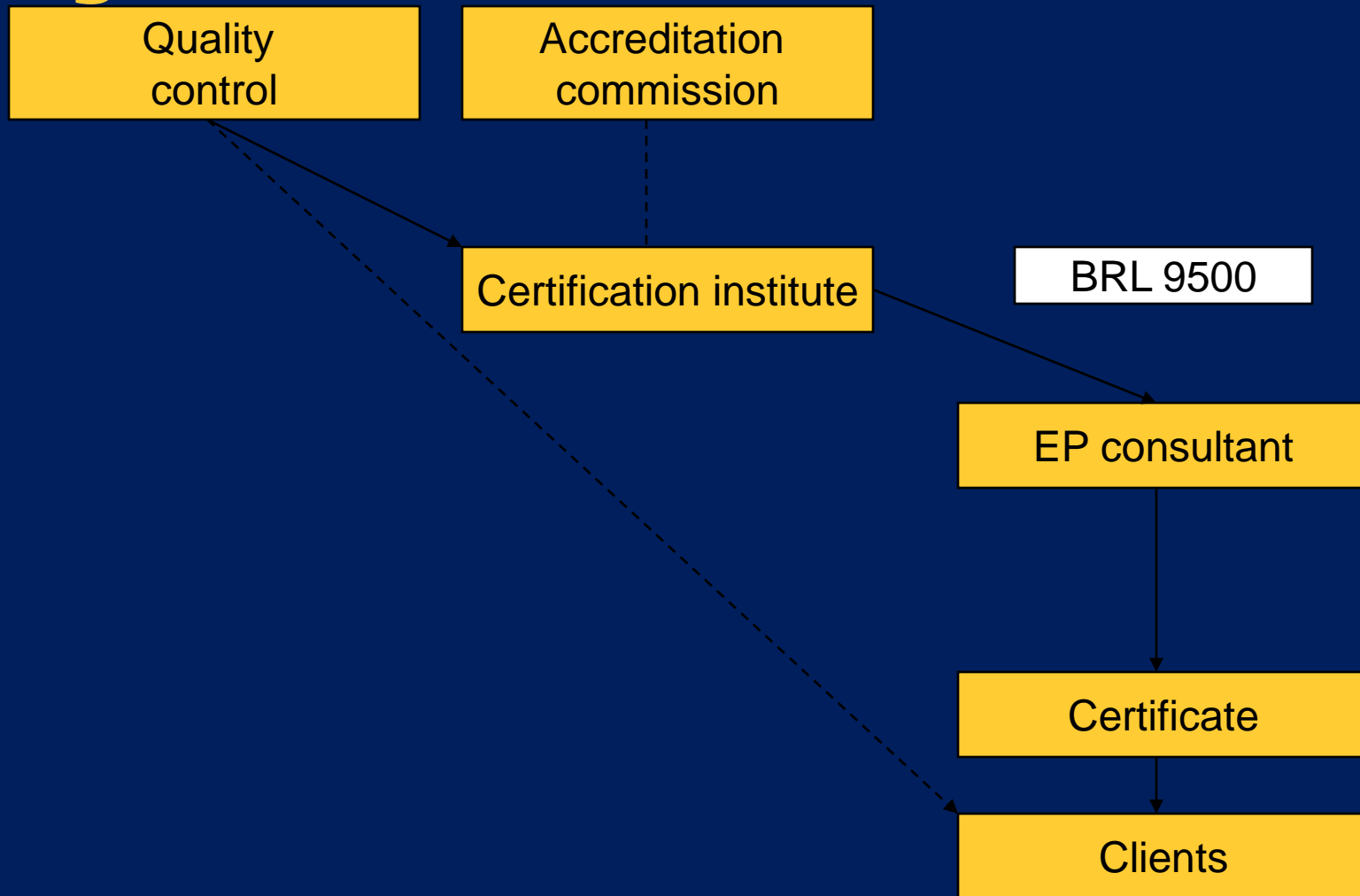


# Building Audit

*October 1, 2009*

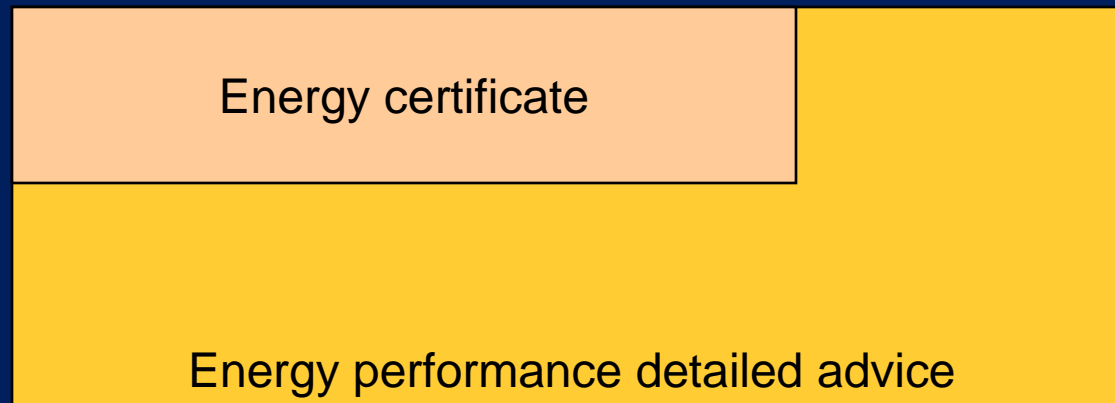
Frank Schipper

# Algemeen



## 2 type of advice

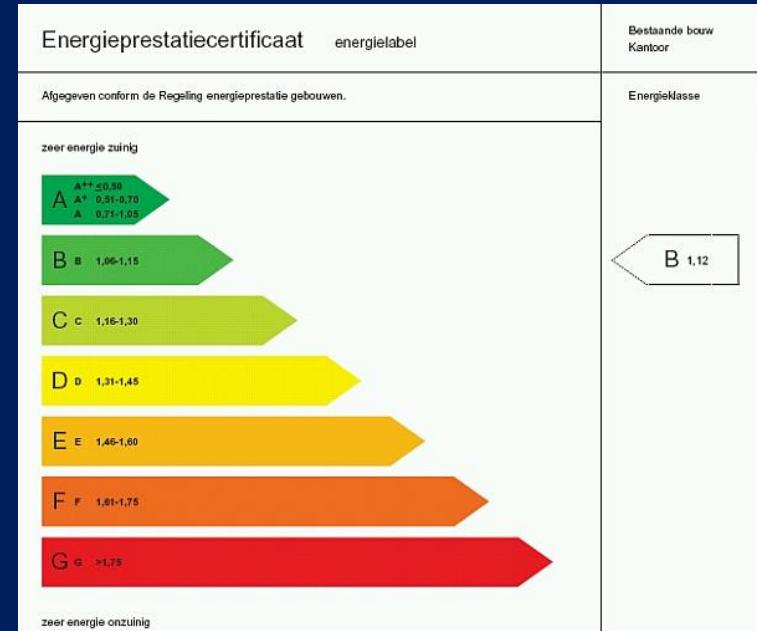
- Energy certificate
- Energy performance detailed advice



# Energy performance NL

- Definition Energy Index

$$EI = Q_{\text{total}} / Q_{\text{permitted}}$$



$$Q_{\text{permitted}} = \alpha A_{\text{envelope}} + \beta A_{\text{floors}}$$

# Standard data for buildings

- Why standard data?
  - Label for the building not the user
  - Comparison between buildings



## Standard data for:

- Meteo data, temperature and solar radiation
- Inside temperature (different functions)
- Usage time, usage factors
- Infiltration
- Minimum ventilation
- Humidification
- Internal heat (persons and office equipment)
- Lighting (burning houres)
- Hot water production

# Audit building

- Collect data
  - Surfaces
  - Drawings (Building and installation)
  - Audit and site measuring
- Preparation
  - Ground plans on A4/A3 format
  - Accessibility of rooms
  - Building boundaries



# Intake

- Digital photo camera, spring rule, lighter, flashlight, compass, knitting needle
- Interview care taker



# Where do we have to look for

- Are the drawings correct?
  - Building envelope (m<sup>2</sup>, U-value, orientation)
  - Transparent parts (m<sup>2</sup>, U-value, orientation, shading)
  - Gross area
- Different functions (office, school, restaurant, ...)
- Different climate systems
- Repetition
- Exeptions
- Technical rooms
- Roof and basement

## “every” room check:

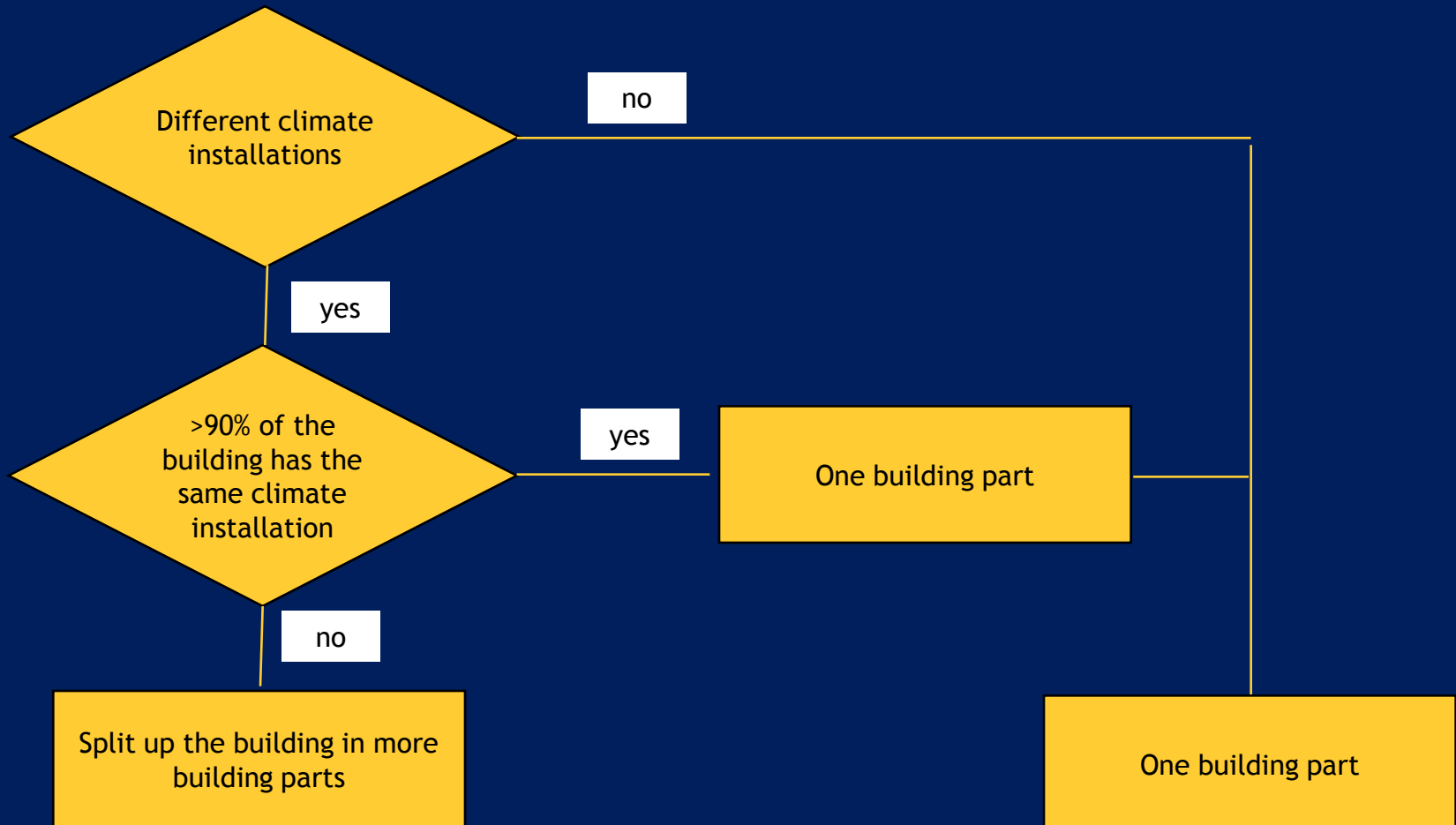
- Ventilation system (in, out, control)
- Heating system (distribution, control)
- Cooling system (distribution, control)
- Lighting (type, W, control)
- Windows (glass type, frame type, shading)
  
- Repetition
- Exceptions

## Advice for energy saving:

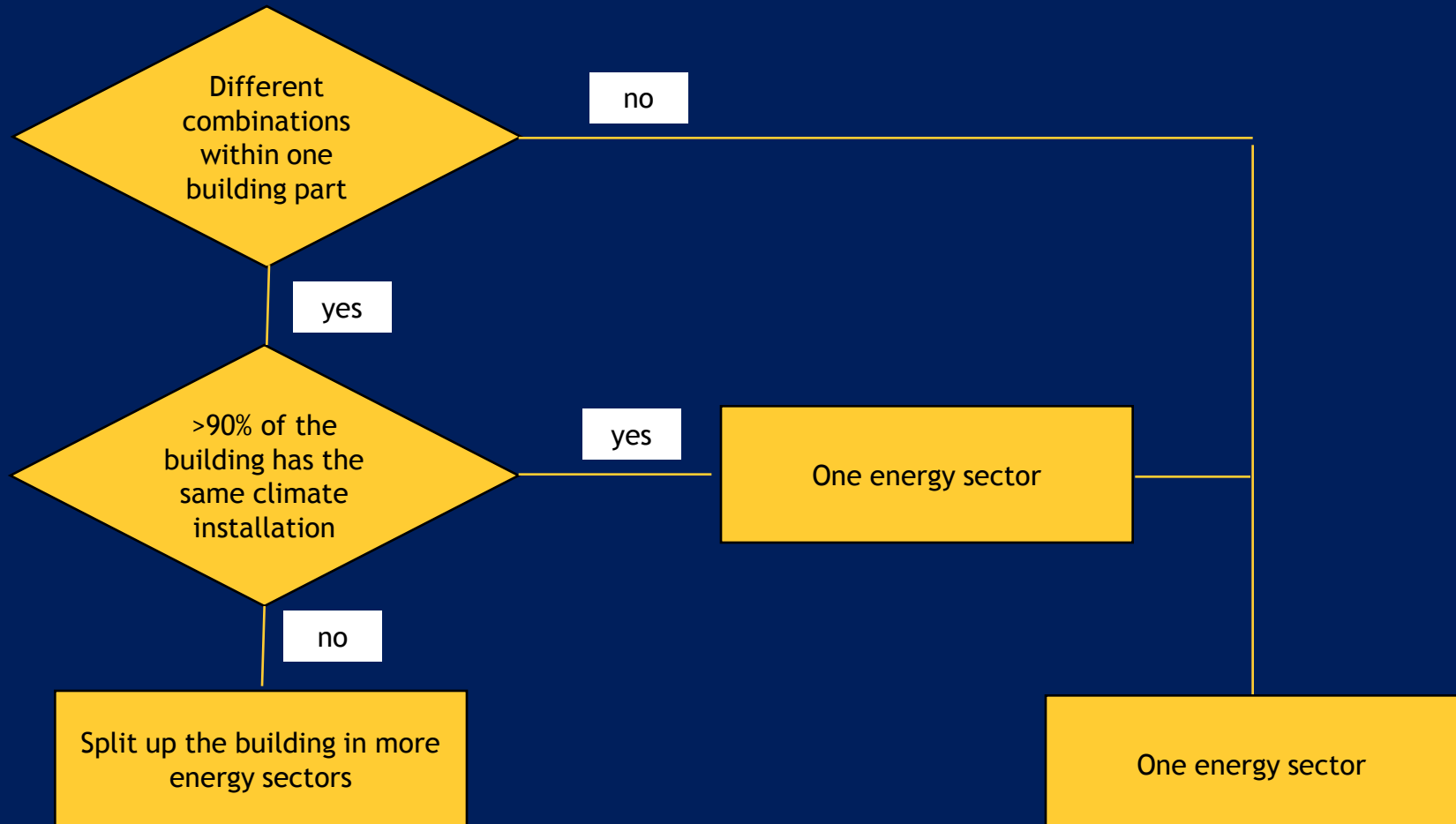
- Office equipment
- Server
- Elevators
- No-break systems, back-up systems
- Telecommunication
- Control of the installation (GBS)
- Outside lighting
- Kitchen equipment

- Lets go!

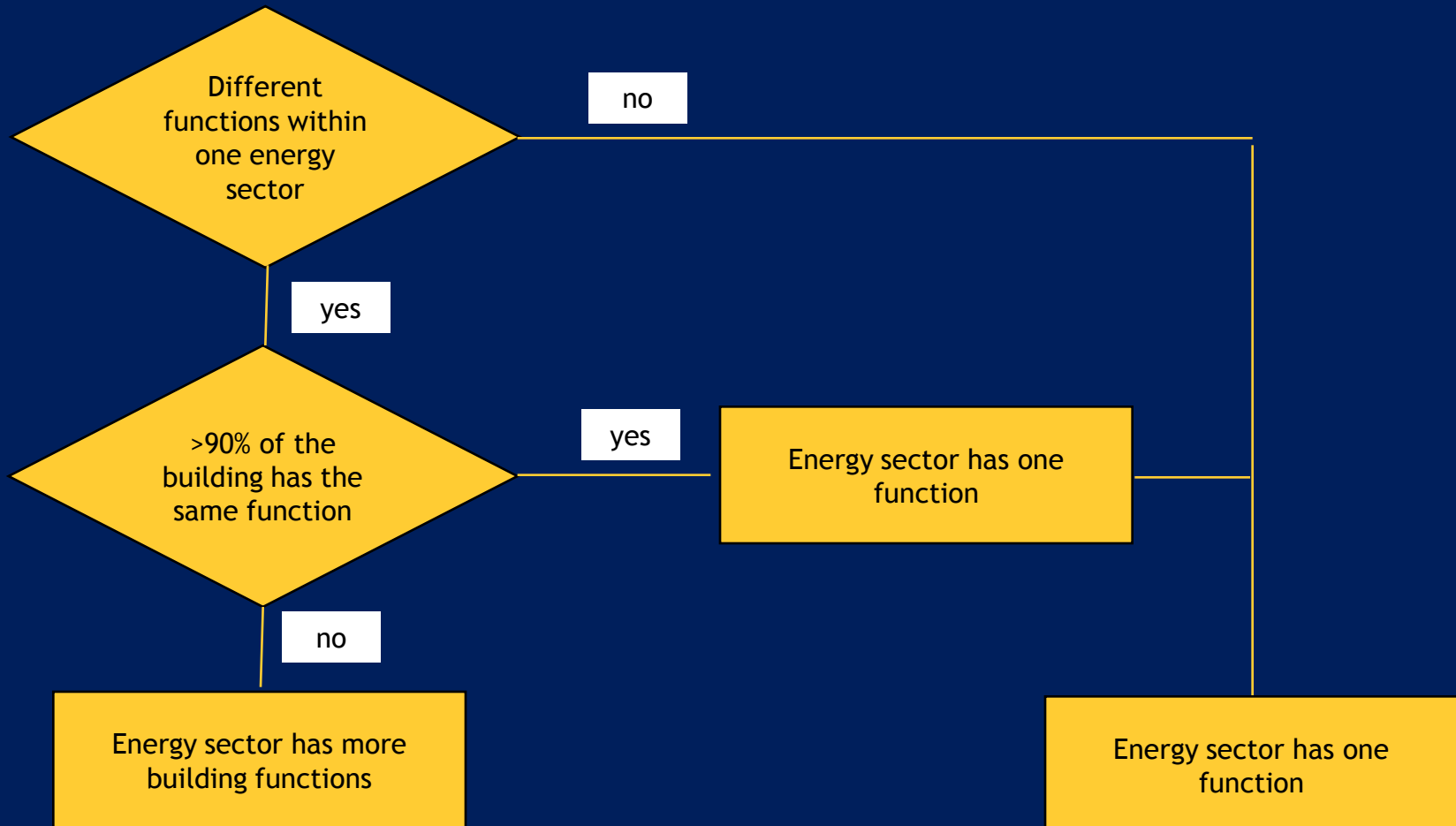
# Separation in building parts



# Separation in energy sectors



# Separation in building functions



# EPA-NR

# Gebruiksfunctie binnen energiesector

- Afb 6.3
- Afb 6.4
- Afb 6.5

# Oppervlakte bepaling

- Gesloten gevel
- Kozijnwerk (incl. beglazing en panelen)
- Daken
- Vloeren (bruto vloeropp)
  
- Gevel: Buitenwerks oppervlak
- Dak binnenwerks, geen overstekken
  - Schoorstenen, lichtkoepels > 2 m<sup>2</sup>

# Oppervlak vloeren

- Grenzend aan buiten of onverw. Ruimten per energiesector
- Gebruiksoppervlak per gebruiksfunctie
- Binnenwerksgemeten (lxb)
  - Minus dragende wanden
  - Minus Trappgat, vides en liften  $> 4 \text{ m}^2$
  - Minus Leidingschachten  $> 0,5 \text{ m}^2$
  - Minus Hoogte lager dan 1,5m
- Gebruiks oppervlak = al verwarmd vloeroppervlak

# Opbouw constructies

# installations

- Heating
- Domestic hot water
- Cooling
- Ventilation
- Humidification
- Lighting
- Solar systems (PV)
  - Opwekking, distributie, afgifte en regeling