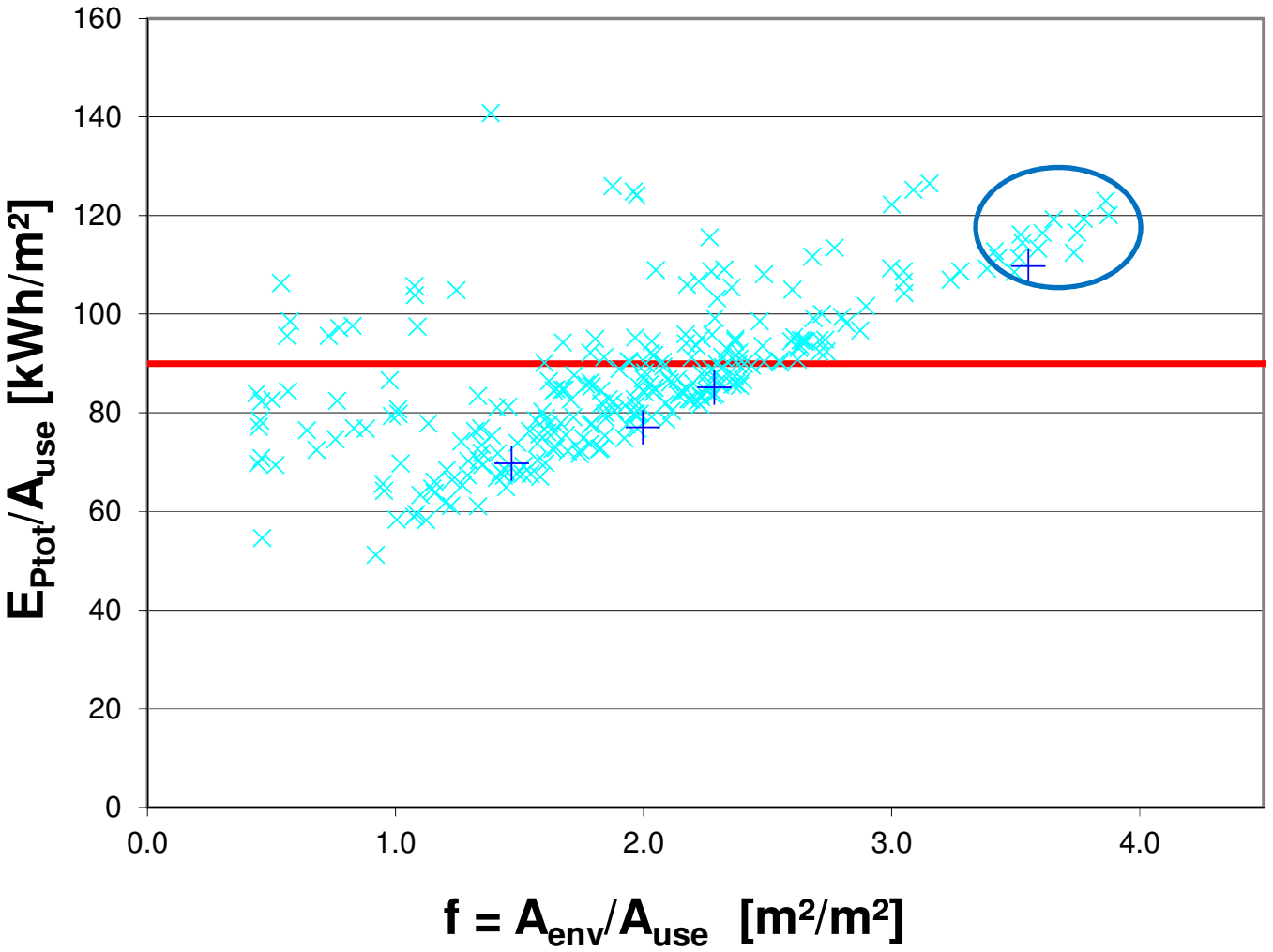
Specific primary energy versus building shape factor



Pressure to relax strictness



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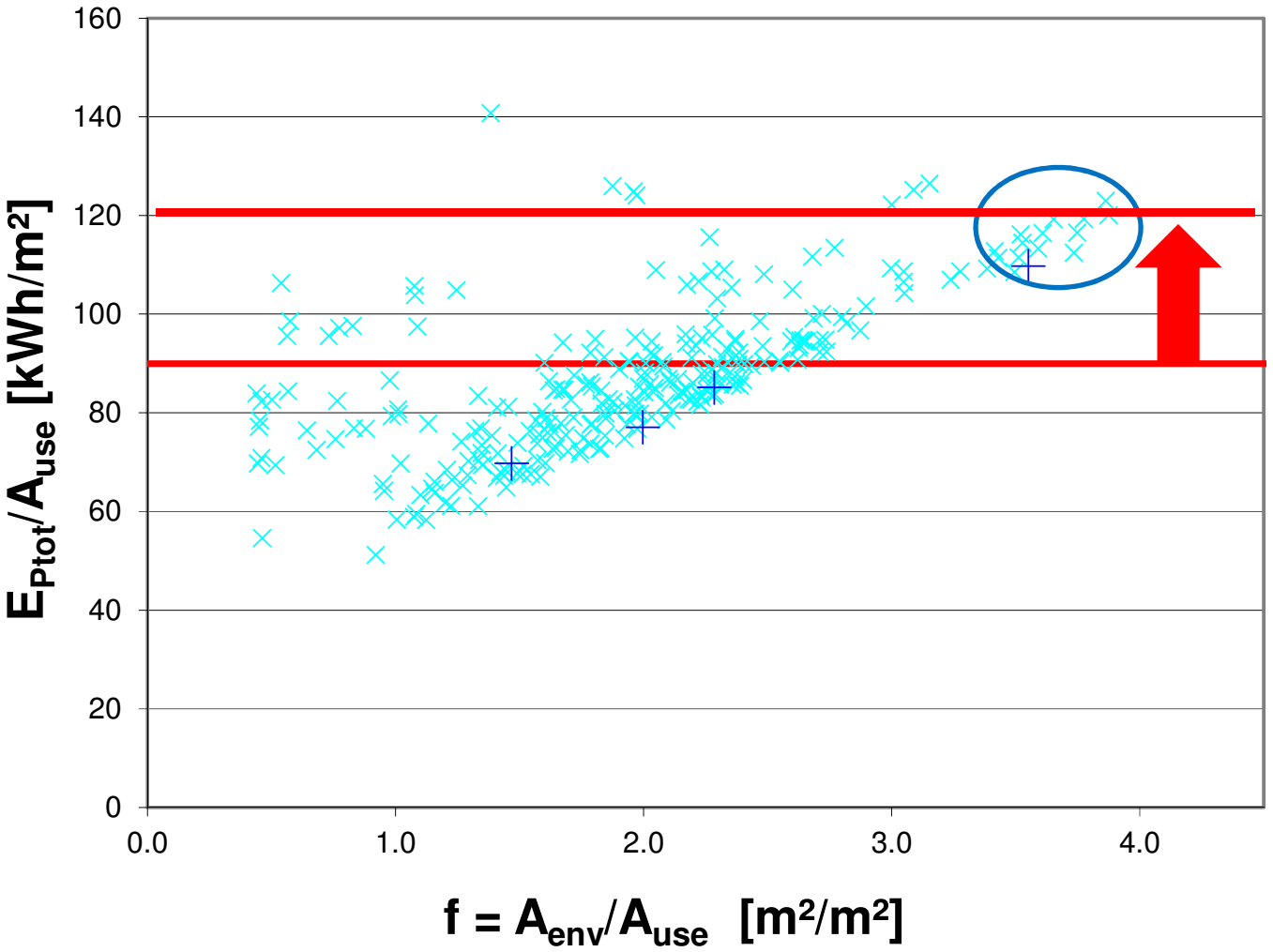
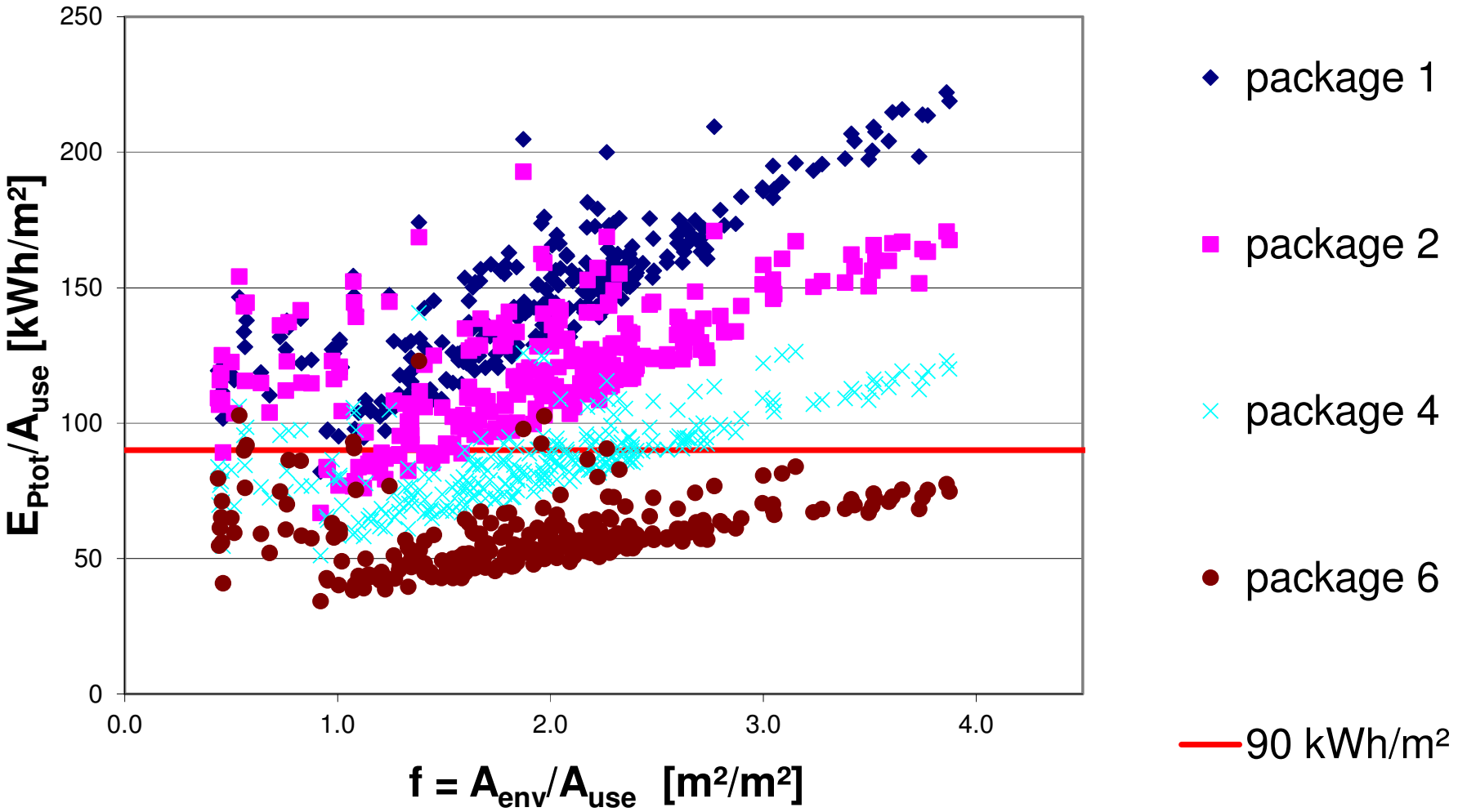


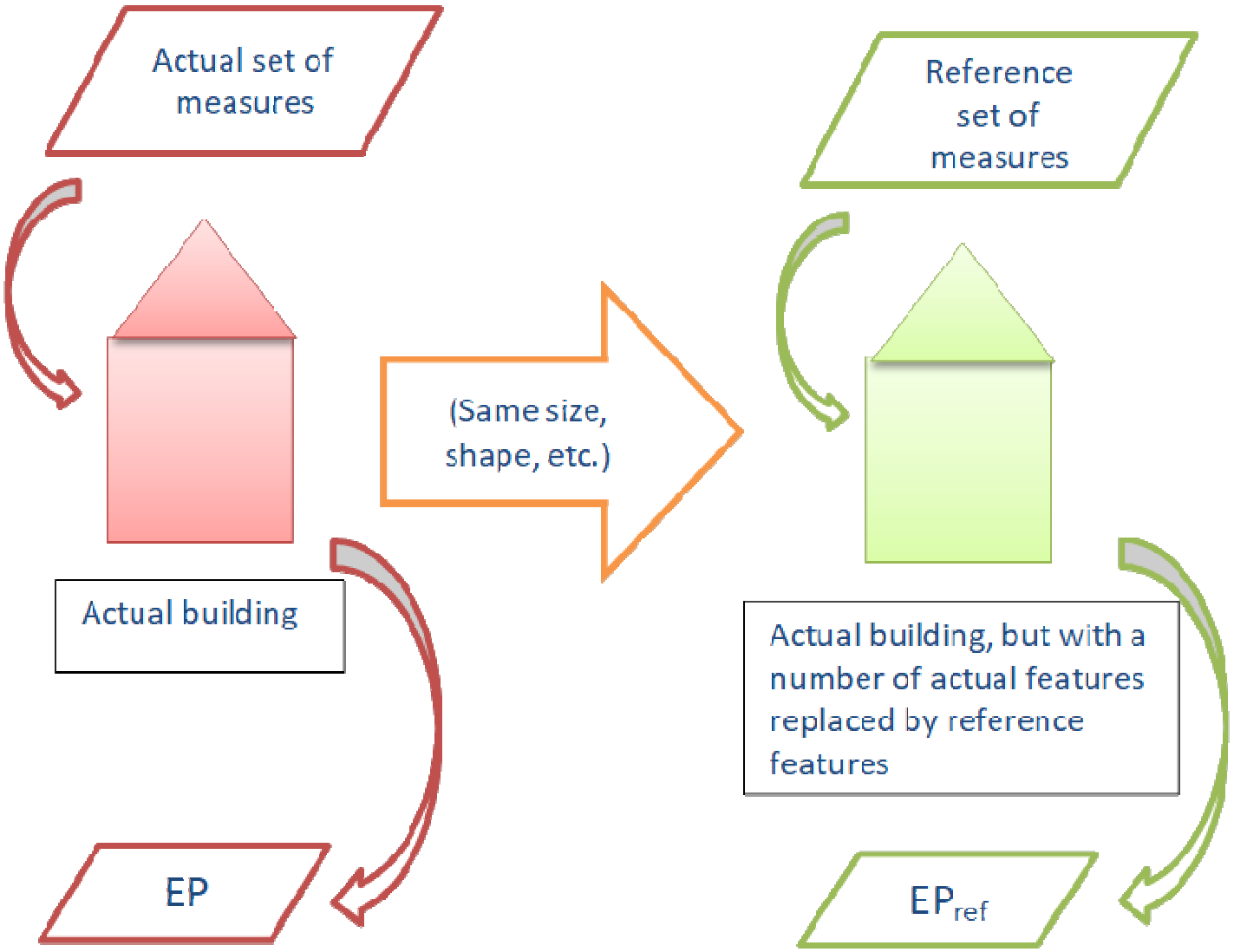
4 sets of technical measures

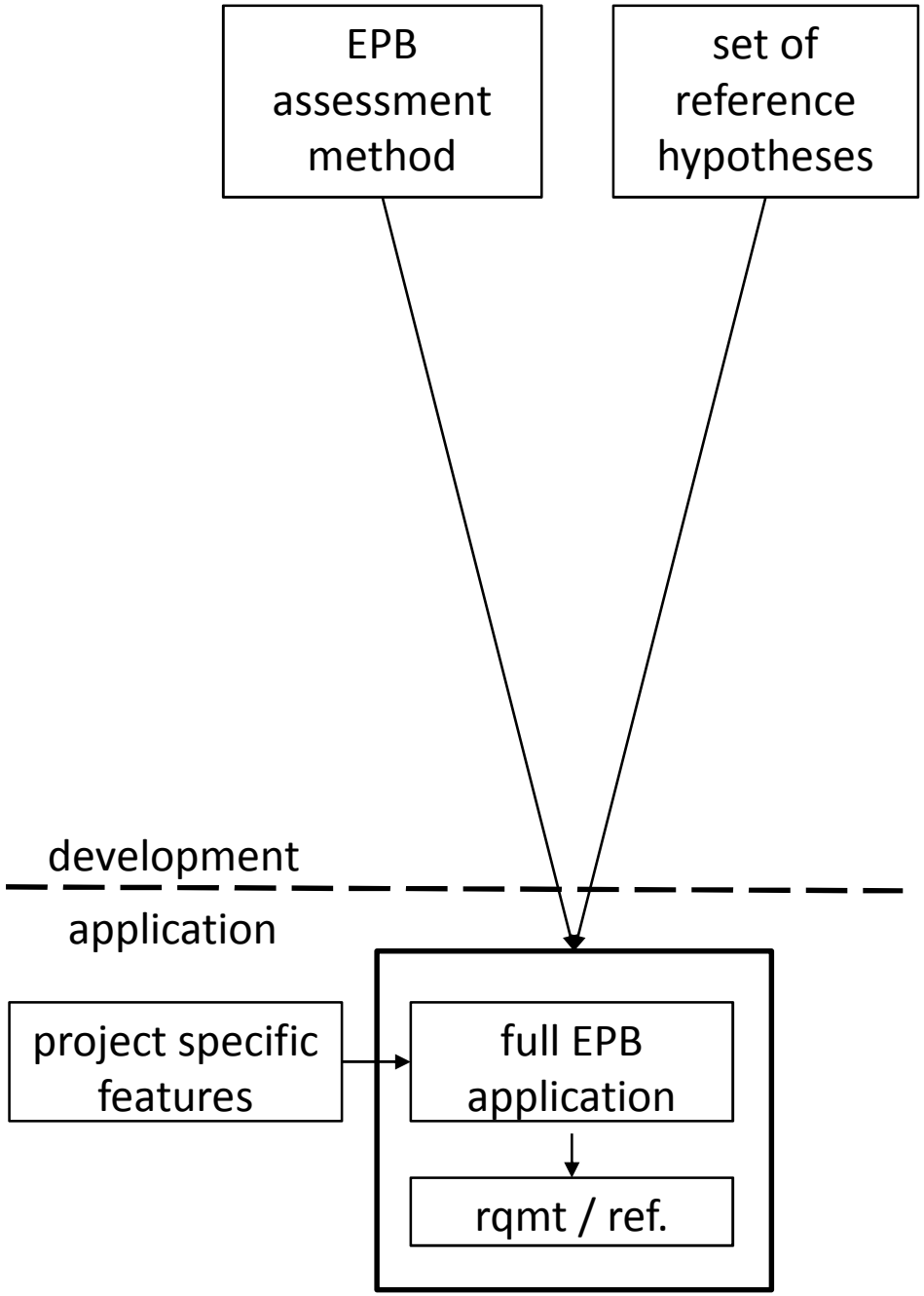


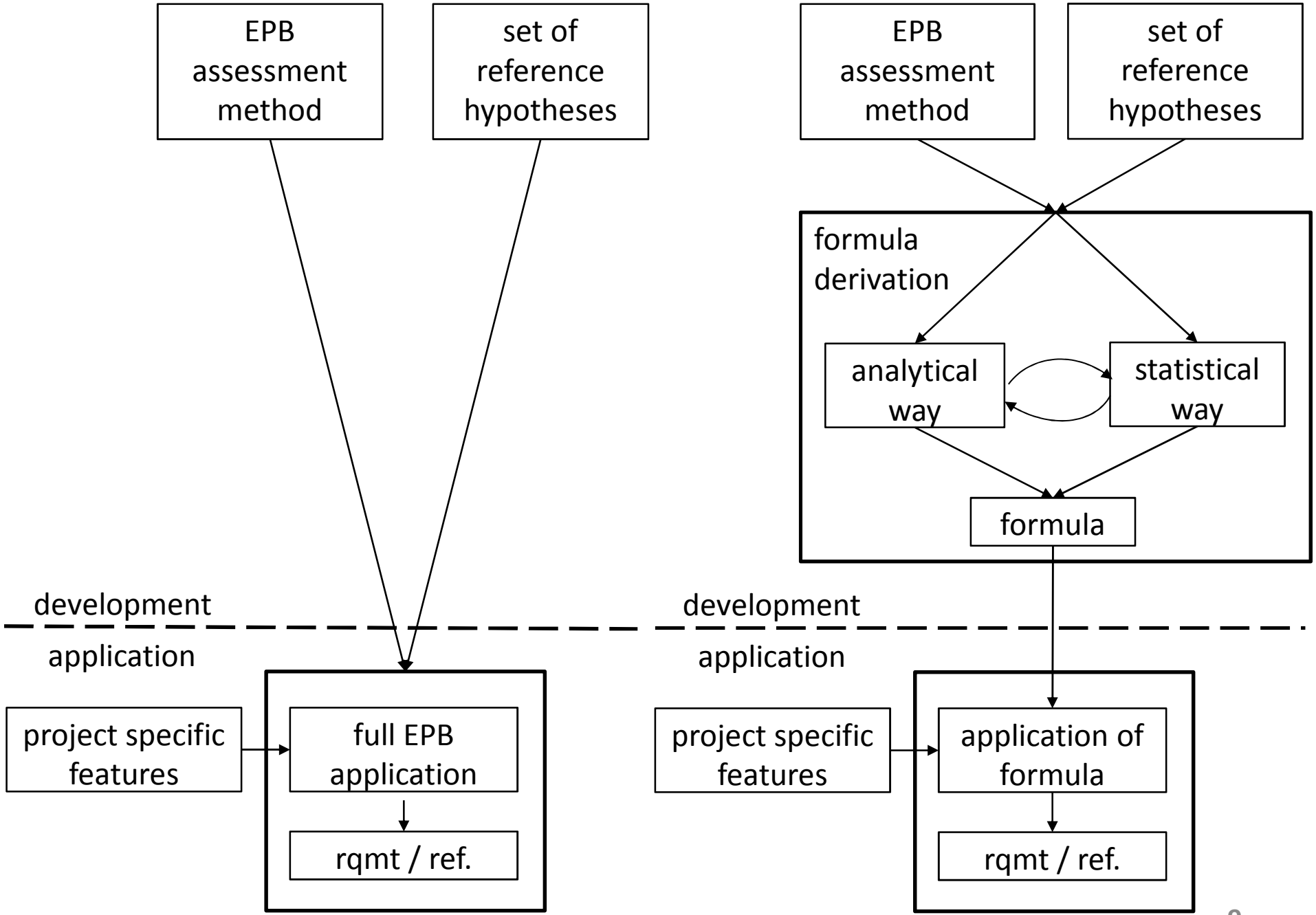
Tailoring practically: 2 approaches

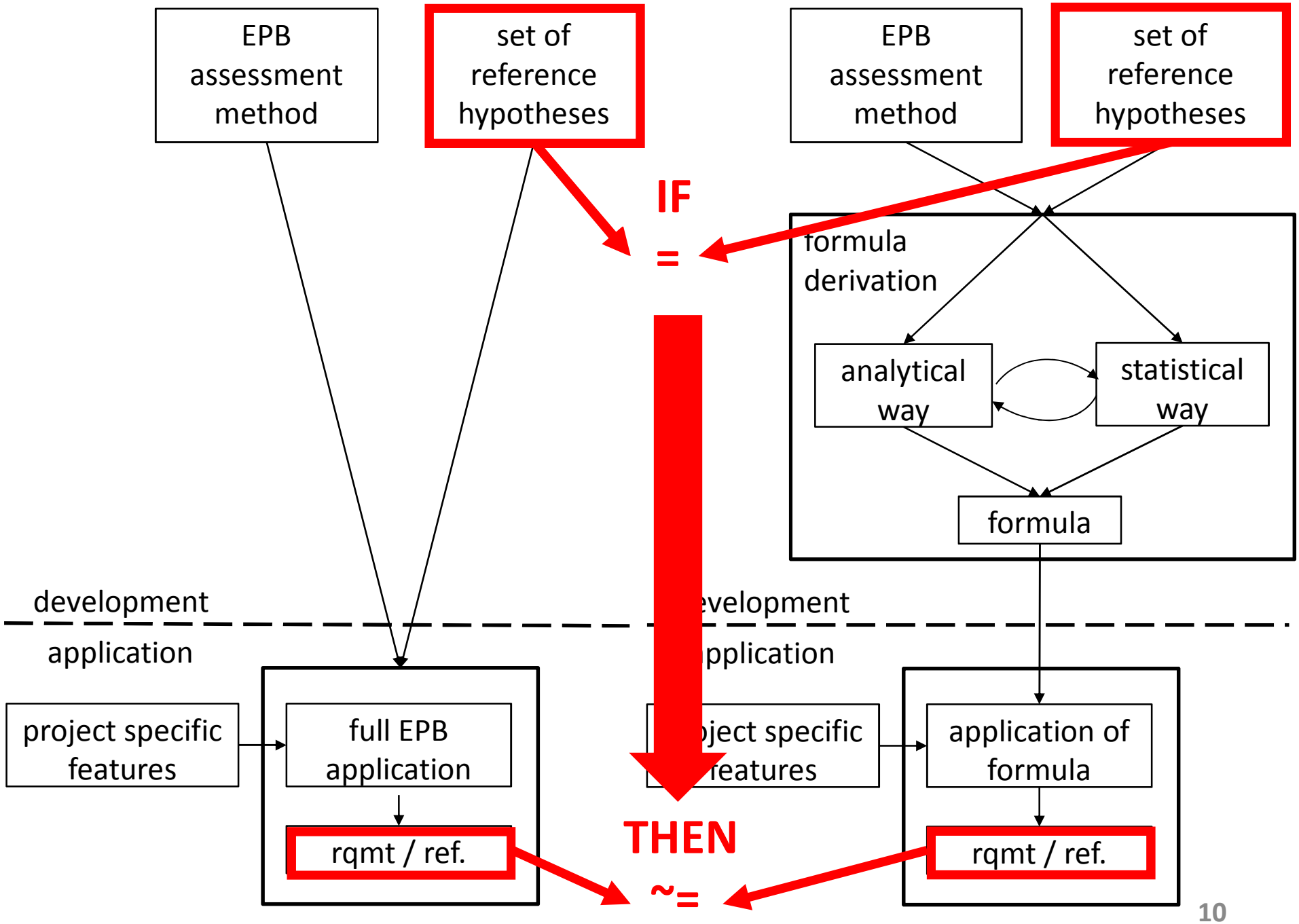
- Notional reference building approach:
  - Requirement = value of +/- same building with set of reference hypotheses
  - See next slide
- Formula approach
  - Requirement = f (several building variables)
  - Mathematical function: simple or complex, linear or not, etc.

Notional reference building approach




EPB assessment method
set of reference hypotheses
development
application
project specific features
full EPB application
rqmt / ref.


EPB assessment method
set of reference hypotheses
EPB assessment method
set of reference hypotheses
formula derivation
analytical way
statistical way
formula
development application
development application
project specific features
full EPB application
rqmt / ref.
project specific features
application of formula
rqmt / ref.


EPB assessment method
set of reference hypotheses
EPB assessment method
set of reference hypotheses
IF
=
formula derivation
analytical way
statistical way
formula
development
application
development
application
project specific features
full EPB application
rqmt / ref.
project specific features
application of formula
rqmt / ref.
THEN
~=

Major project variables for tailoring

- Building category
- Size of the building and its thermal envelope area
- Location
- External environment conditions
- Indoor environment and services:
  - temperature set-point profile for heating
  - temperature set-point profile for cooling
  - ventilation rate
  - illumination level
  - domestic hot water need
  - …
- Energy carrier
- …

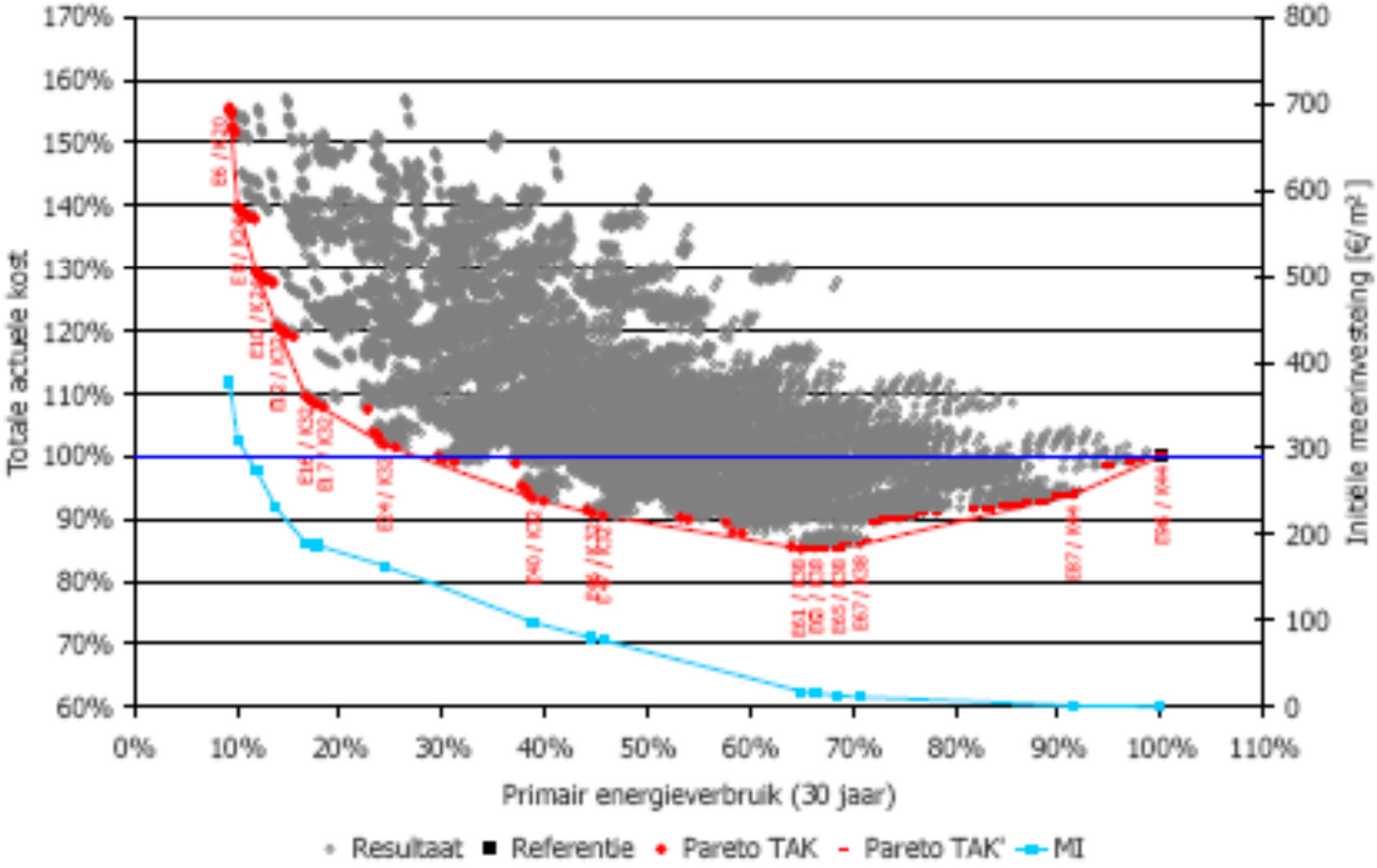
“Mass” calculations

- They can be very useful and provide much insight:
  - To check the EPB assessment methods on a great variety of cases: no anomalies? …? ➔ method robust?
  - To check the requirements:
    - As illustrated
    - Comparable technical-economic strictness for all?
    - With which set of technical measures can they be satisfied?
    - Check which projects have difficulty: cause? acceptable? …?
    - All the more important when the requirements get very strict.
  - Performing automated cost optimality calculations (see later slide)
  - …

Practical process

- Automated calculations (running the calculation engine in batch mode)
- Substantial initial effort to set it up, but if well done (in a general manner from the beginning), it can serve many purposes, and be well worth the original investment.
- Collecting a REPRESENTATIVE sample of REAL geometries
  - Include “outlying” (but acceptable) cases
  - Doublecheck correctness of the geometric data! (otherwise source of anomalies)

Example of other automated calculation: cost optimality analyses



Thank you!

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Your service center for information and technical support on the new set of EPB standards

Ratings and certificates

Dick van Dijk

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This project is facilitated by the
EU-Commission Service Contract
ENER/C3/2017-437/SI2.785185

Start: 21 September 2018 for 3 years

BUILD UP Webinar series
Webinar 3: *EPB postprocessing*
16 April 2020

From indicator to rating

Numerical indicator ≠ Energetic quality
(overall or partial)

Examples of indicators:

- Primary energy (EP_{prim})
- Heating needs ($Q_{H;nd}$)
- *U*-value

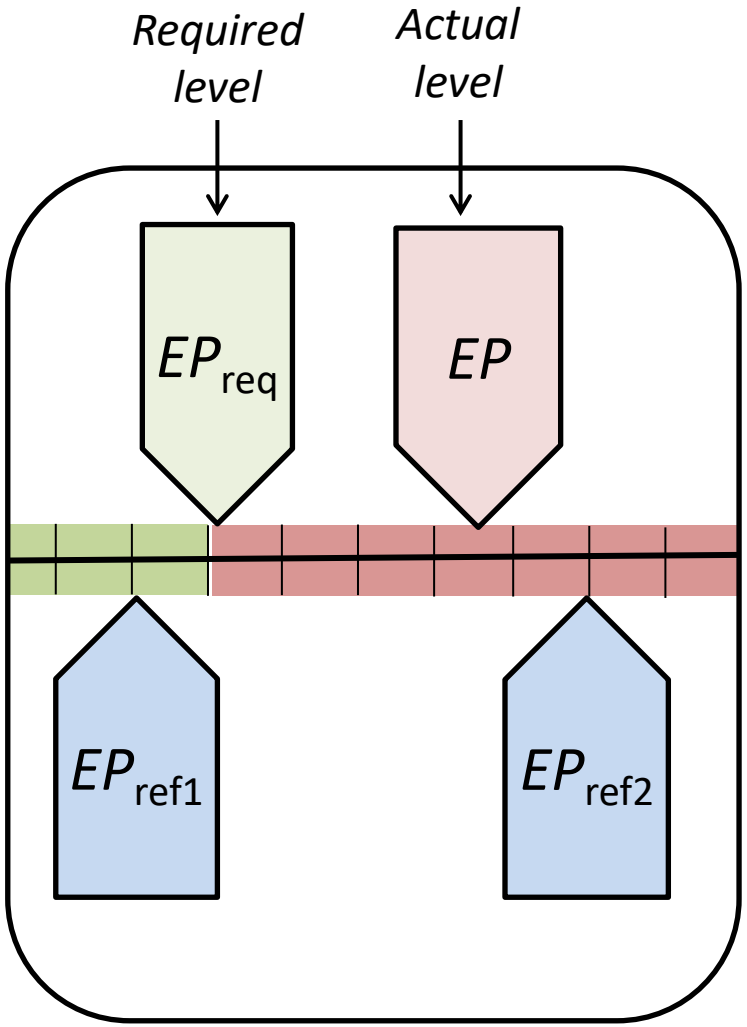
A reference is needed:

- What is **good** energetic quality?
- What is **poor** energetic quality?

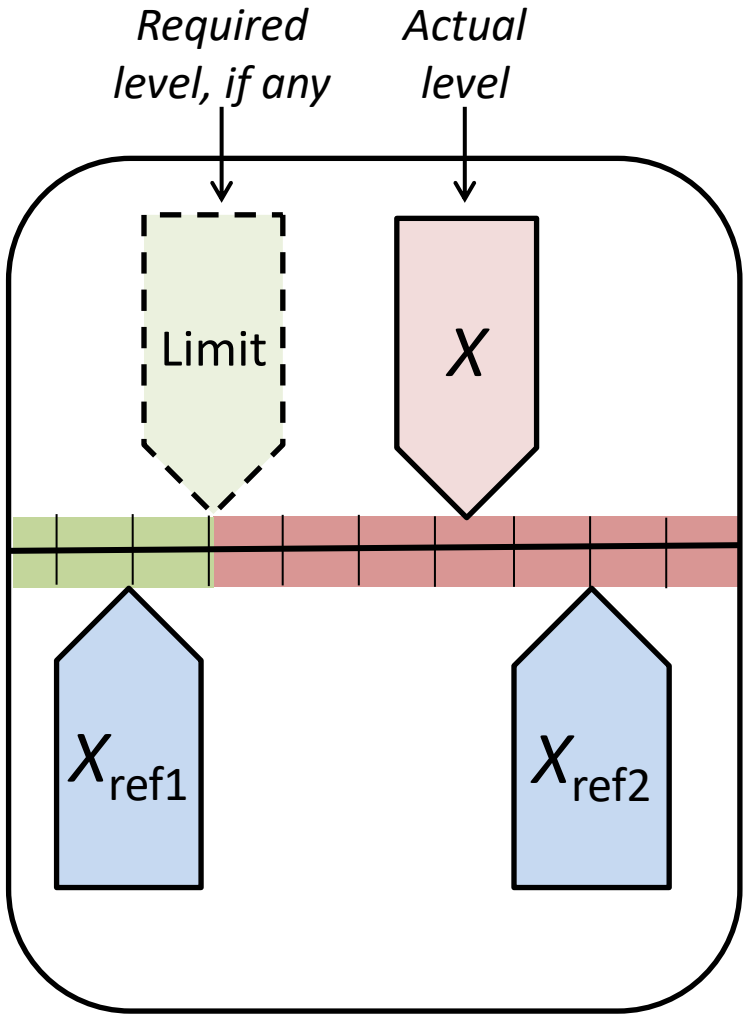
➔ benchmarks

Overall energy performance

E.g.:
two reference points



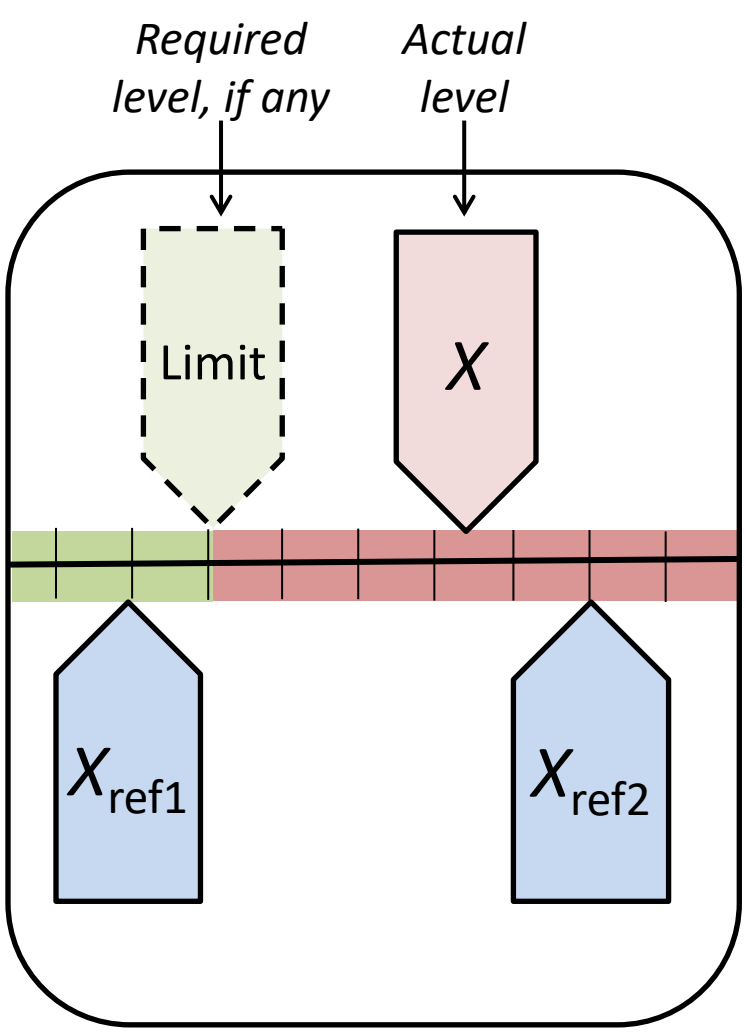
Also for any (partial) energy indicator X



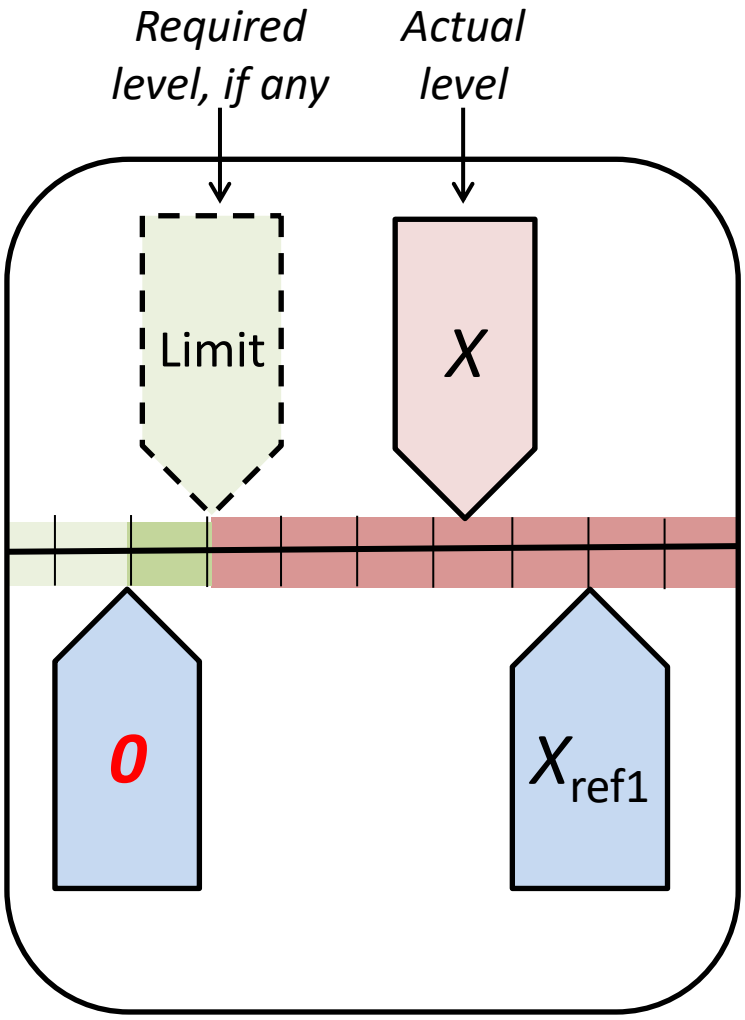
For many indicators there is no requirement (no limit value)

See earlier presentation

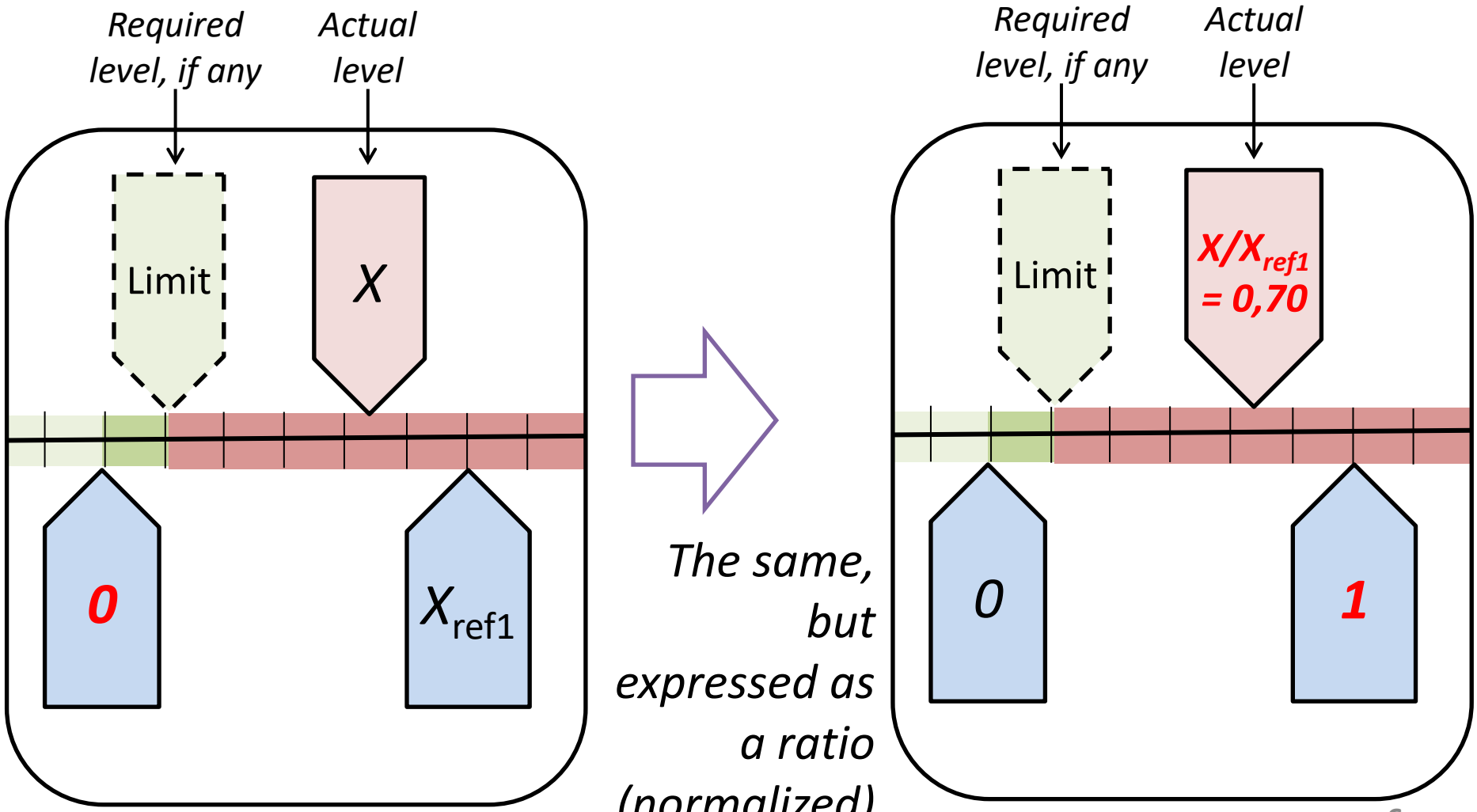
Specific reference values



Looks like a single reference. But...



Expressed as ratio



Overall energy performance rating scales

- Many options possible, e.g.:
  - Two reference values or single reference value
  - Continuous or discrete scale
  - …
- In the standard: two methods are selected (= fully described)

  Shown further on...

  (1) was already used in many countries

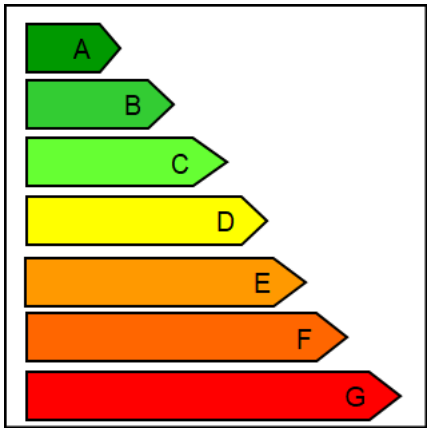
  (2) further developed version

  (recommended in dedicated European study)

  (1)&(2): each with variations
- But others are also allowed (w.request to describe)

From rating to graphical representation

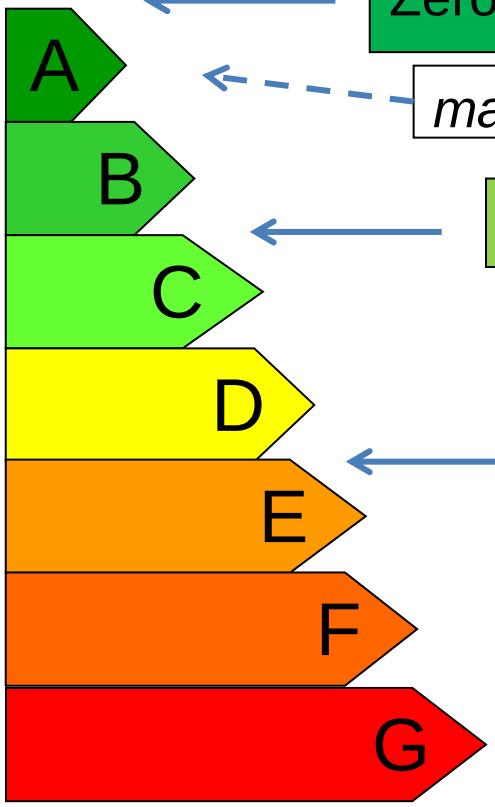
- A specific rating method can still be graphically represented in various ways



- The next slides illustrate the two rating methods in the standard (EN ISO 52003-1) using a specific (recommended) graphical mode

Method 1

Very energy efficient



Zero net delivered energy

may be expanded: A+, A++, A+++

min. required EP for new buildings

average EP for building stock

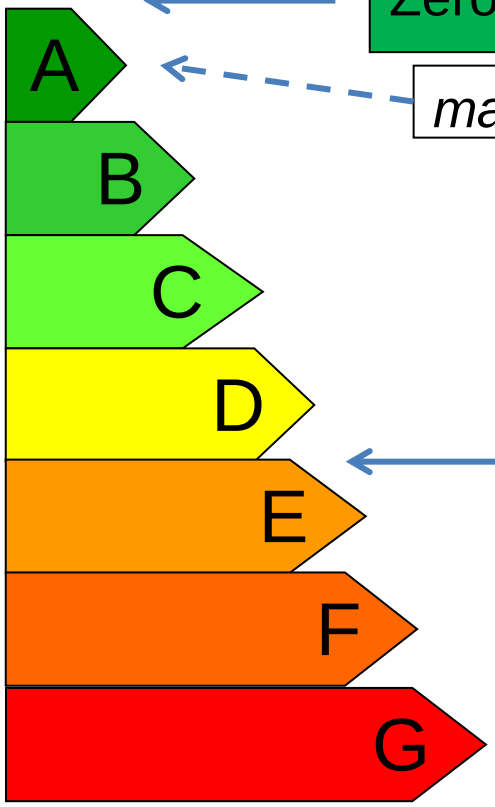
Method 1: *two ref.points, ± linear scale*

Specific variations within this method are allowed

Not energy efficient

Method 2

Very energy efficient



Zero net delivered energy

may be expanded: A+, A++, A+++

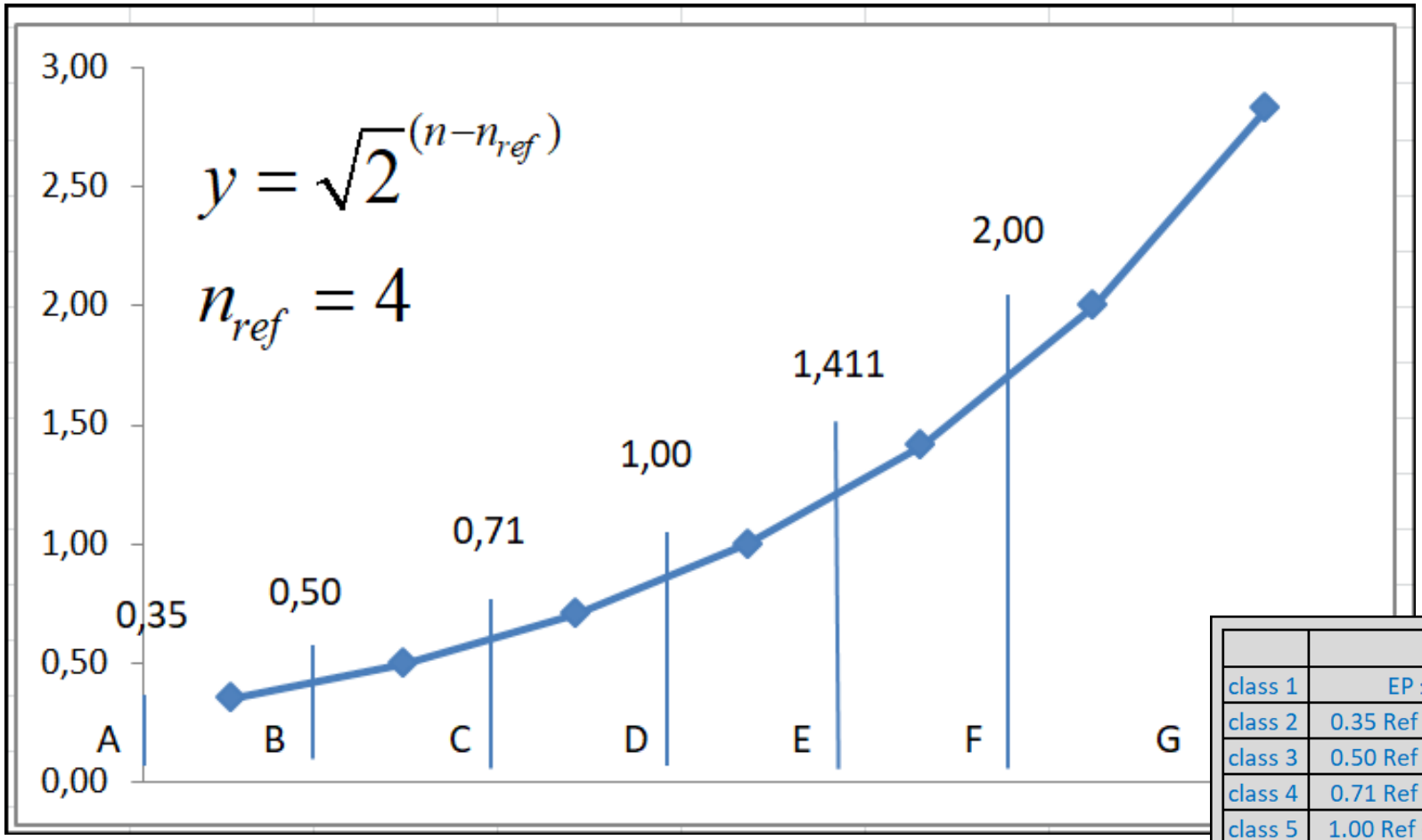
Reference

Method 2: *one ref.point, logarithmic scale*

Specific variations within this method are allowed

Not energy efficient

Method 2



	EP < 0
class 1	EP ≤ 0.35 Ref
class 2	0.35 Ref < EP ≤ 0.50 Ref
class 3	0.50 Ref < EP ≤ 0.71 Ref
class 4	0.71 Ref < EP ≤ **1.00** Ref
class 5	1.00 Ref < EP ≤ 1.41 Ref
class 6	1.41 Ref < EP ≤ 2.00 Ref
class 7	2.00 Ref < EP

Energy performance certificates

Warning:

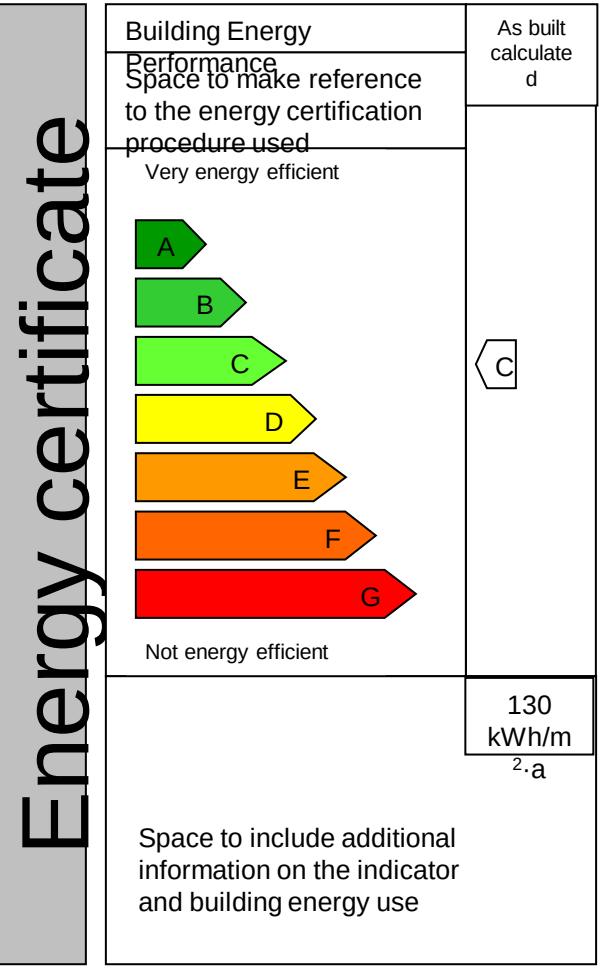
- EP certificates ≠ EP certification
- EN ISO 52003-1 is
  not about the certification **process** (protocol)
  but only about the **content** on the EP **certificate**

Typical sections on EP certificate:

- Info on the type of EP assessment and type of building, type of indicator(s), on the protocol
- Report of the actual assessment (input, method, output), energy label, recommendations for improvement measures

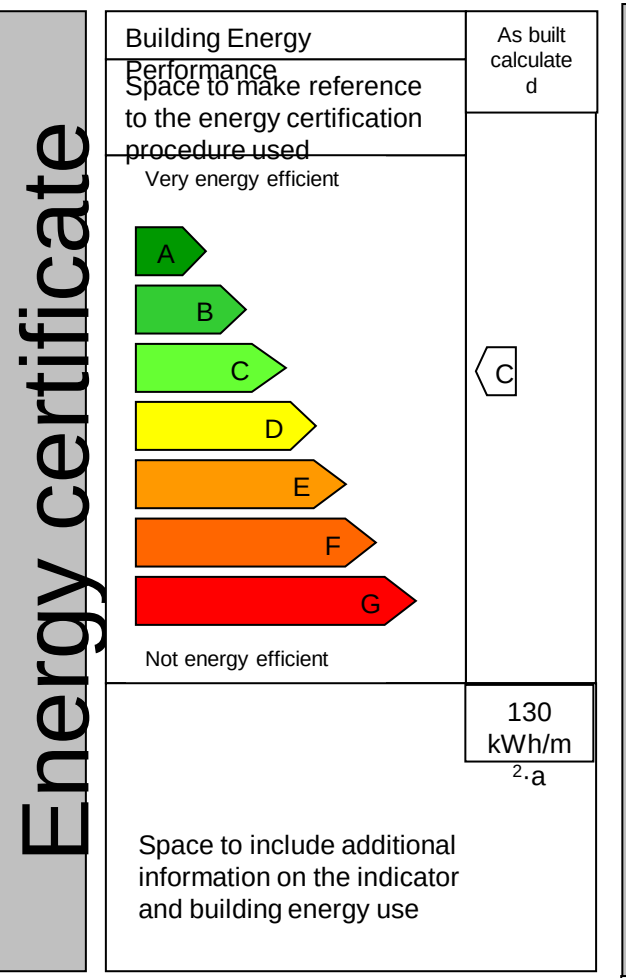
Examples of energy label models

- From the technical report (CEN ISO/TR 52003-2)



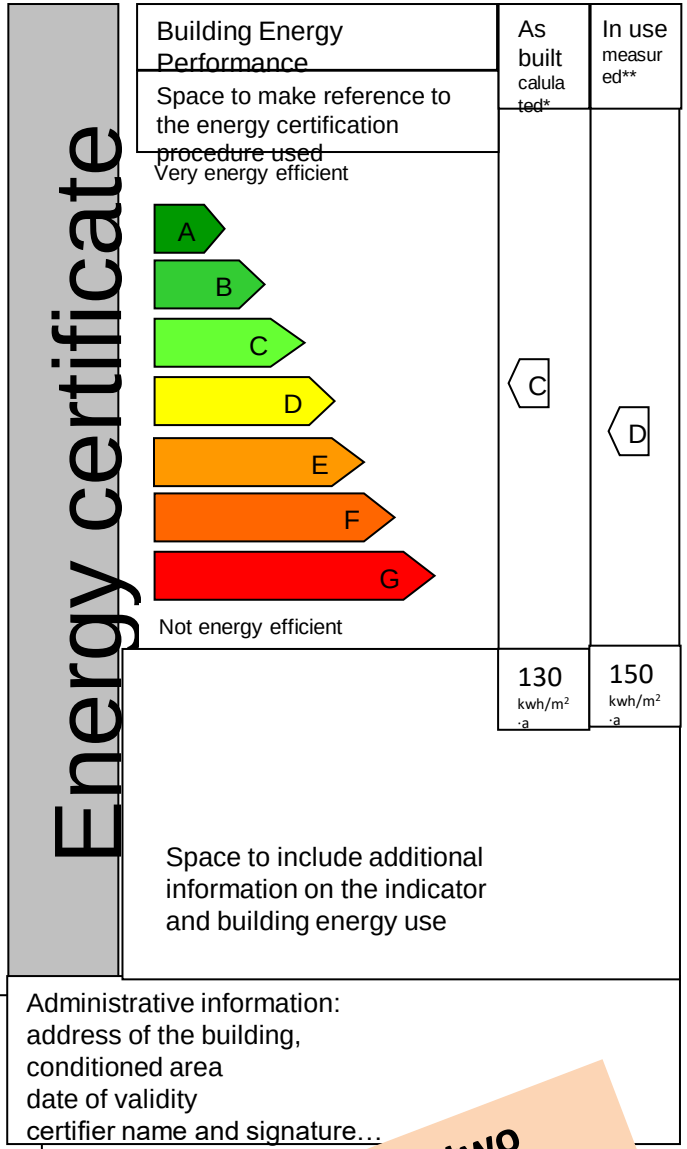
Administrative information:
address of the building,
conditioned area
date of validity
certifier name and signature

Example 1, with one indicator and with classes



Administrative information:
address of the building,
conditioned area
date of validity
certifier name and signature

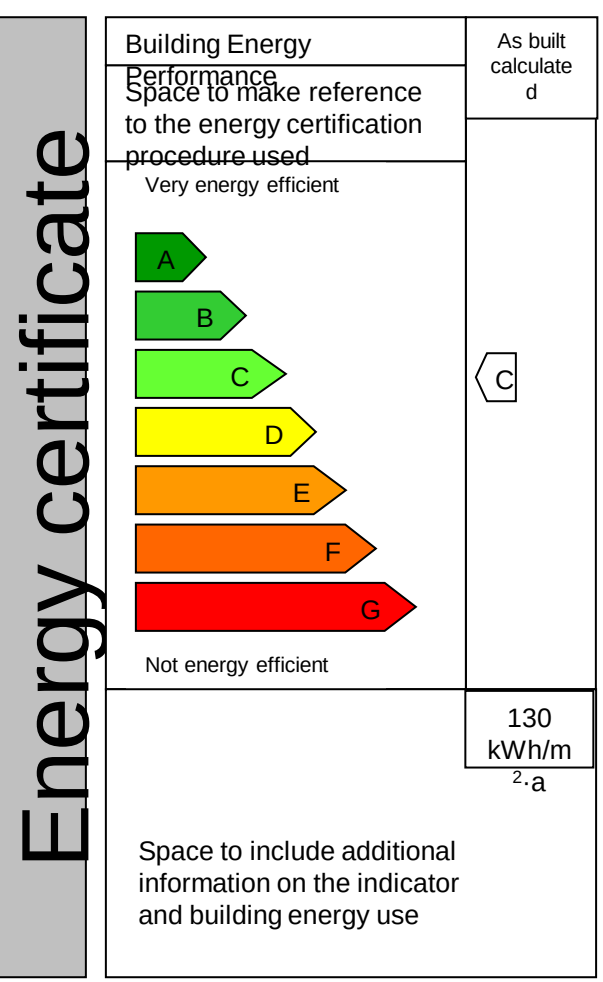
Example 1, with one indicator and with classes



Administrative information:
address of the building,
conditioned area
date of validity
certifier name and signature…

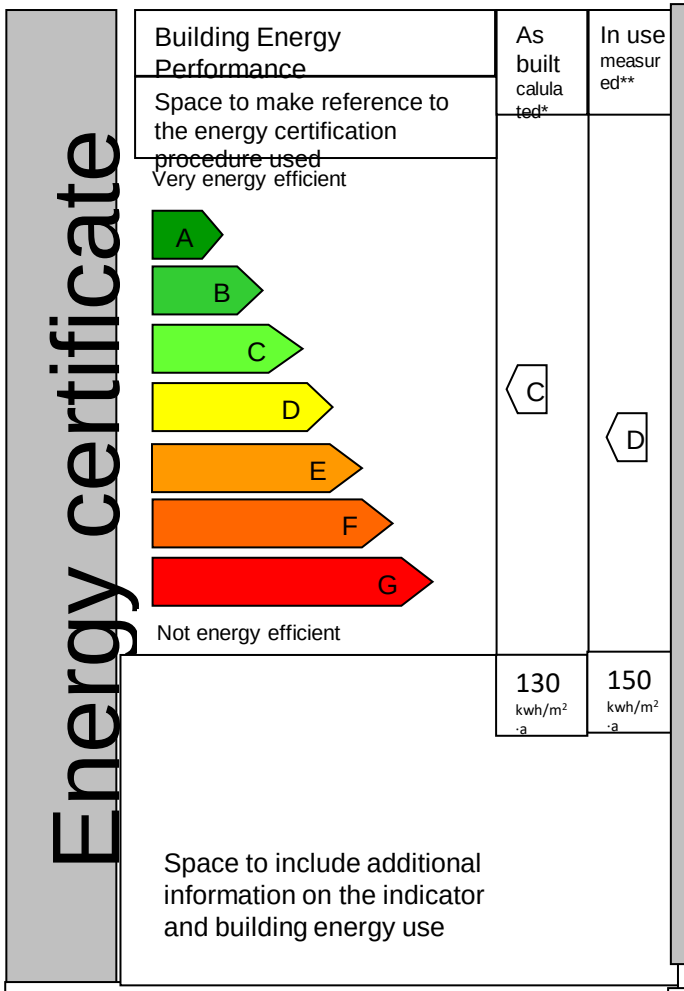
*the calculated rating assume
the energy used for he
lighting (add oth
**the m

Example 2, with two indicators and with classes



Administrative information:
address of the building,
conditioned area
date of validity
certifier name and signature

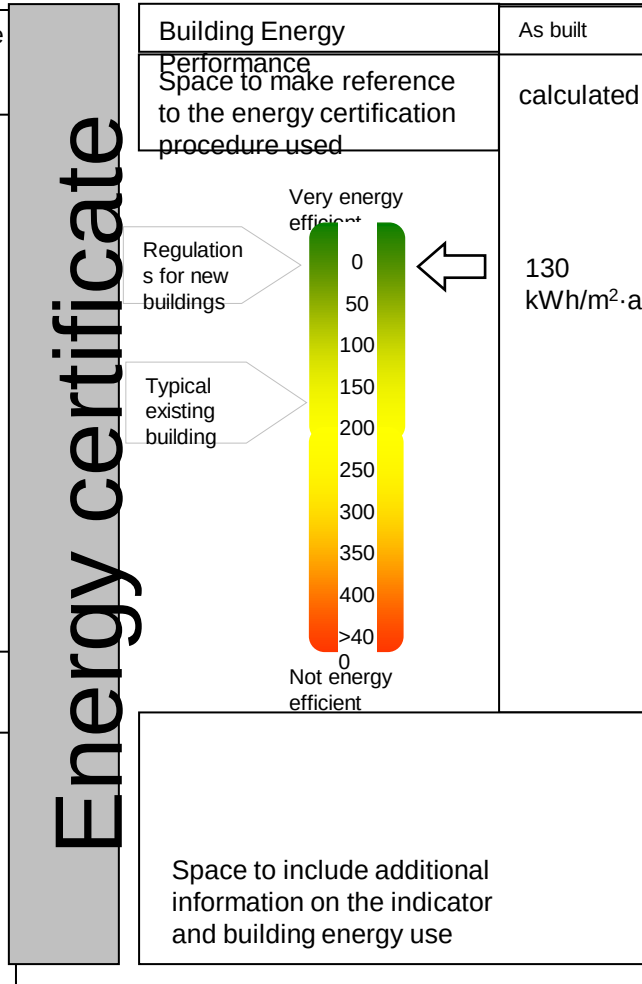
Example 1, with one indicator and with classes



Administrative information:
address of the building,
conditioned area
date of validity
certifier name and signature…

*the calculated rating assume
the energy used for he
lighting (add oth
**the m

Example 2, with two indicators and with classes



Administrative information:
address of the building,
conditioned area
date of validity
certifier name and signatur

Example 3, with one indicator and without classes (continuous scale)

Thank you!

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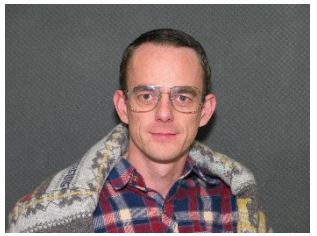
Some highlights of EN ISO 52018

Dirk Van Orshoven



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16 April 2020

INTERNATIONAL STANDARD

ISO 52018-1

First edition
2017-06

Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features —

Part 1: Overview of options

Performance énergétique des bâtiments — Indicateurs pour des exigences PEB partielles liées aux caractéristiques du bilan énergétique thermique et du bâti —

Partie 1: Aperçu des options

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TECHNICAL REPORT

ISO/TR 52018-2

First edition
2017-06

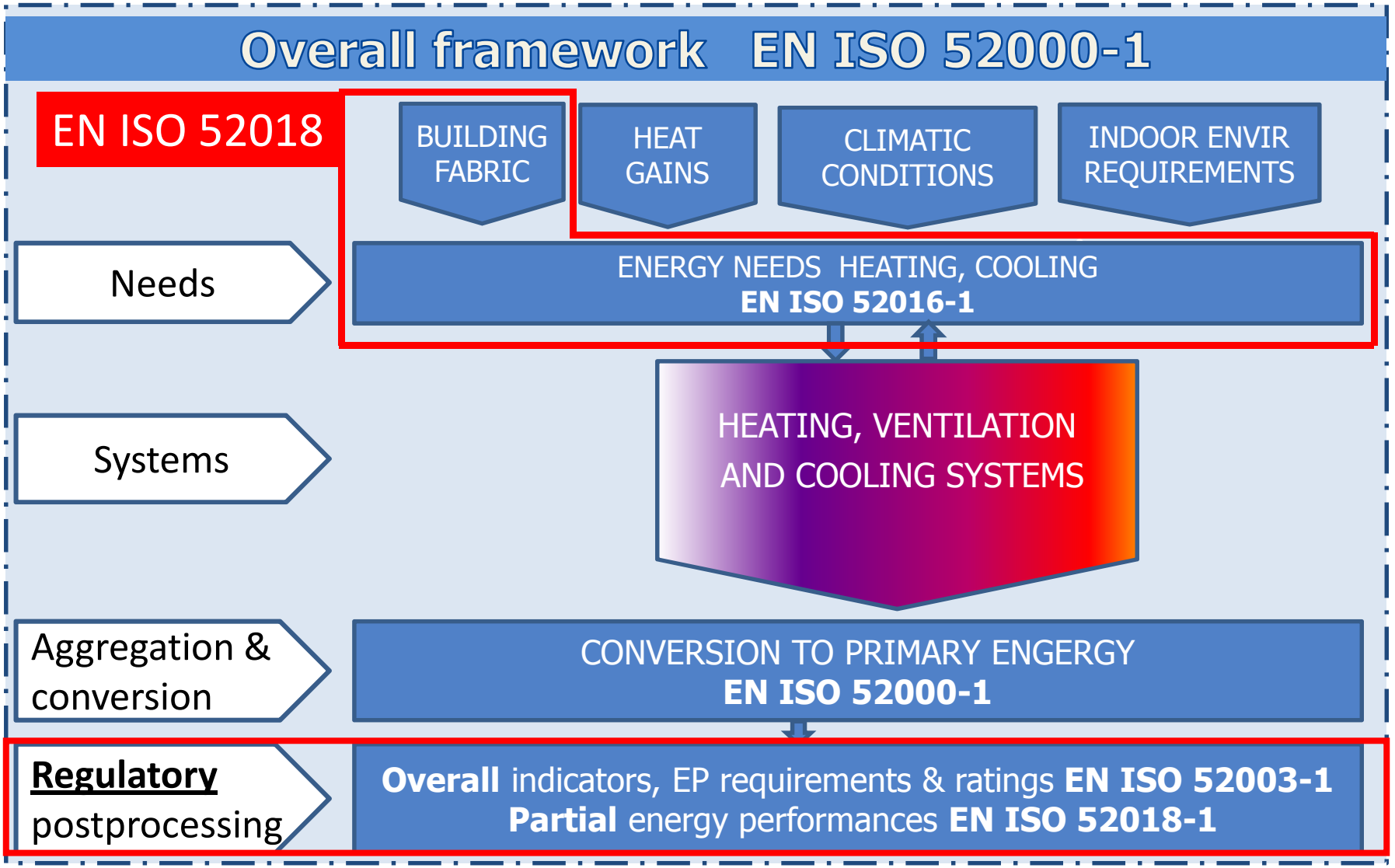
Energy performance of buildings — Indicators for partial EPB requirements related to thermal energy balance and fabric features —

Part 2: Explanation and justification of ISO 52018-1

Performance énergétique des bâtiments — Indicateurs pour des exigences PEB partielles liées aux caractéristiques du bilan énergétique thermique et du bâti —

Partie 2: Explication et justification de l'ISO 52018-1

Position of EN ISO 52018



Reminder: warning

- It is the responsibility of the competent authorities (regulators) to take all of the various decisions related to the public EPB requirements.
- The tables in Annex A are non-restrictive, thus allowing for full regulatory flexibility.
- EN ISO 52018-1 & -2 only provide informative support.

Practical guidance

- Both parts are conceived to be read in parallel, clause by clause.
- Part 1: standard
  - Rather brief enumeration, with only the essentials.
  - Standardised table format for reporting of requirement mix (features and indicators)
    - And “default” values (Annex B)

Practical guidance

- Part 2: technical report
  - A more detailed discussion for each feature
  - Different aspects are analysed for each feature, e.g.:
    - possible motivations,
    - possible indicators,
    - comparable economic strictness of the requirements,
    - practical points of attention,
    - testing,
    - new construction and renovation issues,
    - exceptions,
    - other.

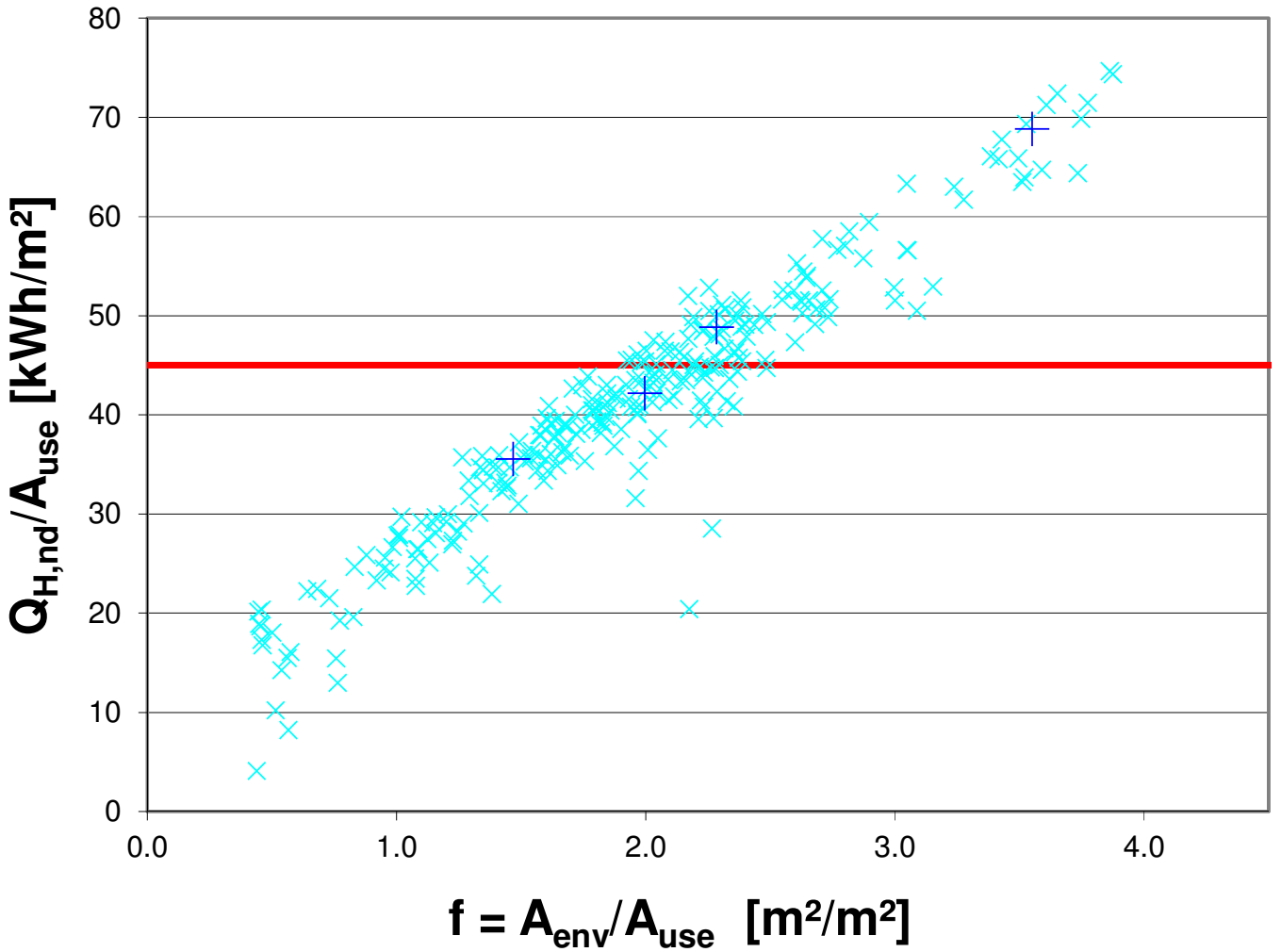
List of treated features

Clause	Partial EPB feature	Indoor environment	Energy efficiency	
6	summer thermal comfort	X	(X)	Energy balance
7	winter thermal comfort	X	(X)	
8	energy “need” for heating, or variants	(X)	X	
9	energy “need” for cooling, or variants	(X)	X	
10	combination of “needs”		X	
11	overall thermal insulation of the envelope		X	Fabric
12	thermal insulation of individual envelope elements	X	X	
13	thermal bridges	X	X	
14	window energy rating		X	
15	airtightness	X	X	
16	solar control	X	X	

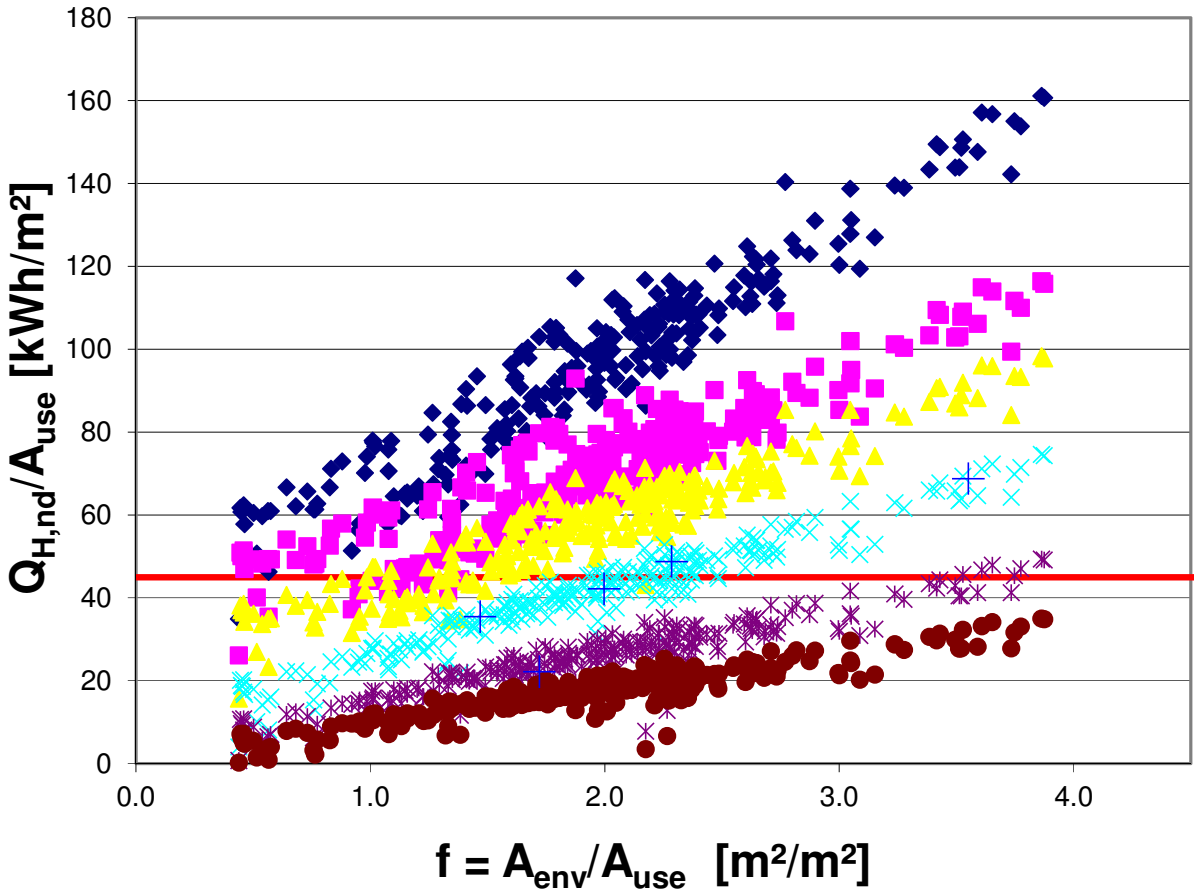
Point of attention: “Summer-winter” balance

- For “cool” climates for building categories that typically don’t have active cooling.
- A strong focus on reducing heating need (by explicit requirement or as a consequence of the overall EPB requirement), may (inadvertently) engender overheating problems in summer.
- Avoid for instance by:
  - Setting a requirement on an overheating indicator;
  - Setting a requirement on the cooling need (even if no active cooling is installed).
  - Include fictitious cooling in the overall EPB indicator (see later)
- Vice-versa for unheated buildings in warm climates

Specific heating need versus building shape factor

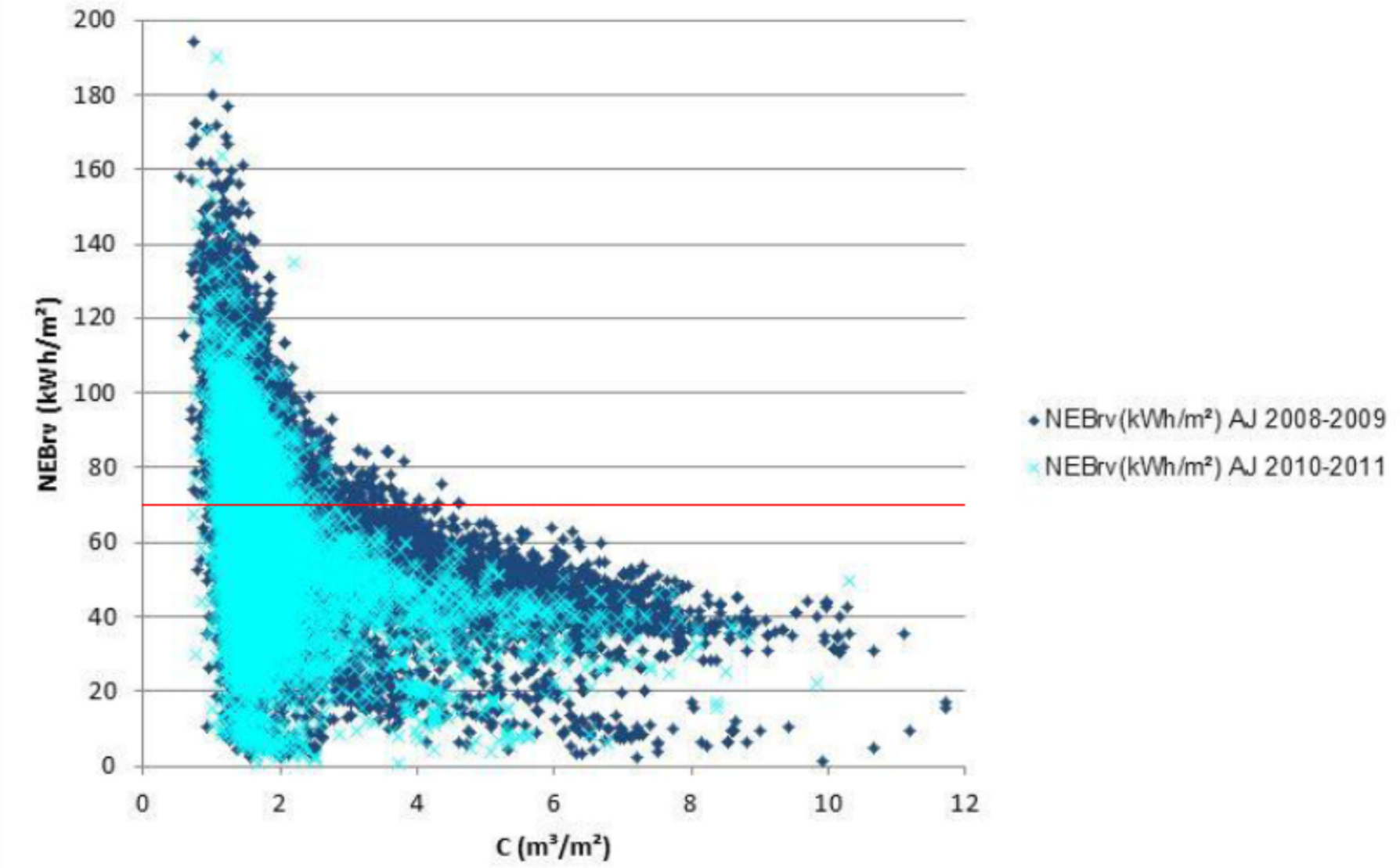


6 sets of technical measures



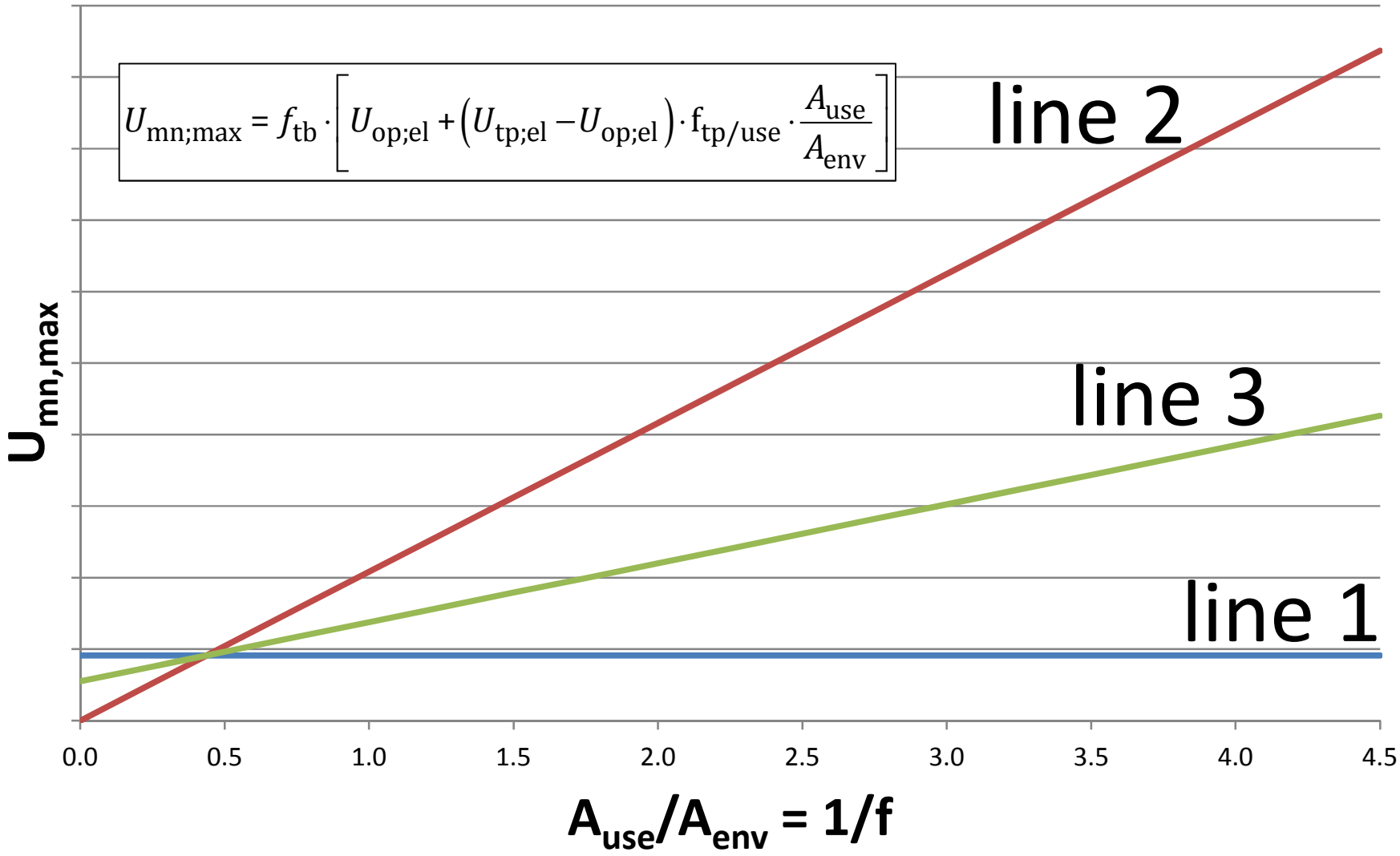
- package 1
- package 2
- package 3
- package 4
- package 5
- package 6
- 45 kWh/m²
- cost optimal points

$Q_{H,nd}$ versus V/A_{env}

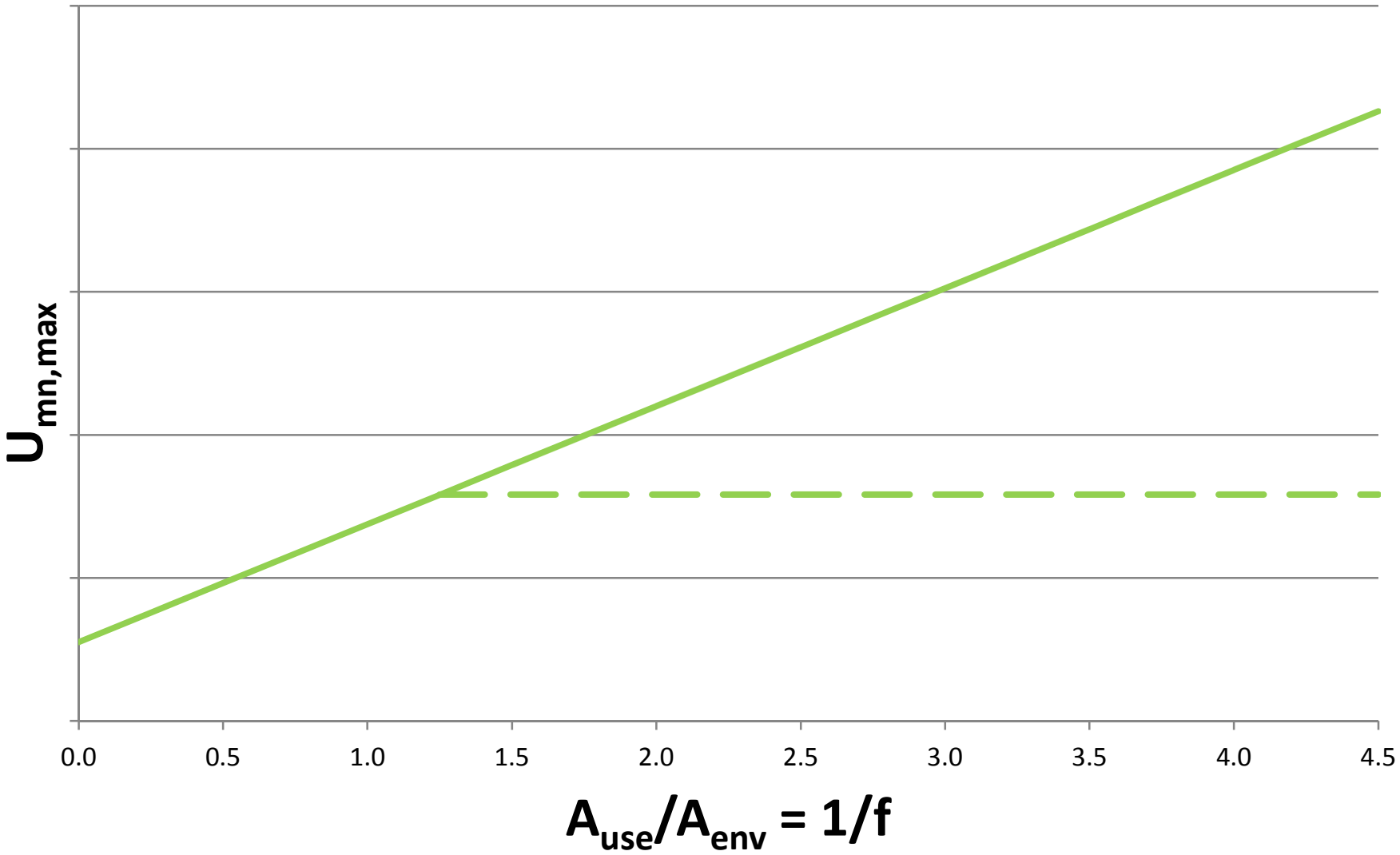


Maximum mean thermal transmittance

$$U_{\mathrm{mn;max}} = f_{\mathrm{tb}} \cdot \left[U_{\mathrm{op;el}} + \left(U_{\mathrm{tp;el}} - U_{\mathrm{op;el}} \right) \cdot \mathrm{f}_{\mathrm{tp/use}} \cdot \frac{A_{\mathrm{use}}}{A_{\mathrm{env}}} \right]$$



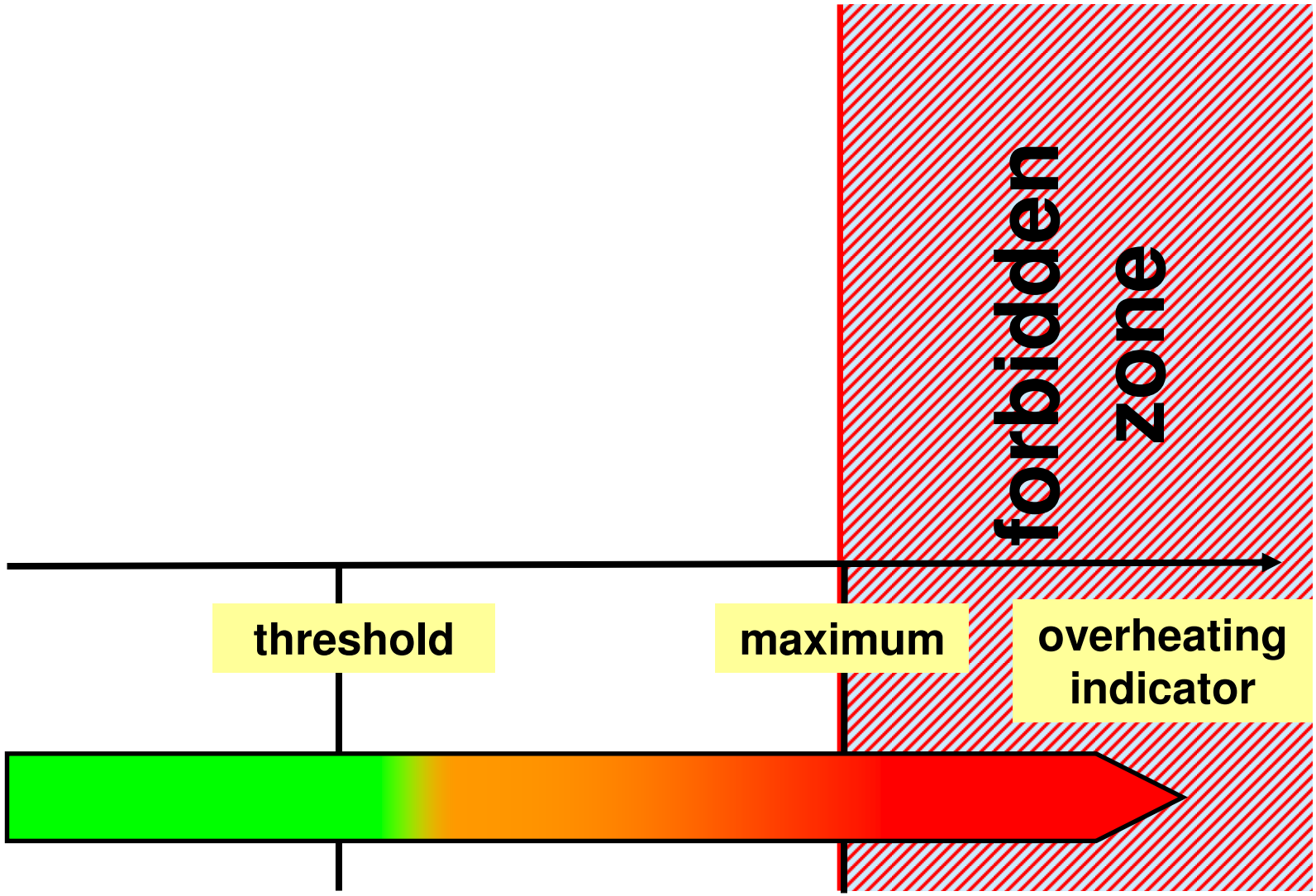
Cut-off



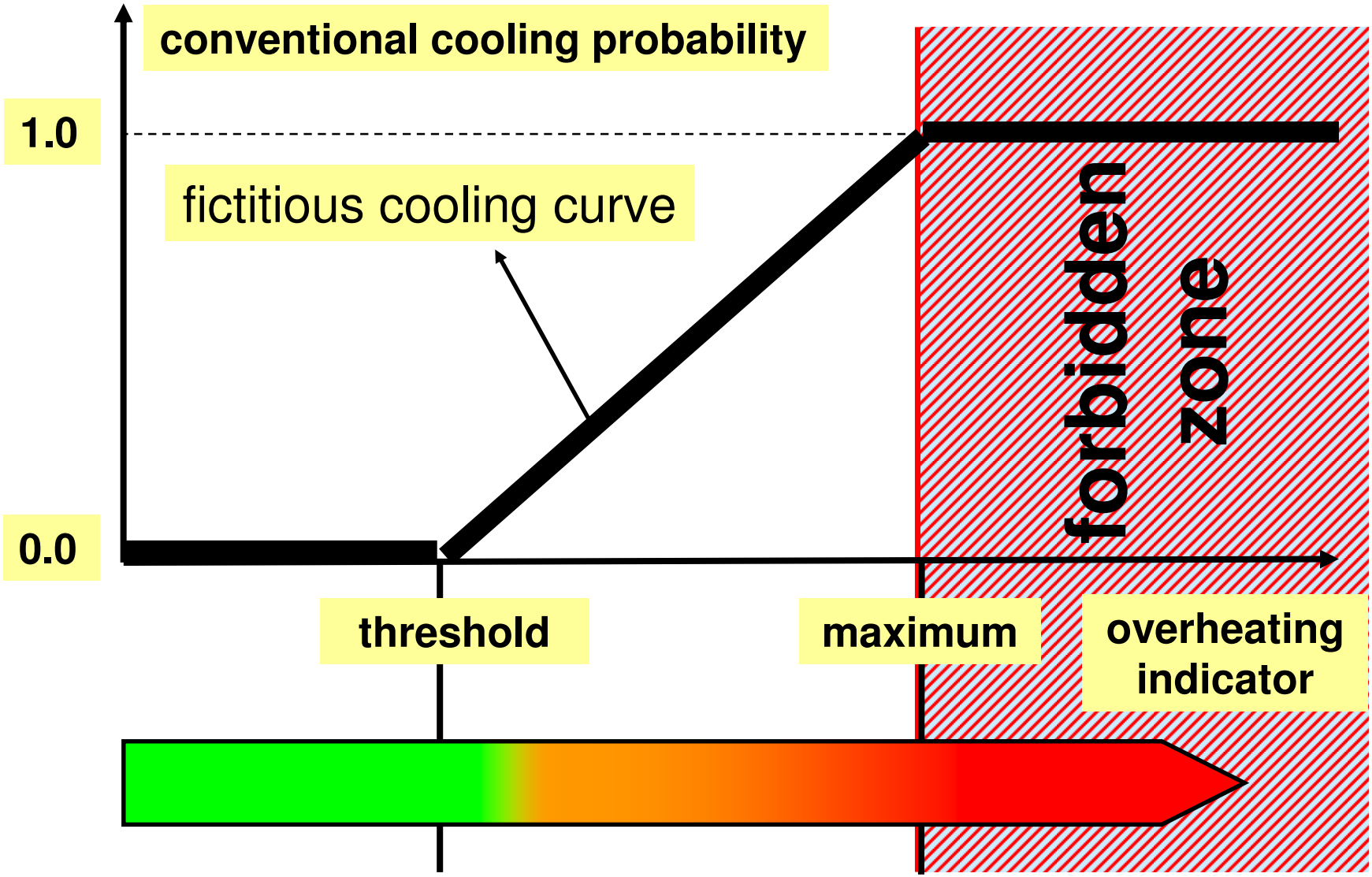
Fictitious cooling

- Cooling can be taken into account in the overall energy performance, even if no active cooling is installed
- Challenge: potential misperception: active cooling is needed
- Possible solution: “conventional probability that active cooling will be installed later”
  - See next slide

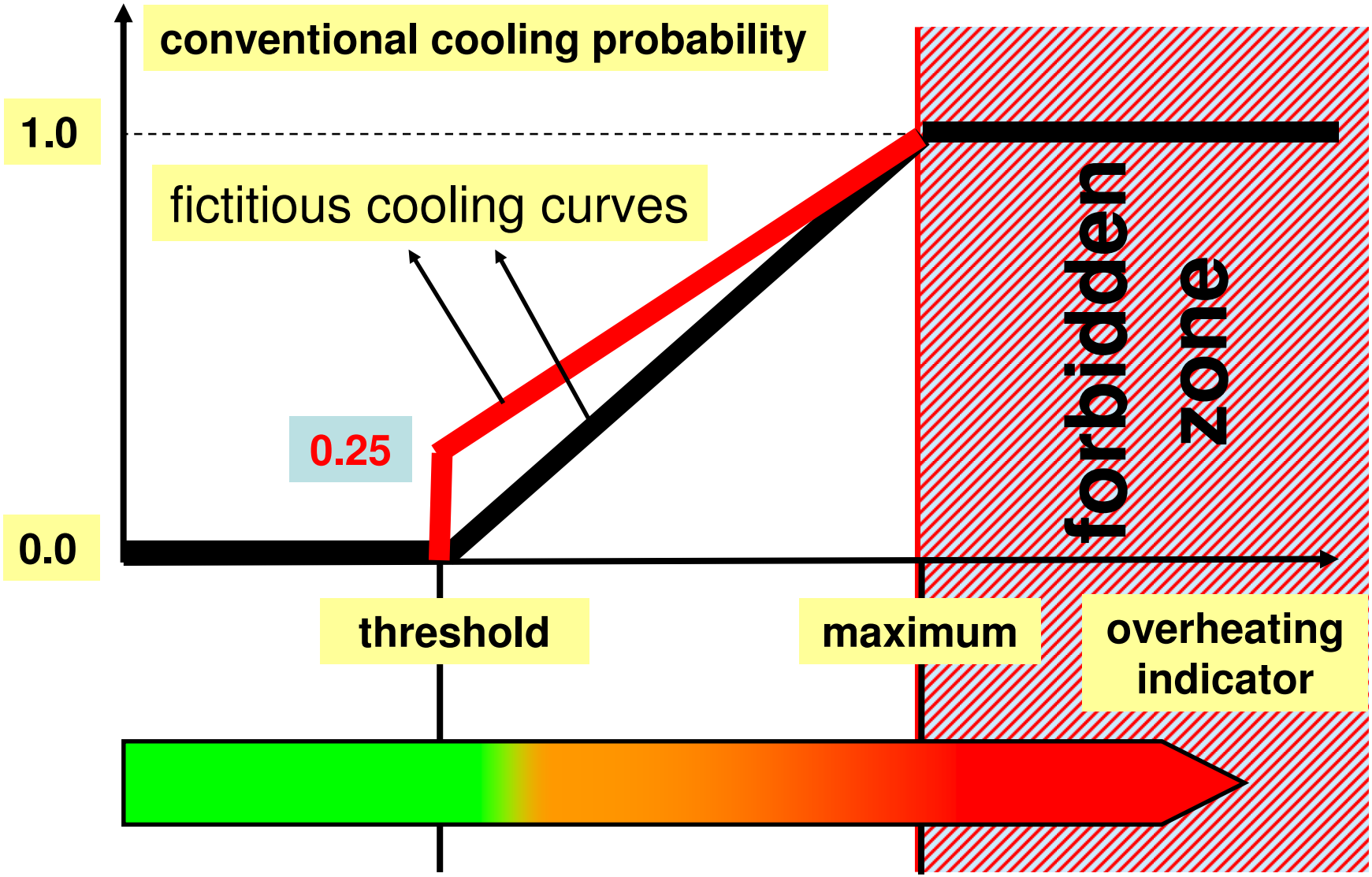
Overheating indicator



Possible weighting factor for fictitious cooling (1)



Possible weighting factor for fictitious cooling (2)

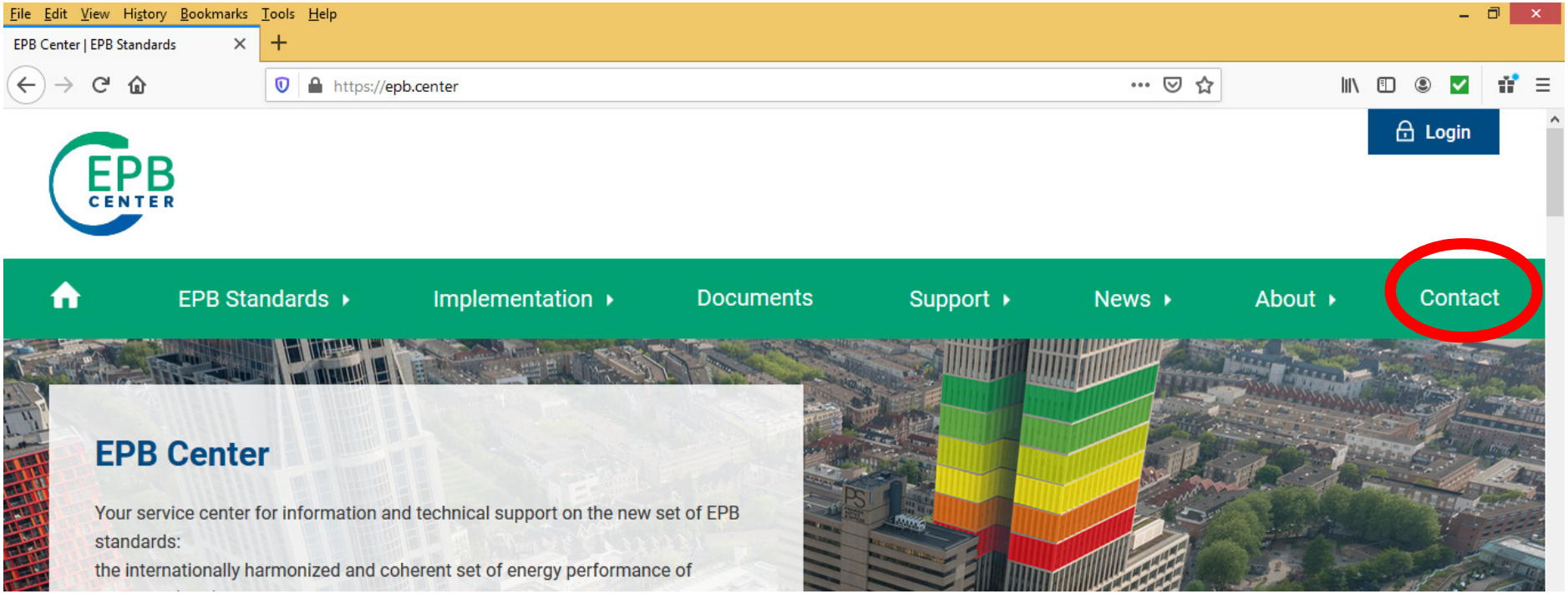


Overall scheme

- Step 1:
  - for all buildings (whether actively cooled or not), evaluate the risk of overheating
  - maybe impose a requirement
- Step 2: cooling probability
  - if installed: p=1
  - else: see previous graph
- Step 3: include the weighted cooling consumption in the overall energy performance & identical requirement
  - if cooling installed: with real system efficiency
  - else: with fixed (somewhat) favourable system values

Questions and comments

- Q&A right now.
- At any time in the future, use the contact form on the website.



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Question and Answer session

Please submit your question in the question box.